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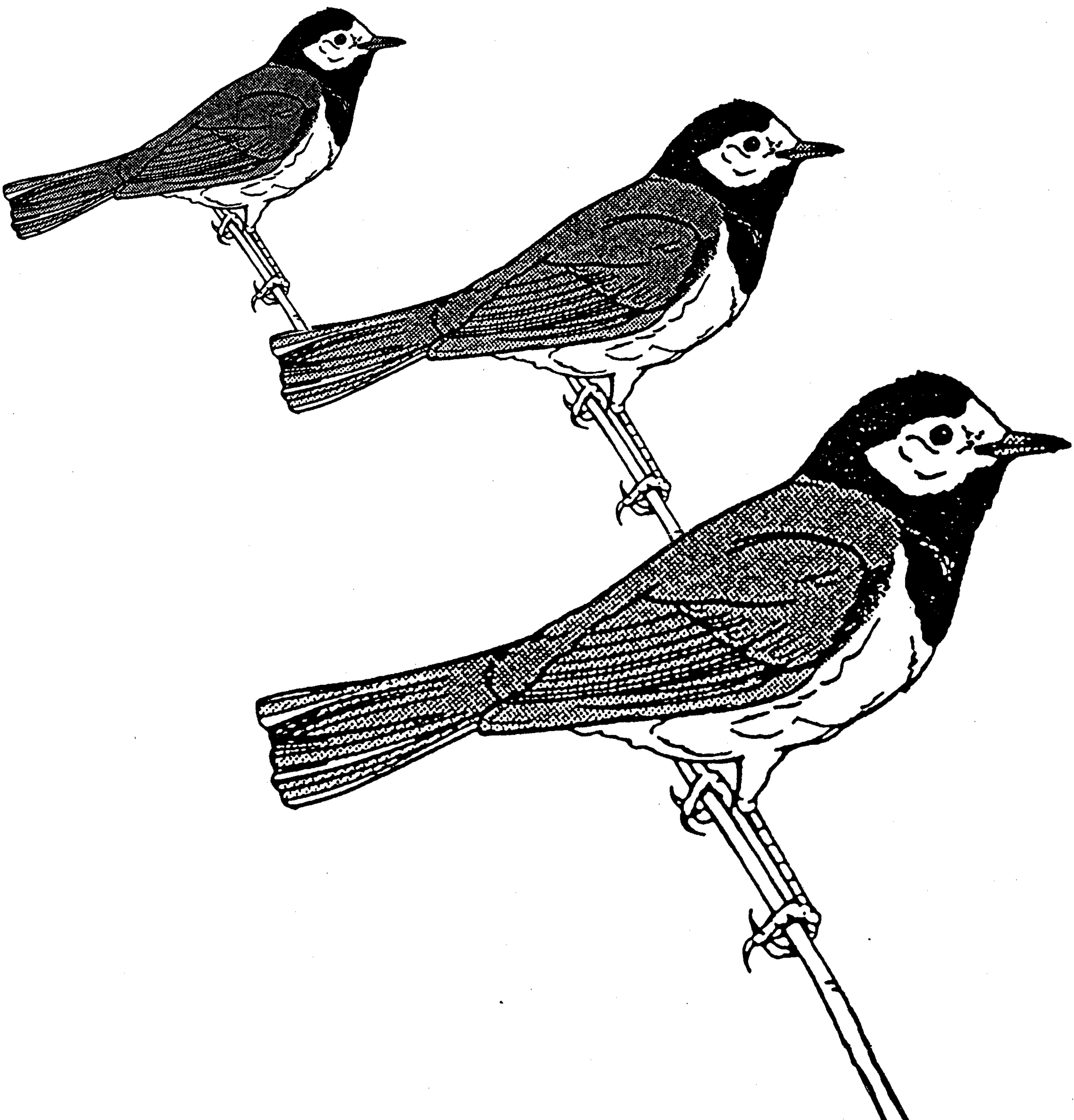
A Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests



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A Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests

compiled and edited by
Winston Paul Smith and David N. Pashley

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PREFACE

Today's land stewards are faced with the challenge of managing natural resources in a social climate with increasing expectations of accountability for an even broader spectrum of ecological and social values. The "buzz" words of days past (i.e., biodiversity, wetland values and functions) are becoming the realities of ecosystem management. Nowhere is this challenge more demanding than in the bottomland forests of the lower Mississippi Alluvial Valley and Gulf Coastal Plain where more than 75 percent of the resource has been lost to agricultural and urban development in the brief period following European settlement. Effective management of the remaining resource is complicated further by a highly diverse ownership with the majority (approximately 60 percent) of the remaining timberlands belonging to the private, noncommercial sector. If we are to succeed in managing the remaining forest resources, we must establish a coalition of professionals, a braintrust that draws from the knowledge, experience, and diverse perspectives of the many scientists and land managers working with industry, universities, and government agencies.

This proceedings is a collection of papers presented at and related discussions that followed a workshop held at Tensas National Wildlife Refuge near Tallulah, Louisiana, on August 9-10, 1993. The purpose of the workshop was to establish a forum for dialogue between scientists and land managers and between foresters and wildlife biologists; the ultimate goal of this interaction was to identify additional constraints imposed by including the habitat needs of Neotropical migratory landbirds in managing bottomland forests. Specific objectives of this symposium were to: (1) provide an overview of the basic ecology of bottomland forests and Neotropical migratory birds, (2) familiarize wildlife biologists with principles and techniques of stand management in bottomland hardwood forests, (3) summarize potential conflicts that exist in managing battomland forests for wildlife species with different habitat needs, and (4) provide participants with a realistic view of the diversity of perspectives and expectations that exists among bottomland hardwood forest protagonists.

This publication contains numerous references to vascular plant and animal species. Rather than include scientific names with common names in the text of each paper, lists of mammal and bird species (Appendix A) and tree and shrub species (Appendix B) are included. Common and scientific names of trees and shrubs followed Little (1978). Common and scientific names of birds and mammals follow American Ornithologists' Union (1983) and Hall (198 1), respectively.

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CONTENTS

An Introduction to Neotropical Migratory Birds and Partners in Flight[1]

Robert J. Cooper and Robert P. Ford[2]

NEOTROPICAL MIGRATORY BIRDS

What Is a Neotropical Migrant?

Neotropical migrants are birds that nest in North America and spend the nonbreeding season in Mexico, Central or South America, or the Caribbean, These attributes differentiate them from migrants in general, which include birds that winter in southern North America but breed in northern North America, and Neotropical birds, which include species that spend their entire lives in Neotropical areas. Although many types of birds are Neotropical migrants, waterbirds such as waterfowl and shorebirds tend to be excluded from consideration under this program, not because they are any less deserving, but because they occupy fundamentally different habitats than most terrestrial species. In addition, there are several conservation programs already underway, such as the North American Waterfowl Management Plan, whose focus includes those species.

More than 160 species of Neotropical migrant landbirds have been listed (Finch 1991). Major groups of Neotropical migrants include raptors (hawks, kites, falcons), cuckoos, caprimulgids (goatsuckers), swifts, hummingbirds, flycatchers, swallows, thrushes, vireos, warblers, tanagers, orioles, buntings, grosbeaks, and some sparrows. Virtually all of these groups are represented in bottomland hardwood forests, if only along forest edges or openings. In particular, Mississippi Alluvial Valley (MAV) forests are important habitats for birds; daily checklists from 10 sites in the MAV included 174 bird species. Of those, 39 were breeding Neotropical migratory species and 41 were transient species (Smith and others, in press). Most were forest birds.

Life Histories

Breeding grounds.--Eastern birds arrive in North America in the spring, often after a transgulf flight. Little is known about resource use during migration, although use of weather radar is likely to shed new light on this aspect of migratory bird life histories (Gauthreaux 1992). Males arrive first, establishing territories through vigorous singing and, occasionally, direct physical contact. Females arrive several days to a week later, choosing a mate among available males, It is at this time that the birds are most easily surveyed via counts of singing males at designated points--so-called point counts. Most species are seasonally monogamous; that is, each season a bird chooses one mate, but that mate is usually replaced from year to year. One or two clutches of young can be raised. Virtually all species are insectivorous during the breeding season. Caterpillars appear to be particularly important food items in eastern hardwood forests.

Nest failure is common among Neotropical migrants. The major source of nest failure is probably nest predation by a variety of predators (mammals, snakes, other birds). Nest parasitism by brown-headed cowbirds also is important in many areas. Cowbirds will lay an egg in the nest of a host, often removing one of the host's eggs in the process. The host's young are usually much smaller than the cowbird nestling, so the latter is fed more and grows faster, usually at the expense of the former.

Cowbirds evolved in the Great Plains of North America; some species that evolved with the cowbird often will remove the cowbird egg or will abandon the nest and build a new one. Forest-dwelling species have evolved no such defenses, however. In some parts of North America, especially in severely fragmented landscapes that were formerly wooded, cowbird parasitism may be so severe that host species such as the wood thrush may raise virtually nothing

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[1]Paper presented at a Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests; 1993 August 9-10;Tallulah, LA.

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but young cowbirds (Robinson 1992).

Wintering grounds.--Wintering ranges often differ between eastern and western birds and also between sexes. For example, Neotropical migrants that breed in eastern North America most commonly winter in the Caribbean, eastern Central America, and South America, usually necessitating a transgulf migration. Western species winter primarily in Mexico and western Central America, funneling into an increasingly narrow area as they proceed south. Those species have a less perilous journey than eastern species but must winter in areas with a greater density of both migrant and resident birds. Habitat use is often similar among breeding and wintering grounds but not for all species.

There is very little data available on the survivorship and sources of mortality during winter. The scant data that do exist, however, seem to indicate that once a bird arrives on the wintering grounds, its probability of surviving the winter is high because it only has to feed itself and is not concerned with competing activities such as finding a mate and raising young. Mortality during migration, however, may be significant, especially for juvenile birds. Storm events can be particularly spectacular and significant to all ages.

Life history parameters.--Although vital rates differ tremendously among all Neotropical migrant species, the birds that are primarily the concern of this workshop, bottomland hardwood forest birds, are mostly songbirds (Order Passeriformes) that have generally similar life history parameters, as listed below (Ehrlich and others 1988):

Age of first reproduction--l year
Survivorship (defined as the probability of surviving from one year to the next)--highly variable:
adults, 0.4 to 0.6; hatch-year birds <0.4
Clutch size: 3 to 6, most often 4
Productivity (defined as the mean number of fledglings produced per adult female per year): 2 to 4
Incubation period: 12 to 18 days
Nestling period: 8 to 20 days

Habitat Requirements

This exhaustive topic is only briefly summarized here. Nearly all habitats will support some type of Neotropical migrant. For example, even urban areas, which are generally unfavorable habitats for most birds, support populations of swifts and some swallows. Similarly, in bottomland hardwood forests, each seral stage will support some species of Neotropical migrants. Early successional stages will support species such as indigo buntings, white-eyed vireos, and yellow-breasted chats. Mature bottomland hardwood forests support a greater number of Neotropical migrant bird species. Some species, such as wood thrushes, Kentucky warblers, and Swainson's warblers, are associated with forest understories. Others, such as cerulean warblers, northern parulas, and red-eyed vireos, are associated with forest canopies. Prothonotary warblers require a nest cavity near water. Others may utilize a range of successional stages or forest layers.

