REFORESTATION OF BEAVER-KILL SITES WITH PLANTED HARDWOODS[1/]

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INTRODUCTION

Beaver (Castor canadensis) populations have increased dramatically across the Southeastern United States during the past 20 years (Bullock and Arner 1985). On many watersheds, the beaver has become a primary nuisance species, inundating valuable forest land.

Adverse economic impacts due to beaver activities have stimulated interest in effective control programs to attain 1) prevention of original colonization, 2) regulation of current populations, or 3) elimination and prevention of recolonization attempts. Intrinsic to population control is the assumption that there is a valuable resource on site that the beaver's activities would place in jeopardy. Justification for population removal depends on reliable predictions of reclaimed land productivity.

Even if effective control and management programs are developed and applied diligently, reclamation of beaver-kill sites presents a complex silvicultural challenge. Early successional stages on these areas are comprised mainly of low-value tree species. The following is a report on an integrated control and reclamation program involving planted tree seedlings on beaver-kill sites in West Tennessee.

METHODS AND MATERIALS

Beaver Control

In November of 1984, the Hobart Ames Foundation, in cooperation with the University of Tennessee Agricultural Experiment Station, began a year-round beaver control program on the Ames Plantation. The 4000-acre study area lies in the upper headwater basin of the North-Fork of the Wolf River, a tributary to the Mississippi River. Population density on the North-Fork downstream from the study area is high based on periodic aerial surveys conducted by Tennessee Division of Forestry personnel (Charles Riddell, personal communication, 1987).

The program was designed to eliminate original populations in the study area and prevent recolonization by catching "pioneer" beaver within 1 month of immigration. Trapping was initiated in all known colonies more or less simultaneously, and trapping intensity was proportional to the number of beaver in the study area in any given time. Twenty-two active colony sites (ranging from 1 acre to 60 acres) were identified. The trapping techniques used were those outlined by Hill (1982) and Weaver et al. (1985). Age det erminations were made by examination of basal closure and cementum deposits of molars and premolars (van Nostrand and Stephenson 1964).

Yearly catch data were divided into 3-month intervals. February-March-April corresponds to the suspected time of dispersal of two-year-olds from natal colonies (Hill 1982). Orthogonal contrasts were developed to test apparent increases in immigration levels during expected dispersal dates.

Plantation Establishment

During spring 1985, green ash (Fraxinus pennsylvanica), sycamore (Platanus occidentalis), sweetgum (Liquidambar styraciflua), cottonwood (Populus deltoides), and cypress (Taxodium distichum), were planted at a 10 x 10 foot spacing on two beaver-kill sites with two replications of 120 trees of each species per site. In the absence of quantitative water table data, the two locations were characterized as "wet", with high water table exposed on about 1/3 of the site, or "dry", characterized by the water table below soil surface and no exposed water. Soils belonged to the Waverly-Falaya-Collins association.

Species blocks were split and swamp cut grass (Leersia oryzoides) was controlled on 1/2 of each plot by spraying a grass herbicide along each row of seedlings, providing a relatively competition-free corridor four-feet wide. Herbicide was applied in April and July.

Survival data were collected at the end of the first growing season. Duncan's Multiple Range test was used to compare survival differences between species and effect of herbicide across species within each location ($p < .05$).

RESULTS AND DISCUSSION

Beaver Control

Figure 1 represents a monthly index of immigration rates into the study area. These

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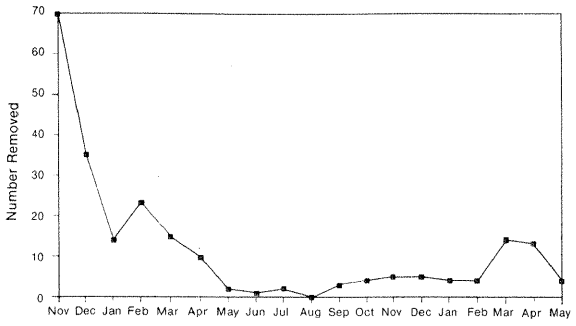
data suggest that high beaver populations can be reduced dramatically. However, immigration rates increase significantly ($p < .01$) during each spring. Catch rates of 2-year-old beaver increased each year beginning in February and generally ending by mid-summer.

Figure 1.--Beaver immigration November 1984 through May 1986.



These findings illustrate the probable impact of dispersal on isolated control programs that are contiguous to dense beaver populations. Control is likely to be a perpetual enterprise varying in intensity with apparently predictable immigration rates. However, because many forest stands require freedom from inundation only during the growing season, beaver control programs might be successful if concentrated in spring and summer months, particularly if original populations are depressed or removed.

Plantation Establishment

Seedling survival on the dry site was greater than 50% for all species except cottonwood (Fig. 2). However, on the wet site, survival was less than 50% for all species except cypress (Fig. 3). Grass control did significantly increase survival on the dry site; however, no significant effect occurred on the wet site, probably because of the high water table and exposed water surfaces greatly restricted herbicide application.

Survival data suggest that successful establishment of desirable tree seedlings is feasible if topography in the impounded area is sufficient to allow effective lowering of the water table. On so-called "dry" sites, survival can be significantly increased with vegetation control. However, final conclusions must await additional tests of species' suitability to the sites created by destroying beaver impoundments.

