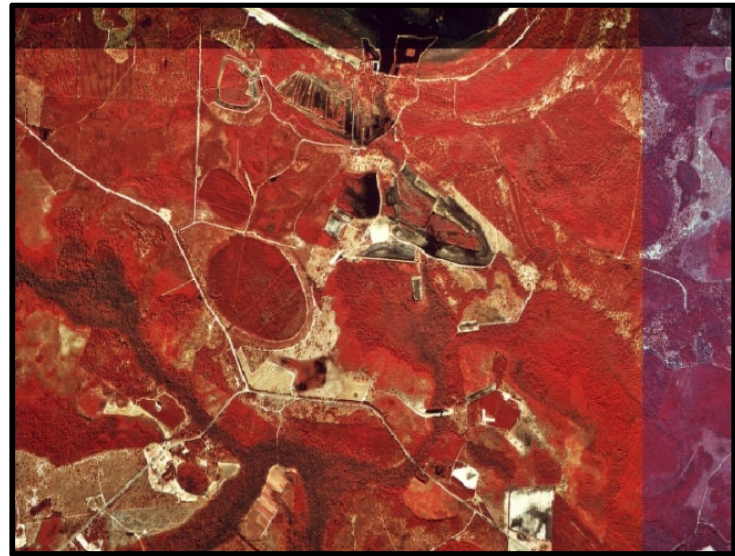


# The 2009 Atlantic White-Cedar Symposium Field Tour

Claridge Forest Nursery  
Bladen Lakes State Forest  
Bayfield Property



**2009 AWC Conference Field Tour  
June 10, 2009  
Agenda**

- 0730**            **Depart from Hotel**
- 0830**            **Stop #1 -- NCDFR Forest Seedling Nursery (Claridge Nursery)**
- **Container Grown AWC**
  - **600,000 seedlings**
- 0930**            **Depart Claridge Nursery**
- 1045**            **Stop #2 – Bladen Lakes State Forest – Johnson Mill Pond**
- **Carolina Bay Ecosystem**
  - **AWC Natural Regeneration – mature and immature stands**
- 1145**            **Depart Bladen Lakes State Forest**
- 1215**            **LUNCH -- Bayfield Tract Lodge**  
**Dohn Broadwell (owner) & Jack Ernst (property manager)**
- 1300**            **Stop #3 – “Bull Bay”**
- **Bay Forest Drain**
  - **AWC Site Preparation Demo**
  - **AWC Artificial Regeneration**
  - **Longleaf Pine Ecosystem**
- 1345**            **Stop #4 – “The Seep”**
- **Wetland Seep**
  - **Nine year old AWC**
- 1430**            **Stop #5 – “ Mutts Lake”**
- **Carolina Bay restoration**
  - **Three year old AWC**
  - **Intensive AWC Management**
- 1515**            **Return to Hotel**
- 1730**            **Arrive at Greenville**

## **History of Container Use by NC Forest Service**

Beginning as far back as 1972, under the direction of O.C. Goodwin, NCFS began doing research into producing containerized seedlings of the Southern pines and various hardwoods. A greenhouse was constructed at Griffiths Forestry Center in Clayton in 1977 and we were in the container grown seedling business. The outplanted seedlings were evaluated, the techniques were streamlined and in 1995, production was increased by 500,000 longleaf pine annually with the goal of producing 3,500,000 seedlings. The 3,500,000 capacity was reached in the year 2000 and we have remained there since. In 1999 the facility was overhauled to improve operating efficiency, address nutrient run-off and expand seedling production.

All of the container production of Southern Yellow Pines, Atlantic White Cedar and hardwoods takes place at Claridge Nursery. We currently are using a wooden bench and fixed irrigation system with capacity of 6.3 million cells of which we generally are able to produce about 4.5 million saleable seedlings.

The container seedling operation primarily produces genetically superior Longleaf Pine seedlings. Through cooperative research with scientists from NCSU, DFR has developed the technology to grow AWC from seed as containerized seedlings. This technology has led to the ability to restore many more acres to AWC than were previously realized. We plan to produce over 5000,000 AWC seedlings this year. DFR is also producing genetically superior Loblolly Pine in containers, and the goal is to produce 300,000 each coastal and piedmont seed sources. In addition, DFR grows 3,500,000 Longleaf Pine. In 2006, DFR expanded production of containerized hardwoods to include several wetland species. Many of these 27 species of seedlings will go to stream restoration and wetland mitigation projects.