It is important to consider scale when examining habitat requirements of forest birds. For example, mature forests will provide habitat for some species, and clearcuts will provide habitat for a lesser number with intermediate stages somewhere in between. But a landscape that features a mosaic of these different successional stages will have more species than any one habitat alone. Also, a patch of forest must be large if it is to contain so-called area-sensitive species. These species are of special concern because their habitats are so rare. In general, a large contiguous patch of mature, multilayered forest will support a maximum diversity of birds because it will provide some of all these habitats, even early successional stages in areas where mature trees have been removed naturally or harvested.

What Evidence is There That Neotropical Migrants Are Declining?

Data sources that have documented long-term declines in numbers of Neotropical migrants include the North American Breeding Bird Survey (BBS), the breeding bird census, monitoring of birds during migration with radar, and a series of long-term research projects, each done at one or several locations. Although results vary with region and bird species studied, the overall conclusion of each of these types of monitoring is that Neotropical migratory birds are declining as a group.

Why Are They Declining?

Undoubtedly, a number of factors act synergistically to cause population declines, and those factors are different for different species. It is tempting to attribute population declines to habitat losses on wintering grounds. Loss of tropical habitats such as rain forests have received much publicity and are well known to the general public. Losses of North American temperate forests, ironically, are less known, Forest fragmentation, which means that large expanses of forest are reduced to smaller fragments within an area of disturbed habitat such as croplands, has numerous effects on forest interior birds. First, many of those species are also area-sensitive species; generally, they are not found nesting in forest fragments smaller than 100 ha (250 acres). Some species, like the cerulean and Swainson's warblers, are rare in bottomland hardwood forests smaller than 10,000 ha. Even for species that will nest in smaller fragments, the problem is exacerbated by the fact that forest edges are close to any given nest. Most nest predators find such areas to be favorable habitat. Also, if adjacent habitats are agricultural and support cowbirds, then most nests will be in easy striking distance.

PARTNERS IN FLIGHT

Purpose and Organization

In response to the problems identified above, the National Fish and Wildlife Foundation (NFWF) hosted an international meeting in late 1990 in Atlanta, Georgia. Representatives from Federal, State, and local governments, large and small nongovernment organizations, and academia attended. The idea for the program was for these representatives to join to reach common solutions to major problems involving Neotropical migratory birds. Thus, "Partners in Flight-Aves de las Americas" (Partners in Flight) was born. The objectives of Partners in Flight are to: (1) determine the status and specific causes of Neotropical migratory bird declines, (2) maintain stable populations, and (3) reverse declining population trends through habitat restoration and management.

Nationally, since 1990, approximately 114 projects have been funded with approximately $3 million of NFWF funds matched by $5.3 million in private funds. Most of these projects were conducted in the United States, but some work has also been done in wintering grounds. Many Federal agencies, including the Department of Defense (U.S. Army Corps of Engineers), Tennessee Valley Authority, USDA Forest Service, and U.S. Department of the Interior Fish and Wildlife Service, signed a memorandum of understanding to manage to conserve Neotropical migrants. National working groups were formed within Partners in Flight to focus on information and education, management, research, monitoring, and international issues.

There also are regional (Northeast, Southeast, Midwest, West) working groups in Partners in Flight.The Southeast working group held its first meeting in Atlanta soon after the first national meeting took place. Five objectives dealing broadly with monitoring, management, communications, education, and research were identified. Four subsequent meetings were held; the Southeast working group now meets annually. Among the major accomplishments of the Southeast working group is the development of strategies of prioritization of species/habitats by physiographic province (Hunter and others 1993). This scheme is being adopted nationwide. Also, Hamel (1992) produced a land manager's guide to bird habitat evaluation in the Southeast.

A focus of the Southeast working group has been to address issues and ultimately manage Neotropical migrants at the physiographic province level, which transcends traditional State boundaries. Two such physiographic provinces pertinent to this workshop are the Gulf Coastal Plain and the MAV. These areas are doing well in research participation relative to other physiographic provinces in the Southeast as evidenced by participation in regional meetings, cooperative research and monitoring efforts, publications, and this workshop.

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Ecology of Bottomland Hardwoods'

John D. Hodges'

INTRODUCTION

There are many reasons why an understanding of the ecology of bottomland hardwoods is important. However, two reasons appear especially important for discussions in this workshop. First, successful management of this important resource, regardless of the specific objectives, requires a good understanding of site variations and the related species-site relationships. The second reason directly addresses one of the stated objectives of this meeting; i.e., resolving of present and potential conflicts over the use of the resource. A knowledge of the ecology of floodplain sites and associated hardwoods should serve as a common ground or starting point from which these conflicts can be resolved.

THE BOTTOMLAND HARDWOOD RESOURCE

All forested sites in the South can be divided into three physiographic site positions--uplands, terraces, and floodplains. Uplands by far occupy the greatest land area in the South. Soils on these areas were formed in place from the parent geologic material or, in some cases, from wind-blown materials. Terraces are old floodplains of current or ancient stream systems. The soils are alluvial in origin but generally are not as productive for hardwoods as the current floodplain soils. Because of their older age, nutrients have been leached, and many terrace soils have fragipans. The term “bottomland hardwoods” generally refers to hardwoods associated with current floodplain sites. Soils on these sites are from recent alluvium, are relatively young, generally have good water relations, and may be highly productive for hardwoods.

Floodplain sites in the South are somewhat arbitrarily divided into major and minor bottomlands (bottoms). This difference may be obvious according to the size of the stream (e.g., major bottomlands are usually associated with large rivers). However, another very important difference may be in the nature of the deposition that occurs. The alluvium deposited in major river bottoms may come from hundreds or even thousands of miles away and is composed of materials of all textural classes and, perhaps, several kinds of minerals. In minor bottoms, the alluvial deposits are of local origin and may vary less in textural class and mineralogy. For the above reasons, major bottoms are most often, although not always, more productive than minor bottoms.

Bottomland hardwoods occur primarily in the Atlantic and Gulf Coastal Plain divisions of the Coastal Plain Province. Their occurrence here is determined by the nature of the geologic materials, which are sedimentary in origin and relatively easily eroded as opposed to the more consolidated geologic material of the mountain and Piedmont regions. In geologic times when the climate was much warmer and wetter, ancient streams first eroded vast amounts of material to form stream valleys and then began the process of deposition, which continues with the current streams.

There are currently about 30 million acres of bottomland hardwoods in the South. This area is less than one-half the area present at the time of European settlement. Most of the reduction is a result of conversion to agricultural use, and much of the loss has been in the Mississippi River system.

NATURAL SUCCESSIONAL PATTERNS ON FLOODPLAIN SITES

Over time, all biotic communities undergo change as they develop from a young (pioneer) to a late (climax) stage. This process is most often referred to as ecological succession, but could be thought of as ecosystem development because it involves changes in both organisms and the physical environment (Odum 1993). Succession is classified as either primary or secondary, depending on the initial site conditions. Primary plant succession begins on sites where plant life did not exist previously, whereas secondary succession occurs on sites formerly occupied

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by plant communities In turn, secondary succession may be recognized as either autogenic or allogenic. Autogenic succession in plant communities is driven by the plants themselves; i.e., one community of plants creates an environment more suitable for establishment of other species than for themselves. Allogenic succession occurs in plant communities following severe disturbances, which interrupt autogenic succession, or when the site is drastically changed. Succession on floodplain sites can involve all three types discussed above because the site itself changes over time due to deposition.

Three different patterns of succession can be recognized in major bottoms. One pattern occurs on permanently flooded sites such as cypress-tupelo swamps. On these sites, succession is "arrested''--compositional changes may not occur for hundreds of years without disturbance. The cypress-tupelo type represents the oldest type (oldest trees) on the floodplain. Stands can be 200 to 300 years old before breakup occurs.

A second pattern of succession occurs on poorly drained sites at low elevations (fig. la). Deposition on these sites is generally of fine-textured material and occurs at a slower rate and over a much longer time span than on better drained, higher elevation sites. The pioneer tree species on these low sites with heavy soils is usually black willow (willow). On these low sites, succession depends on the rate of sediment deposition and sometimes on the texture of the sediment, Where little or no deposition occurs, willow may be followed by an association composed of swamp-privet, water-elm, and buttonbush. This association may be replaced by baldcypress, which may endure for hundreds of years or, if deposition is sufficient, it may be replaced by the overcup oak-water hickory type.

If deposition in the willow stand occurs more rapidly, but still at a slow rate, the site may eventually be captured by an association composed primariiy of overcup oak and water hickory. If deposition continues to occur in the above circumstances, even at a slow rate, it is assumed that these sites will all eventually succeed to the elm-ash-sugarberry (hackberry) type. If sedimentation is pronounced and the site gains elevation rapidly, the willow will be replaced by the elm-ash-sugarberry type. An exception to this pattern can occur when the deposits are of a lighter texture (sandy or loamy) rather than the normal clays. In that situation, a temporary association composed of boxelder, silver maple, and hackberry in the North and boxelder-sugarberry in the South may occur. The elm-ash-sugarberry association may contain significant numbers of stems of other species such as Nuttall oak in the South and pin oak and bur oak in the North.

After the site increases in elevation and deposition slows, disturbances, either human-induced or natural, can result in the elm-ash-sugarberry type being replaced by an association dominated by sweetgum and red oaks (water, willow, and Nuttall oaks). This association is transitory and without management will revert to the elm-ash-sugarberry type. Once deposition essentially ceases and the soil ages, the climax type may start to appear. The first oaks to appear may be cherrybark, Shumard, and swamp chestnut, but the final climax association will also contain other white oaks and hickories. Progression to this stage of succession is not well documented, but evidence for it exists, such as Big Oak State Park in Missouri. Most other sites such as this have been cleared for cultivation,

On these low-elevation sites, the time required for progression from pioneer species to a climax forest could be extremely variable depending primarily on rate of sedimentation. The breakup of most black willow stands may begin as early as age 30, and few remnants survive beyond age 60. With slow rates of deposition, the buttonbush and cypress types could persist for centuries. The overcup oak-water hickory type may occupy the sites for 200 years or more. Where the sites build fairly rapidly, the time required from the pioneer species sere to the climax sere will be about 600 years, mainly because the boxelder-sugarberry and the elm-ash-sugarberry types are capable of self-replacement.

A third pattern of succession occurs on the higher elevation, better drained ridge and front sites (fig, lb). Cottonwood is the principal pioneer species, although black willow may occur on some sites in the early stages. Cottonwood quickly dominates the site. Breakup of cottonwood stands may begin as early as age 45, and very few cottonwood remnants survive to age 80 to 100.

Stand composition following the cottonwood association can be extremely variable and depends primarily on how the cottonwood stand breaks up and on depositional patterns. Tolerant species, usually well established beneath cottonwood stands, will capture the site if the stand breaks up gradually. The next stand will then be composed of boxelder and sugarberry in the South with minor amounts of other species such as elm and ash. Further north, stands may contain hackberry as well as vast amounts of silver maple. These stands, especially those composed primarily of boxelder and/or silver maple, will occupy the site for only about 60 years. Most often, they are replaced by the elm-ash-sugarberry type.