Figure 2.--First year survival on the dry site

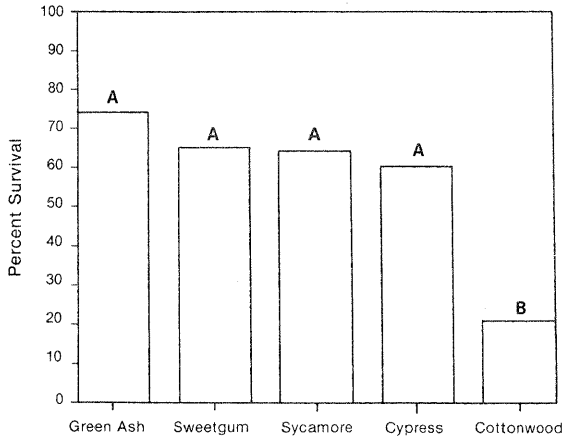
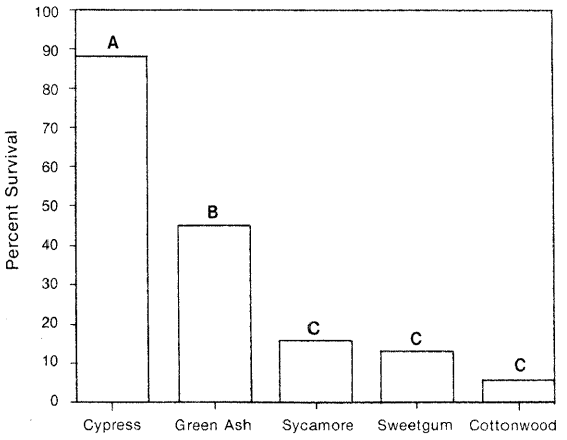


Figure 3.--First year survival on the wet site



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THE TENNESSEE WILDLIFE RESOURCES AGENCY WILDLIFE-FOREST MANAGEMENT PROGRAM 1/

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INTRODUCTION

The Tennessee Wildlife Resources Agency (TWRA is engaged in a long-term wildlife-forest management program specifically designed to meet the needs of wildlife species or groups of species on 150,000 acres of wildlife management areas in the state. The framework of the projects consist of a project mandate, short and long range goals, specific objectives, and policies.

THE MANAGEMENT SYSTEM

TWRA has selected an even-aged forest management system. Forest management compartments of approximately 1,000 acres were established based primarily on natural geographic features. Forest stands ranging in size from 10 to 30 acres are then identified on aerial photographs and data is collected by a field inventory. Following the inventory, permanent stand lines are drawn on a compartment base map. The compartment maps are then entered into a computer via a digitizing table. Stand attributes are entered at an alpha-numeric terminal and related to the appropriate stand number or polygon.

THE WORKING PLAN

The compartment prescription is a ten-year action plan for each compartment. It contains maps of existing forest types; permanent management types based on forest management considerations and permanent management types based on forestry and wildlife collaboration. A schedule of activities lists all cultural treatments, wildlife habitat improvements, road construction, and intermediate and regeneration cuts. A financial summary tracks all revenues and expenditures. The allowable cut is determined by compartment based on a 60 year rotation for pine management types and a 80 year rotation for hardwood management types. One-eighth of the hardwood management type and one-sixth of the pine management type will be regenerated in each ten-year planning period.

REGENERATING OAK

Hard mast is suspected to be the single most important habitat component affecting upland game in Tennessee. This fact has provided the incentive to insure in our planning that oak-hickory stands are regenerated to oak-hickory on suitable sites. A basic 4-step approach has been employed to meet this objective.

1. Realistic expectations must be considered when planning for oak-hickory regeneration areas. TWRA uses a system of site classification based on land types developed from soils data. A matrix of land types and aspect produces a range of productivity classes from which to make management recommendations. Oak sites of either low or high productivity are identified in planning as mixed stands of upland hardwood-pine or upland and cove hardwoods.

2. Adequate oak-hickory advance regeneration must exist prior to harvest. Advance regeneration is defined as seedlings 3 to 6 feet tall and coppice stems 6 feet tall to 8 inches in diameter at the stump. 200 stems per acre meeting these specifications is considered adequate.

3. Pre or post harvest site preparation consisting of slashing potential coppice regeneration and chemical or mechanical control of competing vegetation.

4. Pre commercial thinning and release of oaks and hickories with potential as crop trees. Current activities include chemical control of competition using injection or thin-line bark application.

GIS

The Arc-Info (ESRI) Geographic Information System was acquired by TWRA for data base development, storage and manipulation. Map features such as line, point, or polygons are easily entered, edited, manipulated, and updated within the system. Maps of these features may be displayed on a graphic CRT or printed as hard copies for use in reports or in the field. Associated text or numeric data may be related to map features or used separately within the system.

Complementing this system is the ERDAS image processing system. Our existing grid file data base has been updated on ERDAS and can provide instant analysis of proposed coverages from grid cell satellite image files. Classification of large areas can be accomplished with these files based on different criteria, such as forest type.

1/Poster presented at the Sixth Central Hardwood Forest Conference, Knoxville, TN, February 24-26, 1987.

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THE BOTTOM LINE

The heart of the management program and the basis for most decisions are computer generated wildlife habitat models. The models quickly demonstrate the positive and negative impacts different forestry practices will have on wildlife habitats. Most importantly, the habitat models can show where forestry practices can be used to improve existing habitats.

Using modern technology and up-to-date forest management research, the Tennessee Wildlife Resources Agency will be improving the quality of its timber resource while providing significant increases in quality wildlife habitat for a wide variety of species over a predictable period of time.