# New Vacuum Seed Head for Sowing Containerized Atlantic white cedar

NC STATE UNIVERSITY

James West<sup>1</sup> and Eric Hinesley<sup>2</sup>

Historically, the North Carolina Forest Service (NCFS) annually produced 10 to 20 thousand bare-root Atlantic white cedar (AWC) (*Chamaecyparis thyoides*) seedlings, but results were frequently unpredictable, characterized by great variation in bed density and seedling quality (Summerville et al. 1999). Consequently, natural regeneration was the preferred method of regeneration (Phillips et al. 1992).

In the late 1980s, strong interest arose in restoring (*Chamaecyparis thyoides*) to many of its original sites in eastern North Carolina and other states. Weyerhaeuser Timber Corporation spearheaded this work, and developed methods for vegetative propagation from stem cuttings (Garner and Summerville 1991). During the 1990s, the company annually produced several hundred thousand rooted liners, but the program ended about 10 years ago. That work, plus other research (Hinesley et al. 1994, Hinesley and Snelling 1997, Kuser and Zimmerman 1995) yielded a large body of information for vegetative propagation of AWC from stem cuttings.

Although vegetative propagation is a viable means to regenerate AWC (Phillips et al. 1992), the NCFS decided 6 or 7 years ago to go solely with container production using seed. Research helped establish the protocol for production of containerized plants (Derby and Hinesley 2005a, b). Vegetative propagation is still used for high-value activities, e.g., genetic improvement with superior genotypes.

Historically, the NCFS used a vacuum seeder to sew Ropak multi-pot 45 trays (14 x 9.5 inches, 45 cells per tray, cell volume = 6 cubic inches). It was originally developed to sew large-seeded species such as longleaf pine (4700 seeds per pound). Later, the same equipment was used to sew AWC (440,000 seeds per pound). Because the holes were adapted for heavy seeds like longleaf pine, each hole often picked up as many as 10 or 12 AWC seeds rather than just one, two, or three seeds. This caused heavy over-seeding and massive waste of seed, and greatly increased costs by requiring large amounts of labor to manually thin the overstocked cells in trays. There was also a need for more frequent seed collections.

In 2009, the NCFS considered a new vacuum head with smaller holes for light-seeded species such as AWC. The manufacturer of the old equipment was no longer in business, so a new vacuum head was fabricated by Goldsboro Machining Company using the old head as a pattern. For the 2009 AWC crop, about 5.5 lbs of seed was sewn into \_\_\_\_\_ trays for a target crop of \_\_\_\_\_ thousand seedlings. Compared to the old vacuum head, this is more efficient, and should greatly decrease the amount of labor needed to subsequently thin overstocked trays. Its value further increases considering that thinned seedlings are lost from production. With a more efficient vacuum head, perhaps two or three times as many trays can be seeded with a given quantity of seed, increasing the size of the crop and potential revenue.

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- Derby, S. A. and L. E. Hinesley. 2005b. Growth of Atlantic white cedar seedlings as affected by container volume, substrate, fertilizer, and water regime. *HortScience* 40: 1755-1759.
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**Bladen Lakes State Forest** is a state owned forest located in the southeastern coastal plain of North Carolina. It is managed by the NC Division of Forest Resources for timber, pinestraw production, and wildlife. Covering about 32,600 acres (13,200 ha), it is the largest state owned forest in North Carolina. Nearly every type of plant community found in eastern NC is found in the forest including carolina bays, AWC forests, bay forests, longleaf savannas, swamp forests, and loblolly pine plantations.

### **Background**

During the period 1936-1942, the federal government acquired approximately 35,875 acres in Bladen County under Title III of the Bankhead-Jones Farm Tenant Act. As a result, the federal government paid the back taxes due from the families that occupied this land and relocated the families to other areas where farming was more profitable. This action resulted in what is now called the Bladen Lakes State Forest. During the period 1936-1939, the forest was managed by the Resettlement Administration utilizing Civilian Conservation Corps labor forces and local residents to establish truck trails, Jones Lake and Singletary Lake recreational areas, and buildings and offices for the forest headquarters. Hundreds of acres of pine plantation were established on all available open fields, telephone lines and fire warden dwellings were constructed, and many other projects basic to the management of an area of this size were completed. On July 15, 1940, the Secretary of Agriculture turned the administration and operation of the forest over to the N.C. Department of Conservation. This department leased the land from the federal government until October 19, 1954, at which time the area was turned over to the State of North Carolina in a "fee simple" agreement. The federal government still holds a mineral interest on the property and a reversionary right if the property ceases to be used for public use.