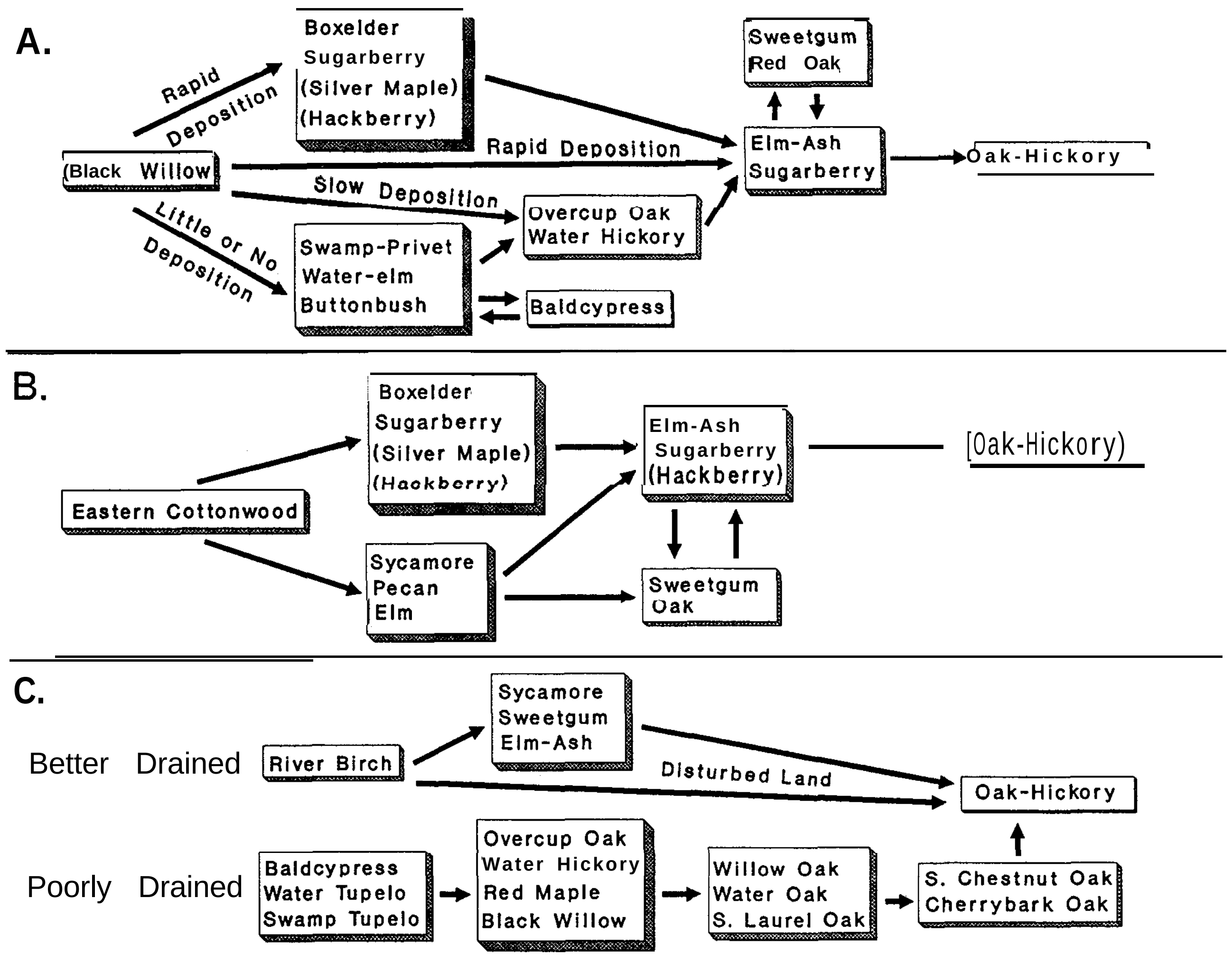

Figure 1.--*Typical patterns of plant community succession in bottomland hardwood forests: (a) poorly drained sites in major bottoms, (b) higher elevation, better drained ridges in major bottoms, and (c) better drained or poorly drained sites in minor bottoms. (Species in parentheses replace southern counterparts at more northern latitudes; e.g., silver maple replaces boxelder.)*

If the old cottonwood stand breaks up rapidly (e.g., after a natural catastrophe), it may be replaced by a stand composed of a number of species, some of which are intolerant. The composition may be primarily sycamore, pecan, and elm (riverfront association), but species such as ash, sweetgum, willow oak, and water oak are usually present. This association may endure for 75 to 125 years and is usually replaced by the elm-ash-sugarberry type. However, if the stand is opened rapidly by a natural catastrophe and sufficient advance regeneration is present, it my progress to a water oak-sweetgum type, which normally would then be replaced by the elm-ash-sugarberry type. Some ecologists do not recognize the riverfront association as a separate stage but as simply a transition between the pioneer (cottonwood) and elm-ash-sugarberry stages. The elm-ash-sugarberry type is long lived and may replace itself and occupy the site for 200 to 300 years. Natural disasters, such as hurricanes, may wipe out the old stand and allow it to be replaced by the red oak-sweetgum type, which may persist for 200 years or longer but, without management, will likely revert to the elm-ash-sugarberry type.

When flooding and sedimentation essentially cease and soils start to mature, the climax association will begin to appear. According to Shelford (1954), this association may begin with oaks such as cherrybark, pin, and swamp chestnut and take 200 years or more to progress to an oak-hickory climax.

In minor bottoms, river birch is often the pioneer species on new or severely disturbed lands (fig. lc). Soils are generally too acid for cottonwood, and if black willow occurs, it is in combination with other species. As in major bottoms, the pattern of succession is related to drainage and changes in the site as a result of deposition. Unlike major bottoms, the ridges, fronts, and better drained flats will support the regional oak-hickory climax even though flooding continues to occur.

SPECIES-SITE RELATIONSHIPS FOR BOTTOMLAND HARDWOODS

Site variation on floodplains and the relationship to species occurrence and development was discussed by Hodges and Switzer (1979). Site variation within floodplains is associated primarily with elevational differences. Differences in elevation of only 2 to 3 feet have a marked effect on site and therefore on species occurrence. These differences primarily reflect differences in drainage and soil moisture, but minor elevational differences also reflect differences in soil type, texture, structure, and pH, all of which affect species occurrence. Topographic, and therefore site, variation within a floodplain is the result of stream movement within the floodplain and subsequent deposition patterns.

In figure 2a, a cross section of a hypothetical major stream valley of the Coastal Plain is depicted. Each topographic feature shown may occur several times and not necessarily in the order shown. Bars or point bars are formed when the concave section of streambanks erodes and the sediment is deposited downstream on an opposite convex area of the stream channel. With time and increased deposition, the bar may become a mud flat and may eventually be raised to the level of the current front or natural levee.

Fronts, or natural levees, are formed when streams overflow their banks and rapid deposition occurs, These front sites are usually the highest, best drained, and most productive areas in the floodplain.

Flats are broad, usually smooth areas between ridges or between ridges and fronts. The soils are predominantly clays, and the drainage class usually varies from poorly drained to somewhat poorly drained, but standing water is usually absent most of the growing season. There may be slight elevational and drainage differences on these flats even though the soils are classified within a series. Flats account for the largest area within the floodplain.

Ridges can vary in elevation from 2 to 15 feet above the flats, but 2 to 3 feet is much more common. Ridges were formed as banks or fronts of older streams. The soils have a coarser texture than those on flats, and drainage, both surface and internal, is better than on flats.

Sloughs are shallow depressions arising from old streambeds, which are almost completely filled with sediment. The soils are usually fine textured, and drainage is poor. The sites typically have standing water well into the growing season.

Swamps are larger depressions formed when streams change course and form lakes, which then continue to be filled with fine-textured sediment. Drainage is very poor, and standing water is almost always present except in extremely dry years.

The relationship between site and species occurrence for a hypothetical major streambottom is depicted in figure 2b. The figure illustrates typical species

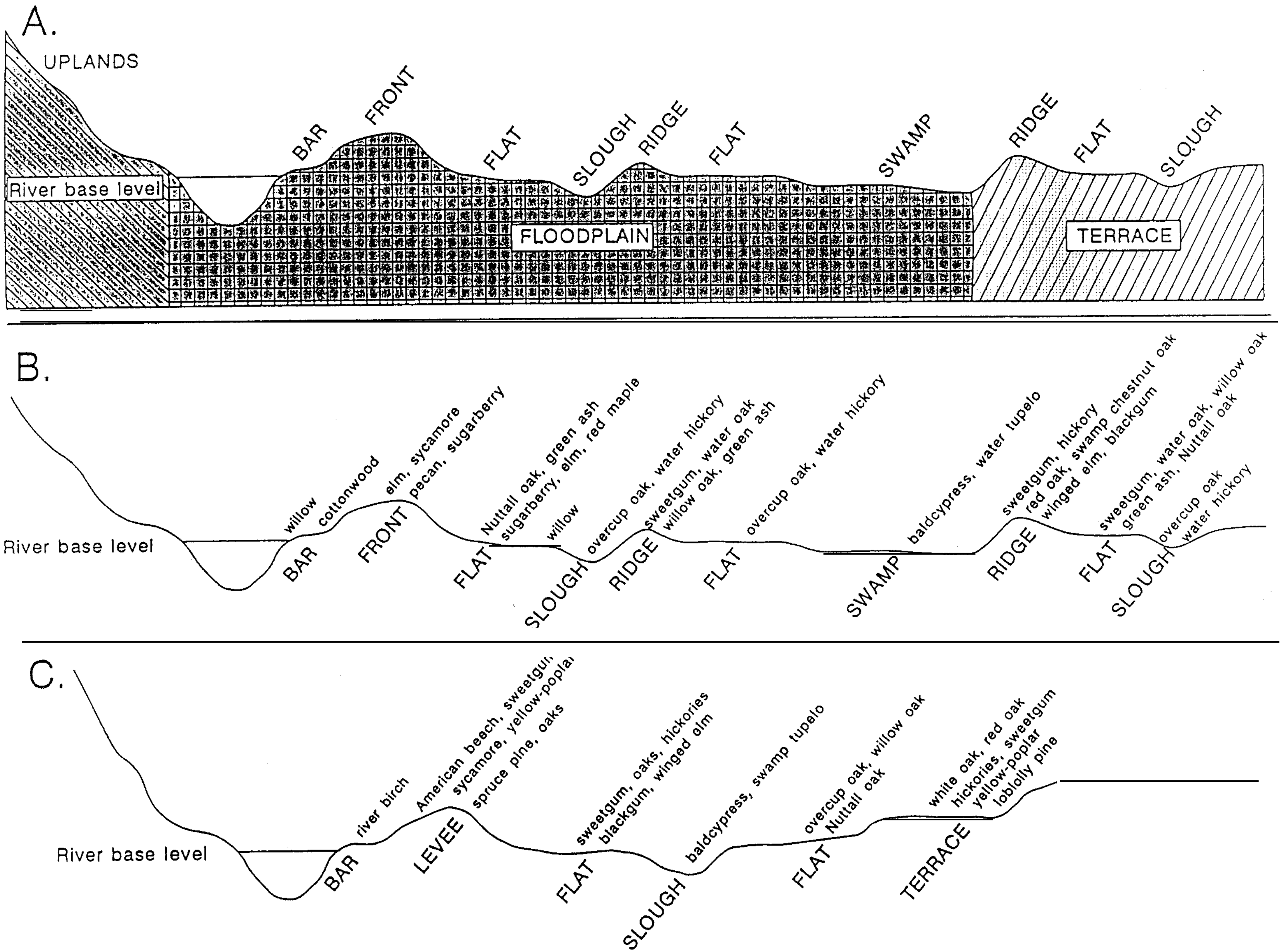

Figure 2.--*Cross section of a hypothetical major stream valley in the Coastal Plain (a), with typical patterns of species distribution relative to topographic position and other site characteristics in major bottoms (b) and minor bottoms (c).*

associations for each site (topographic position), but recall, variations will occur depending on stage of succession. On the newest land near the river (bar or mud flat), willow is the major pioneer species; but if the land is high enough or ifadequate time is available between high water levels, cottonwood can establish itself. Willow and cottonwood need mineral soil to become established, but willow is more tolerant of water. Both species can withstand sediment deposition and, if it continues, front land will be formed, and willow and cottonwood may be replaced by river-front species.

On front land (natural levees), a typical association following cottonwood is composed of elm, sycamore, sweet pecan, sugarberry, boxelder, and sweetgum. This river-front association is not climax, and the successional association will depend on how the stand breaks up. If breakup is rapid (human-induced or natural disaster), a red oak-sweetgum type may occur if advance regeneration is present. If breakup is slow, the stand will retrogress to a boxelder-sugarberry or boxelder-hackberry-silver maple association. As the site matures, it may again be occupied by an association composed primarily of sweetgum and red oaks.

Species composition on the flats is extremely variable. On the lower, wetter flats, overcup oak, water hickory, and baldcypress often predominate. Almost pure stands of overcup oak are common. On the somewhat higher and better drained flats, the most common association is composed primarily of elm-ash-sugarberry with other species such as Nuttall oak, willow oak, and red maple being common in the mixture. Nuttall oak and willow oak will, on occasion, be major components of the stands.

On the ridge sites, species composition depends largely on past events and past treatments. The elm-ash-sugarberry type is the most common association, but if the site is opened rapidly and advance regeneration is present, it can be replaced by a sweetgum-red oak type composed of water, willow, cherrybark, and Shumard oaks, and other minor species in addition to sweetgum. Without management, this type will revert back to the elm-ash-sugarberry association through natural succession.

If sloughs are near the stream and/or sedimentation occurs rapidly, good stands of black willow often occupy the site. If sedimentation continues, the willow will be replaced by the elm-ash-sugarberry type. On sites where sedimentation occurs slowly (e.g., at some distance from the river), overcup oak, water hickory, green ash, and persimmon are the tree species that most often follow the willow.

The baldcypress-water tupelo type is most common in the swamps of major river bottoms. Depending on depth and duration of flooding, other tree species, which sometimes occur, include swamp tupelo, water elm, Carolina ash, water hickory, swamp laurel oak, and overcup oak.

Minor stream bottoms (fig. 2c) are in many ways simply a smaller version of major bottoms--they exhibit the same topographic features, and most of the same species occur there although not necessarily on the same topographic position. Species that occur only on ridge positions in major bottoms often occur on flats in the minor bottoms. River birch is most often the pioneer species on new land such as bars and mud flats. Species composition is extremely diverse on the fronts or natural levees and may include yellow-poplar, American beech, sycamore, spruce pine, sweetgum, cherrybark oak, Shumard oak, water oak, swamp chestnut oak, and several species of hickory. Although flooding still occurs, autogenic forces control natural succession and species occurrence on these front sites. Typical species occurring on better drained flats and ridges of minor bottoms include sweetgum, cherrybark oak, water oak, swamp chestnut oak, American elm, and hickories, On less well-drained flats, the major species include overcup, willow, Nuttall, and swamp laurel oaks, persimmon, green ash, sugarberry, and red maple, Species composition of sloughs in minor bottoms will vary depending on duration of flooding. Baldcypress, swamp tupelo, and water-elm are common where flooding duration is longest and overcup oak, water hickory, and persimmon will also occur where flooding is not as severe. Swamps containing baldcypress and water tupelo do occur on the floodplains of minor bottoms, but the cypress-swamp tupelo type is more common.

IMPLICATIONS FOR USE OR MANAGEMENT

It is obvious that a knowledge of species-site relationships is essential for successful management of bottomland hardwood stands, whether the objective is timber, wildlife, or a combination of the two resources. For example, reforestation or restoration projects are likely to be a complete failure if the species are not matched to the site. It should also be obvious that a knowledge of species-site relationships and ecological succession is important for decisions concerning the treatment of existing stands to obtain the desired objectives,

Considering the stated objectives of this meeting, the most important point to be made is that bottomland ecosystems are not static. The biotic and abiotic components will change over time with or without the influence of humans. What is there today will not be there 100 years from now or perhaps even 10 or 20 years from now. For example, black willow stands simply do not live very long. They will be replaced, and new ones will not be created except by disturbance, natural or human-induced. Furthermore, the ecological principles discussed previously have implications for making management decisions that will resolve or reduce conflicts over use of this important resource. Great diversity is a natural characteristic of bottomland hardwood ecosystems. Thus, over large areas, a great variety of uses and interests can be accommodated. Active management can be used to maintain or increase compositional and structural diversity to meet the requirements of these various uses. However, management designed to accomplish these multiple goals must be approached at the landscape level rather than on an individual stand basis.

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Stand Development and Silviculture in Bottomland Hardwoods’

J. Steven Meadows’

INTRODUCTION

Silviculture for the production of high-quality timber in southern bottomland hardwood forests involves the application of environmentally sound practices in order to enhance the growth and quality of both individual trees and stands. To accomplish this purpose, silvicultural practices are typically used to regulate stand density, species composition, and stem quality to promote the growth and development of high-value stands. To be successful, the hardwood silviculturist must understand the process of stand development--how even-aged, mixed-species stands develop and change over time, especially with respect to species composition and stand structure. If silviculturists know how hardwood stands develop and mature under natural conditions, they are better able to predict the effects of various silvicultural manipulations in these stands.

Successful management of mixed-species stands, such as most southern bottomland hardwood forests, requires specific knowledge about each of the species in the stand: (1) biological requirements, not only for regeneration, but also for future growth and development; (2) pattern of growth over time, such as slow vs. rapid early growth; and (3) silvical characteristics, especially shade tolerance and flood tolerance. These three critical characteristics of a species collectively determine the competitive ability of that species. In addition, differences in the competitive abilities of the various species found in a given stand determine the future development of that stand. The hardwood silviculturist must recognize and understand these relationships to better understand how different stands develop under different conditions to produce the structure and species composition that exist in a given stand today.

GENERAL STAGES OF STAND DEVELOPMENT

Oliver (198 1) proposed that the process of stand development in even-aged, mixed-species stands can be divided into four broad stages: (1) stand initiation, (2) stem exclusion, (3) understory reinitiation, and (4) old growth. Much of the following discussion, unless otherwise noted, has been adapted from Oliver (198 1).

Development of an even-aged, mixed-species stand begins after some type of major disturbance, either natural or human-induced. The disturbance must be severe enough to kill or remove most living trees in an area large enough to promote the development of an even-aged stand. Thus, most of the trees in the new stand will develop in the absence of competition from surrounding, undisturbed trees.

Stand Initiation Stage

After a major disturbance removes the existing stand, tree species begin to reoccupy the area with stems originating from one of three sources: (1) existing stumps and roots, (2) seeds, or (3) advance regeneration. These new individuals grow and develop, gradually utilizing more and more of their available growing space until, at some point in time, one or more of the environmental factors necessary for growth become limiting (i.e., their available growing space is completely utilized). In most situations, light is the first environmental factor to limit growth (this occurs at the time of crown closure). Following a major disturbance, species that exhibit a pattern of rapid early growth thereby gain at least a temporary competitive advantage over species that exhibit a pattern of slow early growth.

This period from the initial invasion of the site by new individuals until the site is fully occupied and environmental factors become limiting is referred to as the stand initiation stage. Duration of this stage varies widely and depends on a number of factors, but in the Southern United States, a new stand fully occupies the site generally within about 10 to 15 years following a major disturbance.

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Stem Exclusion Stage

Once new individuals in the stand fully utilize their available growing space and one or more environmental factors become limiting to growth, the next stage of stand development begins. This is referred to as the stem exclusion stage in which new stems cannot become established in the developing stand. Because crown closure has occurred, environmental conditions on the forest floor are not conducive to the establishment of new individuals.

Because the available growing space in the stand is now fully utilized, intense competition among the existing stems begins to occur. In mixed-species stands, the competitive abilities of the various species present determine how the different species respond to this intense competition. Inherent early growth rate and shade tolerance are the two primary determinants of the competitive ability of an individual species during this stage of stand development. Because the various species in the developing stand have different early growth rates and different shade tolerances, there may be large differences in the abilities of the species to respond to this competition. The end result is a vertical stratification of individual trees and species in which one, or possibly several, species eventually become dominant and suppress the growth of the other species in the stand. This process of vertical stratification may be illustrated through the following scenario.

For example, species with rapid early growth rates (pioneer species) typically dominate the stand initially. Other, more persistent species, although present in the stand, grow slowly during these early stages, and, in fact, are often overlooked as a component in the developing stand. As this period of intense competition continues and the stand develops further, the growth rates of the early dominants slow down, mortality increases, and these pioneer species begin to gradually lose their dominance in the stand. As a result, the more persistent species eventually overtake the pioneers, become dominant, and suppress the growth of the other species in the stand. At this point in the development of the stand, these pioneer species, initially dominant, are now overtopped by the eventual dominant species. If these pioneer species are intolerant of the shaded conditions they now encounter, they will die and gradually cease to be a component of the stand. On the other hand, if these initially dominant species can tolerate some shade, they may remain alive for many years, but will grow slowly as long as the overstory remains intact. Under these conditions, these species will still be present in the stand, but will constitute only a minor component of the mature stand.

The important point is that the species that will eventually dominate the mature stand generally is **not** the species that was largest or most numerous in the early stages of stand development. Other species usually dominate the stand at first, but are eventually overtaken as the stand continues to develop. In fact, in many cases, the species that eventually dominates the mature stand may be infrequent in number during the early stages of stand development and may even be overlooked as a component of the stand, until it finally begins to overtop its competitors.

Understory Reinitiation Stage

As this stratified stand develops towards maturity, the overstory will gradually begin to break apart as scattered individuals die. The openings thus created in the overstory allow sunlight to reach the forest floor, creating favorable conditions for the development of new stems, or advance regeneration, in the understory. Thus begins the understory reinitiation stage of stand development. Understory reinitiation may begin relatively early or relatively late in the life of the stand, depending on the shade tolerance of the overstory species and the frequency of minor disturbances within the stand. Individual stems may remain alive in the understory as advance regeneration for very long periods of time, possibly as long as 30 to 35 years for some bottomland oaks. However, in most circumstances, advance regeneration of oaks and other moderately intolerant species can only be expected to live for about 5 to 10 years in a shaded understory.

Old-Growth Stage

Understory reinitiation may occur continuously within a stand over a long period of time, providing a gradual transition to the old-growth stage. This transition occurs as the mature overstory breaks up slowly through the death of individual trees, The advance regeneration in the understory immediately adjacent to the dead tree is thus released, and these younger individuals gradually grow into the canopy. If this process continues throughout the stand over a long period, the result will be the formation of an uneven-aged, multistrata, old-growth stand composed of individuals of widely differing ages and sizes. However, very few stands ever reach this last stage of development because another major disturbance generally occurs first, sending the stand back to the stand initiation stage.