In the early days, the primary objectives in the management of the forest was to build up the growing stock of timber on the cut-over and previously badly burned areas; to utilize all resources including game; and to demonstrate that such an area can be more than just self-sustaining. In later years the forest was used more as a demonstration and educational type of forest. Operational techniques in forest management and utilization such as planting techniques, control burning, road construction, logging, saw milling, fence post manufacturing and treating, and charcoal manufacturing were demonstrated. Our objectives have changed over the past 50 years to encompass more environmental, research, and training interests.

The present goals and objectives for the forest are:

- \*To operate the forest for effective integration of sound forest management principles and to promote good stewardship practices for the total forest resource.
- \* To use renewable resources and to increase the forest value while protecting and maintaining special resources such as Natural Heritage areas, endangered species and aesthetics.
- \* To regenerate harvested forest resources by artificial or natural silvicultural practices.
- \* To maintain a sound wildlife management program through cooperation with the Wildlife Resources Commission.

\* To serve as a model for sound and innovative management practices and operations, appropriate to site productivity.

\* To provide research sites and to test the results of research conducted by the Division, universities and other scientific agencies to further the science of multiple-use forestry.

\* To Utilize the forest to the maximum possible as a training grounds for division personnel, for forestry schools and other groups especially interested in studying the many aspects of southern sandhill and coastal plain forestry.

## **Stop # 2 –AWC Stands in Johnson Mill Pond Bay**

Johnson Mill Pond Bay is a 777 acre Carolina Bay. It contains a diverse plant community of bay vegetation. Hardwoods, including sweet bay, loblolly bay and red bay, are predominant. Carolina bays are sometime referred to as pocosins because of the peat soil, poor drainage, and dense shrub layer that dominant these sites. Gallberry, blueberry, and fetterbush thrive in the acidic soil. Pond pine and Atlantic white cedar are common in the bay forest. The adjacent Tatum Millpond is listed as a state natural heritage site.

Acres AWC Stands: 3 acres in older stand - N side of road;  
25 acres in younger stand - S side.

Age: Older stand –65 - 70 years  
Younger stand: 20 years

Plant Community: Carolina Bay, Atlantic White Cedar Forest

Harvest: Clearcut in 1989 in 20 year old stand; not known in older stand.

Soil Type: Pamlico Muck and Lyn Haven sandy loam

Regeneration Source: Natural Regeneration

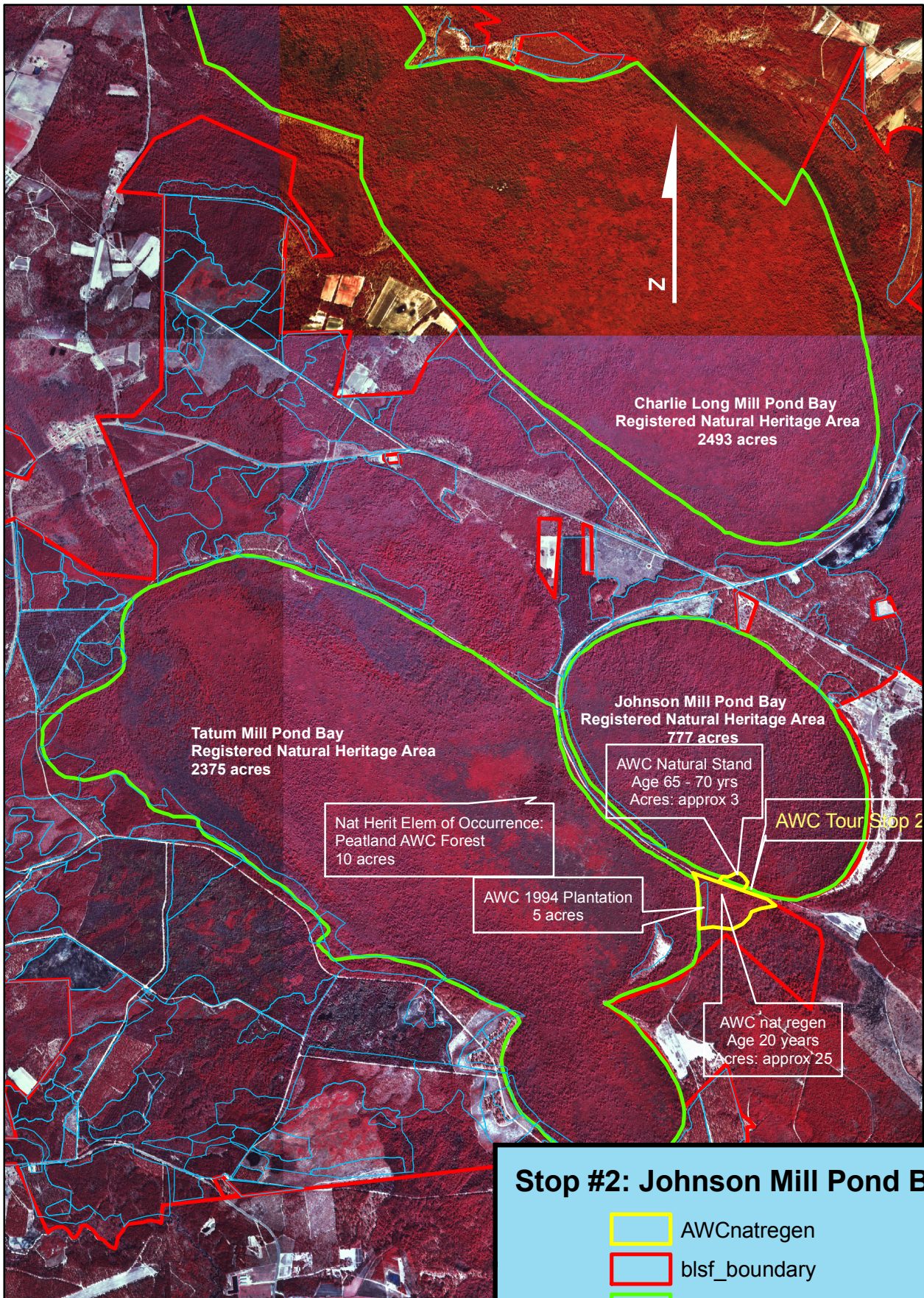
Stocking Density:

Older stand:

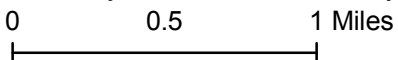
Plot 1 -- BA 220 of AWC (not including other species not counted)  
Plot 2 -- BA 260 of AWC (not including other species not counted.)

Younger Stand:

Plot 3 -- 6800 TPA of AWC ( other species not counted)  
Plot 4 -- 7800TPA of AWC (other species not counted)



Drawn by Michael Chesnutt May 20, 2009



**Stop #2: Johnson Mill Pond Bay**

- AWCnatregen
- blsf\_boundary
- blsf\_dedreg\_12\_04
- Stands2009

1998 Color Infrared Photography

## **BAYFIELD TRACT**

### **Background**

The Bayfield property is located in the coastal plain of NC in Bladen County. The 4000 acre property is privately owned by Dohn Broadwell. Dohn acquired the first of what was to become Bayfield in 1975 as a retreat to pursue his love for duck hunting. Prior to that the woodlands were owned and managed by Canal Wood. Restoration of the Longleaf pine ecosystem became the first management objective for Dohn's woodlands. Since 1975 he has successfully converted over 1200 acres of slash and loblolly pine stands into longleaf and continues to maintain the longleaf by periodic , low intensity prescribed burns. In 2000 his management focus turned to AWC restoration .



The landscape in Bayfield consists primarily of sandy “uplands” separated by wet natured flatwoods. Soil types vary from well drained sands to very poorly drained mucks. Several Carolina Bays are scattered across the property. This unique landform, found only in the coastal plain of the Carolinas, contains a diverse range of habitats from dry sand ridges to wetland depressions and lakes. A large duck impoundment is actively managed for duck food plots. The many different soil and drainage types found here produce a wide variety fauna and flora.

The Bayfield Tract is the largest AWC reforestation effort in North Carolina. Since 2000 Dohn Broadwell and his land manager have artificially regenerated over 700 acres to Atlantic White-Cedar with plans for 300 additional acres. By the end of this planting season over 1 million atlantic white cedar seedlings will have been planted. We will look at his recipe for success as we visit several stands on this property. Stops will include a site preparation demonstration, a 3-year old plantation in a Carolina bay, and a 9-year old planting in a sand hill seep.