Consequently, the old-growth stage is only rarely attained, especially in areas subjected to relatively frequent major disturbances, and is generally not perpetuated for long periods.

STAND DEVELOPMENT IN RED OAK-SWEETGUM STANDS

Much of the evidence supporting Oliver's (1981) description of the four general stages of even-aged stand development comes from his own research in mixed oak-maple-birch stands in central New England (Oliver 1978) and in mixed conifer stands in western Washington (Stubblefield and Oliver 1978, Wierman and Oliver 1979).

The vertical stratification process that Oliver (1978) found in oak-maple-birch stands in central New England is of particular interest. During the first 20 years of development in these stands, red maple and black birch (sweet or cherry birch) were much more numerous and grew faster than northern red oak, even though the oaks would eventually dominate the stand. Somewhere around age 17 to 20 years, the red oaks caught up to the maples and birches in total height. From then on, the oaks eventually outgrew the maples and birches and formed a dominant canopy above them. By the time the stands were 60 years old, northern red oak was clearly the dominant species, and most of the maples and birches had either died or were relegated to subordinate positions in the stand. Diameter growth of these species was greatly suppressed by overtopping oaks. These smaller understory trees could easily be mistaken to be younger, late-invading stems. However, Oliver (1978) showed that these understory trees are, in most cases, the same age as larger, overstory trees. In fact, many mixed-species stands that appear to be uneven-aged because of a wide range of tree sizes within the stand may actually be even-aged stands with this multilayered structure resulting from the vertical stratification process.

Clatterbuck and Hodges (1988) observed a similar pattern of development in cherrybark oak-sweetgum stands on minor riverbottom sites in central Mississippi. In these stands, sweetgum initially dominated the less numerous oaks. In fact, the presence of the young oaks was not readily apparent in the developing stand, such that the casual observer might have predicted that oaks would not constitute a major component of the mature stand. However, in much the same pattern that Oliver (1978) observed in oak-maple-birch stands in New England, Clatterbuck and Hodges (1988) noted that the initially shorter cherrybark oaks were able to outgrow and eventually surpass the sweetgum stems at about age 20 to 25. In fact, by the time the stand was 30 to 32 years old, the oaks were significantly taller than the sweetgum stems and were able to expand their crowns above the sweetgum stems. By age 55 to 60, these stands exhibited a two-tiered canopy in which cherrybark oak clearly dominated the upper canopy and sweetgum occupied the lower canopy.

Both of these studies describing similar patterns of development in mixed-species hardwood stands used a combination of chronosequence and stem-analysis techniques to evaluate development in those stands (Clatterbuck and Hodges 1988, Oliver 1978). The chronosequence procedure assumes that measurements performed in many stands on similar sites, but at different ages, closely approximate the results obtained through successive measurements of one stand over many years.

Fortunately, Johnson and Krinard (1976, 1983, 1988) followed the development of two similar stands of red oak-sweetgum on bottomland sites in southeastern Arkansas since their inception in 1956-57. Through long-term monitoring of permanent plots, they found a pattern of stand development very similar to that reported by Oliver (1978) and by Clatterbuck and Hodges (1988).

For example, through the first 9 years of development on the Saline River site, sweetgum, river birch, and American hornbeam dominated the stand, both in number and size of stems. However, between the ages of 9 and 29, river birch experienced very high mortality and essentially dropped out of the stand. American hornbeam maintained relatively high density but lost its dominance and was relegated to an understory position. Sweetgum, however, experienced only a relatively slight reduction in density and maintained its dominance within the stand. Red oaks were far less numerous than these three initially dominant species, almost to the point of being inconspicuous during the early stages of stand development. However, as river birch mortality increased, American hornbeam growth rates decreased, and red oak growth rates increased. Consequently, the oaks gradually developed into a larger component of the stand. By age 29, most of the red oaks seemed to be on the verge of exceeding the sweetgum stems in total height and, thereby, beginning to dominate the stand. Johnson and Krinard (1988) predicted that red oak would eventually clearly dominate both stands.

In the study reported by Clatterbuck and Hodges (1988), cherrybark oak began to dominate sweetgum at age 20 to 25, whereas Johnson and Krinard (1988) found that red oak had not quite begun to dominate sweetgum even after the first 29 years. The reason for the difference in the timing of this critical stage in stand development may be that the cherrybark oak-sweetgum stands in Mississippi developed on oldfield sites, whereas the red oak-sweetgum stands in Arkansas developed on cut-over sites. Both woody and herbaceous competition is greater on the cut-over sites, thereby suppressing the early growth of the red oaks and slowing the progression of stand development on that site.

SILVICULTURAL IMPLICATIONS

Knowledge of the way stands develop and change over time will enable silviculturists to better understand the specific biological system with which they are dealing. With knowledge of the pattern of natural changes in stand structure, species composition, and dominance, silviculturists can more effectively manage hardwood stands.

Specifically, for even-aged red oak-sweetgum stands in the South, the silviculturist should know that red oak, even though it is few in number and relatively inconspicuous in young stands, will eventually outgrow the more numerous and initially dominant sweetgum and will form the dominant canopy of the mature stand. Concerns expressed by many foresters about the apparent lack of red oaks in young mixed hardwood stands are, in many cases, unfounded. Because of this pattern of development in red oak-sweetgum stands, land managers should be wary of prematurely concluding that their sites are not regenerating to oak. Even as few as 60 free-to-grow oaks per acre, adequately distributed, may be enough to ensure the eventual development of an oak-dominated stand (Clatterbuck and Hodges 1988).

COMMENTS AND AUDIENCE DISCUSSION

A lengthy discussion by the audience centered on the concept of old growth as presented here. In my presentation, it was stated that the old-growth stage of stand development, as defined by Oliver (1981), is only rarely attained and is generally not perpetuated for a long period, depending on the relative frequency of major disturbances. In fact, the "public" concept of an old-growth structure in a climax association of species probably does not exist. These contentions sparked a lively and thought-provoking discussion on the concept of old growth, particularly as it pertains to bottomland hardwood stands in the Mississippi Alluvial Valley.

The audience presented an alternative concept of old growth; i.e., that as an earlier seral stage is replaced by a later seral stage and a multilayered structure develops at least temporarily, this situation should be called old growth for that earlier seral stage. There was some agreement by the audience with this concept, but it was pointed out that this proposal did not satisfy the public conception of old-growth stands. Someone also stated that changes in hydrology (either natural or anthropogenic changes) and deviations from normal climate patterns may also contribute to accelerating the development of a multilayered structure, such that an affected stand could exhibit "old-growth" structure without truly being old.

After much discussion, the audience generally agreed that the public concept of old growth as a multilayered structure in a climax association may be unattainable in the Mississippi Alluvial Valley because of the young geologic age of most of the sites. In other words, the site itself prevents these stands from ever developing a climax association.

The audience then suggested abandoning the term "old growth" because the public concept of it is unattainable in the Mississippi Alluvial Valley and, therefore, the term does not apply to these bottomland hardwood ecosystems. Someone suggested that a more appropriate term would be "a multilayered structure with a diverse species composition." This phrase embodies the characteristics of "old growth" that are desirable for Neotropical migratory bird habitat.

This discussion did not resolve the issue of defining the concept of old growth as it pertains to bottomland hardwood forests in the Mississippi Alluvial Valley. That was not the point or even the potential benefit of the discussion. What the discussion did serve to do was to open up a lively dialogue within an audience composed of a diverse group of resource managers and researchers--foresters, ecologists, wildlife biologists, and fisheries biologists--with diverse objectives and opinions on how bottomland hardwood stands should be managed.

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Managing Terrestrial Game and Neotropical Migratory Birds[1]

C. Michael Staten[2]

INTRODUCTION

Management typically is defined as an operation that involves several functions such as planning, coordinating, directing, controlling, and supervising an activity, with responsibility for results. Being responsible for results is what distinguishes a manager from being merely a proponent or advocate.

Management options vary along a full spectrum ranging from "passive management" to "mining" the resources. Hopefully, the options chosen will be in the middle of the spectrum and include a broad approach, giving consideration to both consumptive and nonconsumptive resources found on an area. Management options should be tailored to keep as many of these interests as possible at priority levels. In most circumstances, land managers are called on to produce game and fur-bearing species, provide fishing opportunities, provide diverse habitats necessary for successful reproduction of songbirds, small mammals, reptiles, amphibians, insects, and plant species, as well as maintain esthetically pleasing landscapes, User groups are often guilty of considering their own special interests as the highest or only priority. Complicating the issue of land management is that few of these priorities can match the economic gains provided by timber resources.

MANAGEMENT OPPORTUNITIES

What Can We Do?

Every land manager has an opportunity to do something for birds. Options for incorporating bird management techniques depend on the management strategy incorporated for the management entity. Even though gravel roads may provide nesting habitat for killdeer, hopefully, one will not be satisfied with such small endeavors. There should always be innovation shown in searching for ways to incorporate birds in the management scheme. As an example, cane thickets are excellent habitat for hooded warblers, Swainson's warblers, and Kentucky warblers. Baldcypress trees scattered throughout the forest can be excellent candidates for bear dens as well as the preferred trees for yellow-throated warblers. Small ponds can be habitat for wood ducks, black-crowned night-herons and yellow-crowned night-herons, as well as prothonotary warblers.

Meeting Habitat Needs

Snags and cavities are required by many species of birds to complete their life cycle. Of course, it is obvious that they are used for nesting and food sources, but they also provide protected roosts during the winter. Cavities also satisfy denning needs for squirrels and other small mammals.

Noncommercial, mast-producing vegetation species are also important to terrestrial game species. Most vines produce seeds that are diet staples for squirrels and turkeys as well as browse for deer. These same soft-mast species can be important food sources for many songbirds. Other birds may not use the fruit, but "glean" among the leaves for insects. The vegetation produced by the vines themselves serves as nest structure, escape cover, and feeding structure for birds. Small, mast-producing trees such as mulberry or dogwood also provide important food sources. Mulberry may also be a good source of cavities as individual stems become older.

Fragmentation and Edge

Most management for game species includes creating "edge." Edge is defined as the border between two or more communities, usually plant communities. Deer and rabbits use edge where they find nutritious browse and escape cover. Turkeys and quail use edge, especially permanent openings, for nesting and brooding their young in

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search of protein-rich insects needed by the young for rapid body growth. Bears find edge to be important habitat for berries and other soft mast. Many bird species, such as white-eyed vireos, yellow-breasted chats, and indigo buntings, use forested edge for nesting habitat. Many more nest in different habitats, but use edge for feeding. This complicates management by creating the need for a diversity of habitats. This diversity may be accomplished through the creation of forest edge. Forest edge is usually the simple "setting back" of succession. These "set-backs" also help create a diversity of vegetation layers, which is the result of differing amounts of sunlight allowed through the forest canopy as well as differing vegetation age.

While being very important for a multitude of species, edge may also create problems. The edge becomes a natural travel lane for predators and parasites. Skunks, raccoons, opossums, coyotes, foxes, bobcats, feral cats, snakes, crows, and blue jays tend to follow edge in search of prey. The brown-headed cowbird, an avian nest parasite, also tends to follow edge in search of active bird nests in which to lay their eggs. Forests in close proximity to agriculture may be parasitized more heavily by cowbirds because agricultural areas are their preferred foraging habitat.

Managers should give consideration in planning as to how edges or fragments are created to increase wildlife productivity. For example, a small parcel of habitat in an agricultural field may attract nesting birds, but the small size of the parcel may allow more complete searching by predators, In this situation, the edge habitat becomes a liability or trap. The solution may include eliminating the fragment, increasing its size, or connecting the fragment with adjacent habitat so that the entire habitat would be less easily searched. This illustration is also a lesson in wildlife population management. The larger habitat would be considered a "source," where more individuals were produced than predated. The smaller habitat would be a "sink" where predation exceeds production. Even worse, in the future, populations produced in the "source" could be attracted to the "sink," where they might also be predated.

Because roads and food plots could possibly help fragment smaller habitat blocks, their construction should be carefully planned. In many forested blocks, a good road is an asset for reaching the resources managed in that forest. These resources range from harvesting forest products to harvesting a sustainable proportion of the deer herd. Very few managers with multiple use responsibilities will argue that roads are unnecessary. On the other hand, too many roads may affect the quality of the recreational experience in the forest due to increased access by those competing for the same wildlife resource. A primary road system maintained for vehicular traffic with smaller roads or trails for temporary access may fit the needs of the manager. When not needed, smaller roads could be closed to vehicular traffic other than light, off-road vehicles or "walk-in" traffic. These smaller roads would most likely be covered by tree canopy and could be maintained by late summer bushhogging. During the spring nesting season, the road would be allowed to grow up in vegetation, which could make less of a distinct travel route for predators and parasites.

If supplemental nutrition is deemed desirable to reach prescribed management goals, rather than scatter small food plots throughout the forest, the roadsides of the primary road system could be daylighted (i.e., maintained open canopy to increase incidence of sunlight) and planted. This procedure would allow the roadbed to dry out more quickly and be more easily maintained. Planting forage species, which may be less attractive to nest predators or parasites, may have merit. Cowbirds may feed heavily in plots with grass seeds, but cowpeas, corn, or clover would be less attractive to cowbirds during the nesting season due to increased ground cover and fewer sources of food. Not being able to find food sources easily in the forest may well force the cowbird to leave the forest to find food in its normal pasture/agricultural habitat, thus reducing the time available for daily nest searching.

Additional Considerations

Streamside management zones (SMZ's) have vast potential for incorporating wildlife management with timber management. Although designed to protect the watershed from excessive siltation, these areas (SMZ's) are important for maintaining diversity. Not only do they prov

By prioritizing goals and objectives, combined with the best available science and human innovation, sustainable management of natural resources is attainable. Every land manager has an opportunity for incorporating some sort of bird management into their overall management strategy. The responsibility shown today will help maintain wildlife habitat for future generations.

QUESTIONS AND COMMENTS

Q. How far will cowbirds travel to parasitize nests?

A. Cowbirds can travel long distances to parasitize nests, but usually, heaviest parasitism is found within 1/8 to 1/4 mile of edge.

Q. At what point is timber management considered fragmentation?

A. That has yet to be determined, but forests bordering agriculture are influenced by edge up to 1/4 to 1/2 mile.

Comment-- More studies are needed on the relationship of nesting and predation in edges.

Q. Are food plots determined to be beneficial in managing game species?

A. Yes, if they are strategically located and properly maintained to reach specific goals and objectives. Food plots are often established to simply enhance public perception.

Comment--Diet analysis of cowbirds has shown more insects than grass seeds.

Comment--On public lands, food plots should not be located too close to roadsides due to possible poaching problems.

Regional Waterfowl Habitat Trends and Implications for Neotropical Migratory Birds[1]

Kenneth J. Reinecke[2]

INTRODUCTION

The three objectives of this paper are to: (1) review the primary habitat changes resulting from future trends in waterfowl management; (2) predict whether the effects of these habitat changes will be positive, neutral, or negative for populations of Neotropical migrants; and (3) identify any significant conflicts between management for Neotropical migrants and waterfowl.

The following are emphasized here: (1) management activities on three habitats (forested wetlands, moist-soil areas, and cropland habitats) on public lands; (2) management activities on private croplands; and (3) the resulting interactions between public and private lands.

To determine effects of waterfowl management strategies on populations of Neotropical migrants, this paper includes an overview of regional waterfowl management strategies as outlined in the Lower Mississippi Valley (LMV) Joint Venture of the North American Waterfowl Management Plan. According to the Joint Venture Plan, the goal of waterfowl habitat managers during the period 1986 to 2000 is to:

> "Provide an adequate quantity, quality, and distribution of migration and wintering habitat on public and private lands to ensure that the LMV Joint Venture area can support a wintering population of at least 8.6 million ducks and 1.0 million geese during years of normal precipitation."

The practical interpretation of this Joint Venture policy is that waterfowl managers will try to ensure that an adequate quantity of forested wetlands, moist-soil impoundments, and croplands are available to provide foraging habitat for dabbling ducks on naturally flooded sites and on public and private lands managed purposefully for waterfowl. The relative emphasis placed on these habitats (forested wetlands vs. moist-soil areas vs. croplands), habitat sources (public vs. private), and degrees of management control (water control vs. natural flooding) will determine net effects of waterfowl management on Neotropical migrants.

Because waterfowl managers have protected large acreages of forested wetlands, waterfowl management historically has had a very positive effect on Neotropical migrants. However, maintaining duck populations at the levels envisioned in the North American Waterfowl Management Plan will not be possible without managing some public lands as moist-soil areas and croplands, with their relatively high food production capability.

However, these nonforested habitats will not be optimal for Neotropical migrants, most of which require forested habitat. Thus, although waterfowl management in the Mississippi Alluvial Valley generally is beneficial to Neotropical migrants, it is not realistic to expect to optimize conditions for both groups of species simultaneously.

The management strategy of the Lower Mississippi Valley Joint Venture can be portrayed as a spreadsheet or balance sheet of habitat types and land ownership patterns (fig. 1). This model or framework is providing a focus for managers implementing, and for researchers evaluating, the Joint Venture. It also is a convenient way to summarize effects of waterfowl management practices on Neotropical migrants.

Within this framework, scenarios could be developed wherein the waterfowl goals of the Joint Venture were achieved with more or less forested wetlands, and the resulting management would be more or less beneficial for Neotropical migrants. The primary objective of this paper is to describe the most likely scenario that will occur in the LMV and its effects on habitats and populations of Neotropical migrants.

Some of the data necessary to determine effects of waterfowl management practices on Neotropical migrants are being collected as part of an evaluation of the effectiveness of the LMV Joint Venture management strategies. The plan describing this integrated package of research and management studies currently is in the final stages of development. It has been designed to determine: (1) how much waterfowl habitat exists in each of the categories

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[1]Paper presented at a Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests; 1993 August 9-10; Tallulah, LA.

[2]National Biological Survey, National Wetlands Research Center, Vicksburg, MS 39180-2975.

in figure 1, (2) if the sum of all habitat in the categories satisfies Joint Venture goals, and (3) if the habitats have been combined in the most effective way to benefit waterfowl and other wetland wildlife.

As an example, a questionnaire is being used to determine general habitat characteristics of public lands and the changes that occur as the Joint Venture Plan is implemented. Results from the most recent (1993) of these so-called "Public Lands Questionnaires' provide a means of relating availability of habitats on State and Federal wildlife areas to the requirements of migratory forest birds. Currently, about 4.4 million acres (20 percent) of the original 22.0 million acres of bottomland hardwoods in the Mississippi Alluvial Valley remain. Of the remaining 4.4 million acres, about 625,000 (14 percent) are held in fee title by public agencies and managed to benefit natural resources. Of the 625,000 acres in public ownership, 81,500 (13 percent) are managed as green-tree reservoirs, which use systems of levees and water control structures to provide more dependable flooding of forested wetlands during winter for waterfowl.

EXPECTED TRENDS IN WATERFOWL HABITATS IN THE MISSISSIPPI ALLUVIAL VALLEY

Forested Wetlands

There definitely is an increasing trend (fig. 2) in the number of acres of forested wetlands on public lands related to waterfowl management. Land acquisitions will bring additional forested wetlands into public ownership during the period 1986 to 2000. The area of land involved probably will be on the order of several tens of thousands of acres, most of which will remain subject to natural hydrology.

Relatively little expansion of green-tree reservoirs (GTR's) is expected in the future for several reasons. Green-tree reservoirs have relatively high development costs, and GTR's don't contribute as much to meeting the food needs of wintering waterfowl as some other management practices do. Development of GTR's results in loss of forested habitats from associated rights-of-way, and permits and mitigation may be required for construction of levee systems. Construction of the existing 8 1,500 acres of GTR's in the Mississippi Alluvial Valley has resulted in loss of bottomland hardwood forests on 3,000 to 4,000 acres of public land. Also, regular annual flooding of GTR's can cause tree mortality or a shift in overstory species composition from red oaks to more water tolerant overcup oak and green ash.

Another source of increased acres of forested habitat for Neotropical migrants on public lands will be reforestation of cleared lands that are purchased by public agencies. The number of acres involved cannot be determined yet because the number of cleared acres to be purchased is unknown, and the needs of waterfowl for food production from open habitats must be planned in greater detail (fig. 1).

Nonforested Lands

Moist-soil areas.--A significant increase in acreage is expected in this category (fig. 2). Wetland restoration of natural sloughs in cleared land using low earth levees and small water-control structures has been effective. When these areas are managed by annual drawdowns in spring or early summer, the resulting grasses, sedges, and associated plants produce an abundance of seeds as food for waterfowl. Because moist-soil management benefits more species of wetland wildlife than cropland management, this technique will be the primary method used to provide food for waterfowl on cleared land. The total acres involved and the increase in acres necessary to meet the waterfowl goal will be determined through further data analysis and planning by the LMV Joint Venture staff.

Croplands.-- The trend in croplands is difficult to quantify (fig. 2)'but is probably negative. Cleared lands in public ownership will increase as a result of acquisition; however, reforestation will return many of the acres to forested wetlands. Some existing cleared lands also will be reforested, whereas others will remain open and managed as cropland for waterfowl. Croplands that continue to be managed for waterfowl will be those that: (1) provide food sources that can't be satisfied with other management methods, and (2) are involved in rotation with moist-soil management, (3) are needed to support cooperative farming programs providing necessary waterfowl food sources.