### **Stop # 3 – “The Bull Bay” Tract**

Acres:	155
Age:	na
Plant Community:	Nonriverine Swamp Forest, AWC Peat Forest, Bay Forest
Harvest:	Clearcut in 2008
Soil Type:	Lynn Haven/Torhunta muck sandy loam
Site Prep Method:	KG Raked , Chopped, and Bedded with a Savanna Plow
Planting Date:	Winter 2010





Spacing: 6' x 6' , 1210 TPA  
Seedling Type: AWC container grown seedlings (NCDNR nursery)

#### **Stop #4 – “The Seep” Tract**

Acres: 25  
Age: 9 years  
Plant Community: Sandhill Seep, Pond Pine (*Pinus serotina*) formerly dominated site  
Harvest: Salvage Cut in 2000 following wildfire  
Soil Type: Lynn Haven and Torhunta mucky sandy loam  
Site Prep Method: Drum chopped , Low beds  
Planting Date: Winter 2000  
Spacing: 8' x9' , 608 TPA  
Seedling Type: AWC bareroot seedlings (NCDNR nursery) + unknown source



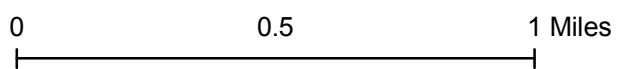
#### **Stop #5 – “Mutts Lake”**



Acres: 98  
Plant Community: Carolina Bay, Low Pocosin.  
Harvest: Clearcut – 2005, Drained and planted to Loblolly Pine plantation in 1985  
Soil Type: Lynn Haven and Torhunta mucky sandy loam  
Site Prep Method: KG Raked, Chopped Bedded with a Savanna Plow  
Planting Date: Winter 2006  
Spacing: 6' x 6' , 1210 TPA  
Seedling Type: AWC container grown seedlings (NCDNR)



Drawn by Michael Chesnutt May 20, 2009



**Broadwell Tract  
AWC Tour Stops 3, 4, and 5  
2008 Photography**



November 13, 2008

**ATLANTIC WHITE CEDAR PLANTING SUMMARY**

<b>BAYFIELDS</b>			
<b>Tract</b>	<b>Date</b>	<b>Seedlings</b>	<b>Acres</b>
2 The Seep	12/28/00	15,000	25.00 **
Big Empty	12/11/02	23,000 NCFS/BARE	
Big Empty	04/25/05	21,750 NCFS/CONT.	36.98
Egg Bay Rim	11/01/04	2,400 NCFS/CONT.	
Egg Bay Rim	04/25/05	5,250 NCFS/ CONT.	6.32
The Wally	04/25/05	3,250 NCFS/ CONT.	2.69
Davis Tract	12/05	21,750 NCFS	17.97
3 Mutts Lake	12/05	119,000 NCFS	98.35
North West Indian	12/05	38,250 NCFS	31.61
Behind the Boat	12/05	14,720 NCFS	12.16
Alban's Lungs	12/05	15,750 NCFS	13.01
Little Empty	12/05	20,250 NCFS	16.73
Doe Island	01/06	5,000 NCFS	4.96
	01/06	1,000 LP.Co.	.83
The Bear Path	04/07	81,750 NCFS	67.56
The Pork Chop	04/07	121,750 NCFS	100.62
The Little Wilson	04/07	4,500 NCFS	3.72
The Little Wet	12/07	9,750 NCFS	8.05
The Wilson Tract	12/07	54,250 NCFS	53.09
10,000 MARYLAND			
Chip Deck Tract	02/11/08	109,500 NCFS	90.50
Chip Deck Tract	11/07/08	19,500 NCFS	16.11
1 The Bull Bay Tr.	04/10/08	36,250 NCFS	29.95
The Bull Bay Tr.	11/05/08	37,750 NCFS	31.19
The Egg Bay	02/28/08	87,500 NCFS	72.31
SholarTr.	11/06/08	27,500 NCFS	22.73
<b>BAYFIELDS TOTAL</b>		<b>906,369</b>	<b>749.06</b>

<b>AT BAYFIELDS</b> -----	<b>749.05</b>
<b>BLAKEFIELDS</b> -----	<b>110.08</b>
<b>TOTAL TO DATE</b> -----	<b>859.14</b>

**THIS WILL LEAVE 140.86ACRES TO BE PLANTED TO HAVE 1,000 ACRES.**

**ACRES NEEDED TO REACH 1,000 ACRES FOR 2009 = 140.86**

<b>2009</b>		
<b>THE PINE FLAT TRACT</b>	<b>BURN, BED, PLANT</b>	<b>98.00 +- ACRES</b>
<b>THE BULL BAY TRACT</b>	<b>BURN, BED, PLANT</b>	<b>58.00 +- ACRES</b>
<b>THE SCHOLAR</b>	<b>KG, BURN, BED, PLANT</b>	<b>11.00 +- ACRES</b>
<b>THE TOWNSEND/SCH BAY</b>	<b>BURN, BED, PLANT</b>	<b>20.00 +- ACRES</b>
<b>(226,270 SEEDLINGS NEEDED)</b>		<b>187.00 +- ACRES</b>