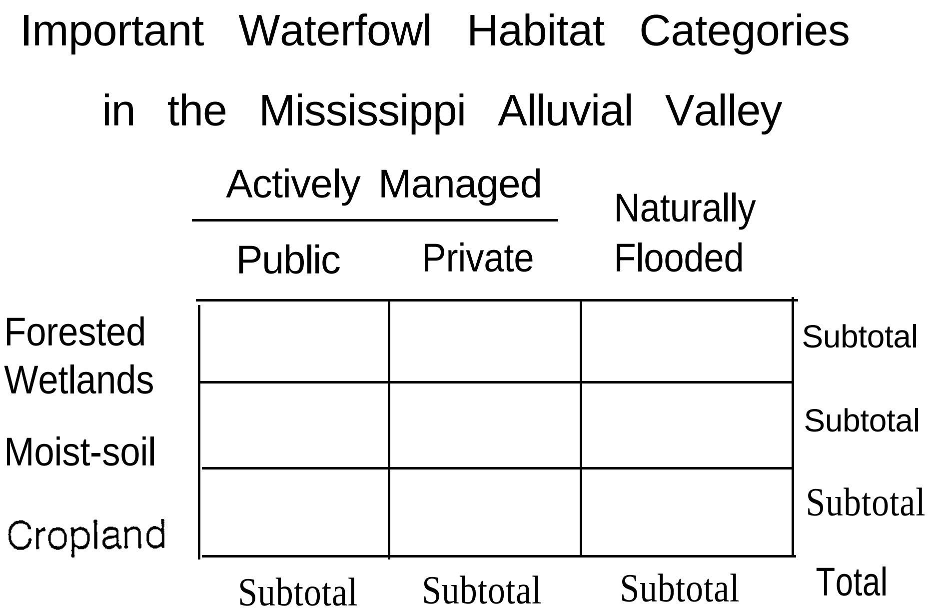

Figure 1.--*Conceptual framework for developing regional waterfowl habitat management strategies under the Lower Mississippi Valley Joint Venture of the North American Waterfowl Management Plan. The system consists of three important habitat types and three classes or land ownership or management control.*

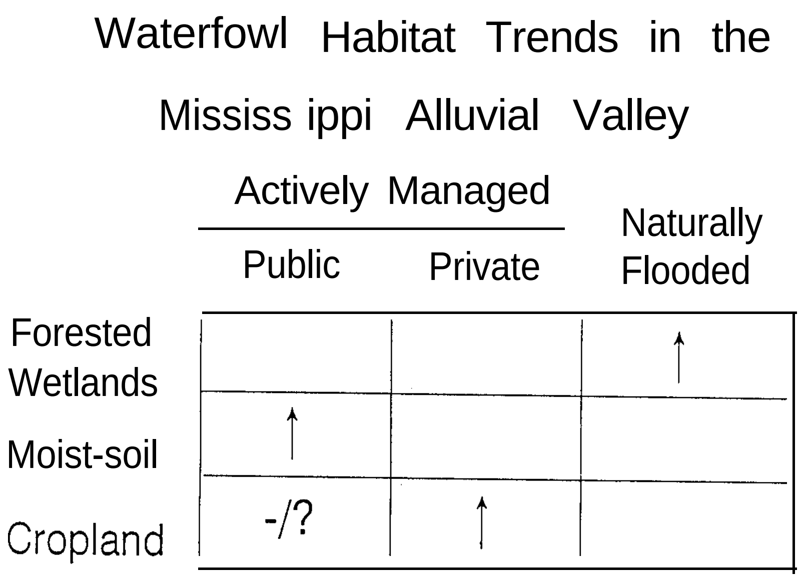

Figure 2.--*Conceptual framework for developing regional waterfowl habitat management strategies illustrating where predicted changes will occur in the size of system components.*

Effects of Habitat Changes on Neotropical Migrants

	Actively Managed		Naturally Flooded
	Public	Private	
Forested Wetlands			+
Moist-soil	+		
Cropland		+ ?	

Figure 3.--Conceptual framework for developing regional waterfowl habitat management strategies illustrating the predicted effect on Neotropical migratory birds of the habitat changes identified in figure 2.

WILL NEOTROPICAL MIGRATORY BIRDS BENEFIT FROM HABITAT CHANGES ASSOCIATED WITH WATERFOWL MANAGEMENT?

Direct Benefits From Increased Habitat Acres

Acquisition of additional tracts of bottomland hardwoods will directly benefit Neotropical migrants (fig. 3), provided that forest stand structure is not so degraded and that fragmentation is not so excessive that the site functions temporarily as a population sink. Reforestation of acquired cleared lands will provide more habitat for Neotropical migrants when succession has proceeded to the appropriate state to provide favorable conditions.

Increasing the acres allocated to moist-soil management for producing duck foods may benefit some Neotropical migrants that use edge habitats (e.g., catbirds, chats, yellowthroats), but the primary beneficiaries will be ducks, wading birds (e.g., herons and egrets), and marsh birds (e.g., rails and shorebirds).

Increasing winter flooding on more acres of private land will benefit few species other than waterfowl, unless a means is found of convincing significant numbers of farmers to flood fields shortly after the autumn harvest, in which case shorebirds will receive substantial benefits.

Benefits Associated with Habitat Management Practices

Forested Wetlands.--Waterfowl managers will encourage foresters to manage for a substantial component (30 to 70 percent) of red oaks (willow, Nuttall, cherrybark, pin, and water) where sites are appropriate. Because acorn production is greatest among trees with d.b.h.'s >10 inches and crowns exposed to full sunlight, management for acorn production should be compatible with management for the relatively mature and multilayered forest that is thought to be of greatest value to Neotropical migrants.

Moist soil--Increased emphasis on moist-soil management will result in a larger number of refuges managing multiple impoundments. The larger number of moist-soil impoundments under management will create opportunities to provide water regimes that favor species other than waterfowl. For example, if adequate impoundments are available, some can be managed to provide foraging sites for ducks during midwinter, whereas others can be flooded in spring as migration habitat for shorebirds or as foraging habitat for breeding wading birds. Similarly, availability of multiple impoundments provides opportunities to attract migrating shorebirds in autumn. Although these groups of water birds are not the focus of efforts to benefit Neotropical migrants, they are considered by the Joint Venture to be important species of wetland wildlife that can benefit from waterfowl management activities,

Croplands.--Recruiting private landowners in the vicinity of refuges to provide foraging sites for waterfowl by flooding croplands during the dormant season can help refuges achieve waterfowl objectives while devoting fewer acres to intensive food production. By developing strong "private lands programs," managers of public lands may be able to put additional acres into moist-soil or bottomland hardwood habitats and provide greater wildlife and environmental values by managing more natural habitats.

CONFLICTS BETWEEN MANAGEMENT FOR WATERFOWL AND MANAGEMENT FOR NEOTROPICAL MIGRANTS

Three potential conflicts between management for waterfowl and management for Neotropical migrants are: (1) development of green-tree reservoirs, (2) management of existing forests to maintain or increase the percentage of red oaks, and (3) decisions made about reforestation of acquired or existing lands that were nonforested.

The principal benefits gained from development of green-tree reservoirs are availability of more predictable habitat for ducks, such as mallards and wood ducks, and availability of hunting opportunities where few exist. On the other hand, negative effects of green-tree reservoir development on Neotropical migrants may include: (1) loss of habitat along rights-of-way, (2) tree mortality resulting from regular winter flooding, (3) changes in overstory tree species composition, (4) decreased understory vegetation and altered frequencies of breeding bird species associated with the understory, and (5) possible negative changes in competitors, predators, and parasites resulting from the creation of edges in the forest interior.

This issue probably is not a major source of conflict between management for waterfowl and Neotropical migrants because emphasis on green-tree reservoirs as a management practice will decrease in the future for the reasons already discussed.

The second issue, management of bottomland hardwood forests to maintain red oaks, also should not be a major source of conflict. On private land, foresters favor red oaks for their desirable commercial properties. On public land, acorn production that is favored by waterfowl managers is greatest in large trees with well-developed crowns, the kind of trees likely to be found in relatively mature forests with multiple layers of overstory and understory vegetation.

However, important questions remain about the role of oaks in the multilayered forests favored by Neotropical migrants. For example, can red oaks, which are relatively intolerant of shade, be maintained in forests managed for a multilayered structure? Also, is the structural diversity of trees more important than their species diversity, and do oaks support as many lepidopteran caterpillars, which may be a "keystone" resource for breeding Neotropical migrants, as do other species of trees?

The last issue, the extent of reforestation of cleared lands purchased by public agencies, may have the greatest potential for conflict between those interested in managing for waterfowl and Neotropical migrants. The ideal management strategy for Neotropical migrants would be to purchase only forested wetlands for public ownership or to reforest all cleared lands. However, doing so would make it impossible to satisfy the food requirements associated with current waterfowl population objectives, and it would preclude managing certain habitats (i.e., moist-soil areas) for the benefit of waterfowl as well as wading birds and shorebirds.

Because it is impossible to optimize a system for two species or species groups simultaneously, the best compromise might be to carefully inventory the system of public lands (fig. 1) and reforest any areas not essential to meeting habitat objectives for populations of waterfowl or related water birds. Consideration also should be given to minimizing fragmentation and edge when selecting sites for reforestation or management as open land.

Is Reforestation an Adequate Restoration of Bottomland Hardwood Functions for the Needs of Neotropical Migratory Birds?'

Kenneth F. Ribbeck and William C. Hunter'

INTRODUCTION

The conversion of forested wetlands to agricultural and other uses throughout the lower Mississippi Valley during most of the 1900's sparked large-scale attempts to artificially restore forests during the last decade. The major motivating factor for wildlife agencies to initiate reforestation efforts is the importance of these habitats for reversing declines among waterfowl species and supporting other game and nongame species. Also, providing habitat for game species (especially deer and turkey) is frequently the wildlife issue of greatest interest among private landowners entering into State and Federal partnerships to restore forested wetlands. The relationship between mast crops and healthy game populations often results in reforestation efforts focused primarily on establishing oaks first to avoid difficulties associated with establishing oaks intermixed with other tree species. The benefits from reforestation efforts for game species appear high; benefits for nongame species are often assumed to be high as well.

Recent concerns over the declines of Neotropical migratory landbirds, the importance of the lower Mississippi Valley for many of these species, and the dependence of many of the highest priority species on mature forested wetlands have led to incorporating the needs of these species into public land management practices, including reforestation efforts. Thus, the main questions to be addressed for this topic are:
are habitat features considered important for waterfowl and other game species, now incorporated into most reforestation efforts, also important for Neotropical migratory landbirds, and are there other factors that should be considered?

REFORESTATION IN PRACTICE

Reforestation of cleared and farmed bottomland hardwood sites is an important component in the restoration of bottomland hardwood systems. The beneficial functions these systems provide can only be realized if the entire restoration project of the system is completed.

Reforestation is a primary component of the restoration process and, when accomplished correctly biologically, will account for the most rapid return of system benefits to wildlife and humans. Analysis of historic vegetative composition of the site along with site alterations incurred due to agricultural practices is necessary to determine species composition required for restoration. Additionally, long-term (100-year) and short-term (1- to 1 O-year) flooding patterns (occurrence, duration, and season) must be evaluated and weighed heavily as determining factors in species selection for site restoration.

Site quality and geography of associated unaltered forest habitat (forests not cleared for agriculture) play an equally important role in the species selection process. In general, higher quality sites with immediate adjacent forest lands and shorter term agricultural history have a stronger propensity to recover to a more complete bottomland hardwood system.

Reforestation of agricultural sites with emphasis on hard mast producers (oaks and pecans) is necessary to ensure the most expeditious return to prior converted habitat conditions. This is due to the general inherent incapability of hard mast species to disperse seeds to any great distance; there are some exceptions as with overcup oak and bitter pecan. However, the experiences of the senior author and his colleagues reveal a limited capability of the lighter seeded species (e.g., American elm, ash, sugarberry, maple, etc.) to occupy the large expanses of agricultural lands in associated lower quality floodplains. Primary reasoned modes of present active dispersal appear to be wind, water, and animals, with combinations of two or all modes providing the densest stocking. However,

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'Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA 70898; U.S. Department of the Interior, Fish and Wildlife Service, Atlanta, GA 30345, respectively.

relative distance to existing forest structure appears to be a limiting factor in dispersal success.

Introduction of the lighter seeded species, either during or after the initial reforestation with the heavier mast species, may be necessary in the lower quality sites to ensure a more diverse woody composition in the future forest. This would also provide a more balanced vegetative component upon which most historically occurring animal life could depend for the basic necessities.

CONCLUSIONS

Micro-site selection (choosing the right species for the right micro-site) is extremely important for successful restoration of these altered systems. A "pine plantation" approach cannot be assumed to be appropriate for bottomland reforestation, as hardwood species selection can change with only a slight change (e.g., 2 to 6 inches) in site elevation. A good working knowledge of the affected site and hardwood species requirements is necessary to match the species to the site and ensure survivability of the plantings. Overall success of the restoration process will then be weighed by the return of the other variables associated with the system.

The following factors should be considered by managers involved in reforestation of bottomland hardwoods:

(1) Landscape selection criteria; e.g., reforesting numerous small sites (<100 acres) vs. a few large sites (>1000 acres) and reforesting directly adjacent to existing forests vs. sites isolated from existing forests.

(2) "Favored" tree species now emphasized in plantings; e.g., appropriateness of emphasis on red oak (i.e., hard mast) species vs. emphasis on a greater diversity of tree species (including hard mast species) in plantings.

(3) Distance to seed sources for light seeded species and influence on future habitat condition important for Neotropical migrants.

(4) Soil and hydrologic considerations for determining tree species used in planting; e.g., should sites be passed over if they are not suitable for priority red oak species but could support other tree species (e.g., baldcypress) possibly important for Neotropical migratory landbirds.

(5) Reforestation as a mitigation tool; e.g., appropriateness of mitigating loss of structurally diverse and species rich forested wetlands with reforestation emphasizing red oak plantings. (Will all functions and values eventually be mitigated for, and how long should it take?)

(6) Nonecological aesthetic vs. logistic and financial constraints; e.g., straight vs. irregular plantings, "patchy monocultures" vs. high species diversity per acre.

Involving Forest Industry in Neotropical Migrant Management[1]

Jimmy Bullock[2]

INTRODUCTION

Because most land in the United States is privately owned, including forest land, it is clear that the private sector should be a major cooperator in "Partners in Flight" efforts to conserve Neotropical migratory birds. The "private sector" is more than forest landowners, whether corporate or noncorporate; it includes agricultural landowners, mining interests, housing and commercial land developers, and others. The private sector also includes the general public as users of products generated from private lands. Private landowners are extremely diverse and vary considerably in their land ownership objectives. With that diversity comes a unique opportunity for cooperation in addressing natural resource issues (Wigley and Sweeney 1992).

In the South, corporate and noncorporate private landowners own approximately 90 percent of all forested lands. Thus, efforts to enhance forested habitat for Neotropical migrants must involve private landowners. While the private, noncorporate sector owns forest land for a variety of uses, timber production ranks as the most important. The forest products industry is a diverse group of small to large companies. Some own their own lands, others depend on timber from private or public lands. Each company's products determine how they will manage their forests. Despite these and other differences, there are similarities among corporate landowners:

(1) they own land and expect to make a return on their investment in this land;
(2) they harvest timber because the public requires and demands forest products, and this demand will increase with time; and
(3) by and large, corporate landowners are becoming better stewards and more responsible managers of the total resource.

DEVELOPING PARTNERSHIPS

Dr. Ben Wigley and Dr. James Sweeney, in a paper entitled "Cooperative Partnerships and the Role of Private Landowners" (1992), supported the concept that cooperative public/private sector partnerships in which all participants contribute may be the best vehicle to involve forest industry with Neotropical migrant management. I agree with their conclusions.

The authors used the Black Bear Conservation Committee (BBCC) as a case study of the development of a successful cooperative partnership and attributed the BBCC's success to several factors:

(1) all members "leave at the door" any agenda except working for the resource;
(2) mutual respect among members for objectives of each partner;
(3) all members contribute to the effort;
(4) initial positive cooperation on "common ground" issues;
(5) environment in which members can informally socialize and come to know each other as individuals; and
(6) "best available" scientifically derived information is the final arbiter.

Also, it should be emphasized that too often the public sector falls short in its understanding of private sector concerns, basic forest/wildlife management concepts, or understanding why the private sector is hesitant to become involved in partnerships. Even of more concern is that sometimes the public sector may not even care about private sector concerns.

ANDERSON-TULLY'S MANAGEMENT STRATEGY

Finally, I want to briefly discuss one private corporate landowner's approach to management of Neotropical migratory birds. Anderson-Tully Company (ATCO) believes a well-designed timber management plan is beneficial for both game and nongame wildlife species. For optimal wildlife benefit, a managed timber stand should provide

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[1]Paper presented at a Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests; 1993 August 9-10; Tallulah, LA.

[2]Anderson-Tully Company, P.O. Box 38, Vicksburg, MS 39181.

a diversity of food, cover, and habitat types including an interspersion of tree species, stand densities, and age classes. Anderson-Tully's sustainable uneven-aged management philosophy, with its selective harvesting approach and timber stand improvement and natural regeneration techniques provides that diversity. Wildlife habitat is further enhanced through the designed placement of wildlife food plots and permanent wildlife openings, roads and maintained roadside corridors, streamside management zones, and increased den and snag tree availability.

Anderson-Tully's approach to Neotropical migratory bird management is proactive in nature. A sampling system will be developed to quantify an array of habitat quality variables within each of the nine timber types found on company lands. Using this information, company resource managers will have better knowledge of how all pieces of the ecosystem puzzle fit and a better track on how ATCO's management system influences habitat quality for both game and nongame wildlife species. Anderson-Tully cannot manage for all Neotropical birds or all wildlife species on every acre of company land. Every acre will be managed for what it is best suited; however, this may be timber species, herbaceous vegetation, game or nongame wildlife species, and Neotropical migrants. Anderson-Tully is fortunate-- its intensive management system and ecologically rich lands will promote habitat for a diversity of Neotropical migrants across the landscape, whether the migrants prefer early successional plant communities, mature hardwood forests, or managed intermediate stands. As a private landowner, ATCO must realize an economic profit from company lands in order to continue to own them. The challenge as managers of this resource will be to sustain the management of all natural resources through time in an ecologically responsible fashion. Working together with all stakeholders in a cooperative manner, economic reality can be balanced with ecological responsibility.

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Context and Priorities in the Management of Neotropical Migratory Birds[1]

David N. Pashley[2]

INTRODUCTION

Land managers and conservation policymakers are faced with a bewildering array of alternatives. Economic requirements and public demand often conflict with conservation objectives. While most agree to the desirability of taking the needs of Neotropical migratory birds into consideration, the means whereby these needs can be integrated with other objectives are not always clear. The intent of this workshop is to air issues of potential conflict and move toward resolution of those issues.

There are few cases in which management of forest-dwelling migratory birds will be the sole, or even primary, objective. The point of this workshop is to begin planning bird management within the context of other priorities. The most common primary objectives in forested habitat of the Mississippi Alluvial Valley are timber production, terrestrial game, and waterfowl. There are potential conflicts, but it is also clear that many standard practices are entirely satisfactory for songbirds and fairly minor modification of other practices can result in heightened habitat suitability. Many details remain to be worked out, but relative compatibility is well within the realm of possibility. There are other important values, such as improved black bear habitat and water quality, that can be enhanced through songbird management.

PRIORITIZING SPECIES AND HABITATS

There is considerable variation among Neotropical migratory birds. Some species have stable populations, whereas others are in decline; few species show consistent patterns across their entire range. There is a great deal of variation in habitat requirements, ranging from pastures to disturbed shrub to mature forest. It is impossible to manage a land unit for Neotropical migrants without learning which species are present, which are of greatest conservation concern, and what their needs are. Proper management cannot occur, regardless of the presence or absence of conflict, until priorities are established.

Development of such a prioritization scheme has been an important activity for Partners in Flight, and the process is nearing completion. A species in an area is evaluated on the basis of seven factors: global abundance, extent of breeding distribution, threats during breeding season, extent of winter range, threats during winter and migration, local population trend, and importance of the area to the species. The scheme has been adopted, draft values for the above parameters are under review, and the Colorado Bird Observatory has been contracted to complete prioritized species lists for every State and physiographic area in the United States. Thus, the prioritization scheme should be finished fairly soon, and lists of species will thereafter be readily available. In the current draft, the top 10 breeding species in order of conservation concern within the Mississippi Alluvial Valley are: Bachman's warbler, prothonotary warbler, Mississippi kite, Swainson's warbler, painted bunting, American swallow-tailed kite, yellow-billed cuckoo, wood thrush, white-eyed vireo, and hooded warbler.

Issues of Context

These lists, however, are only a starting point. With so many bird species to deal with, management for any single species (except for those that are truly endangered, none of which exist any longer in bottomland hardwood systems) is entirely impractical. Those highly prioritized species that cohabit a particular habitat should be managed in concert through plans that satisfy all of their needs. This is the upcoming phase in Partners in Flight. It will require cooperation among foresters, wildlife managers, and ornithologists but is not at all an intractable problem.

The emphasis that needs to be placed on any given species within the Mississippi Alluvial Valley depends, to a large extent, on what is happening within the entire range of that species. This is another issue of context.

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[1]Paper presented at a Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests; 1993 August 9-10; Tallulah, LA.

[2]The Nature Conservancy of Louisiana, P.O. Box 4125, Baton Rouge, LA 70821

Conservation of wide-ranging, long-distance migrants can only be achieved through a hemispheric perspective. The responsibility of this part of the world for the long-term perpetuation of a given species has to be evaluated on the basis of what is happening throughout the range of that species, This sort of determination is an upcoming challenge within Partners in Flight.

The role of any particular land unit within a physiographic area is another issue of context. This consideration falls into the discipline of landscape ecology. Take an example in which two general habitat conditions must be maintained for the sake of species prioritized highly enough to be of concern. If neither habitat type is provided on private lands (which may be entirely agricultural), then a manager of public lands on which management of songbirds is a priority ought to provide both habitat types. If, on the other hand, one of those habitat types is amply provided on private land (i.e., early postdisturbed industrial forest land or tall trees in low-density residential areas), then the public land manager should concentrate on the type that is absent. Real-world situations are not typically as easily evaluated, and regional conservation planning should be another goal for Partners in Flight.

As has been amply demonstrated in descriptions of the ecology and silviculture of bottomland hardwood systems, there is a temporal context that also needs to be considered. As conditions change, an area that currently provides suitable habitat for a particular bird species will not necessarily continue to always do so. With or without active management, this is a very dynamic system, and one cannot be so complacent as to assume that conditions that are currently satisfactory will remain so in the future. This is just one of the reasons why an understanding of ecosystem dynamics is critical.

The final issue of context is the place of Neotropical migratory bird conservation within the broader issue of protection of biological diversity in general. First, we have to keep in mind that providing habitat for Neotropical migrants does not take care of all groups of species, in addition to bird species, that are in peril or undergoing declines. Wetlands species, such as shorebirds, and freshwater forms, such as mussels, are two obvious examples. A landscape view of habitat protection must be broad enough to include all elements of diversity. However, within habitats that could be managed for Neotropical migrants reside a great many other organisms that could benefit from bird conservation. Land managers should consider all rare organisms in making decisions. If additional lands are to be brought into public ownership or otherwise managed specifically for birds, areas that also harbor other rare elements of biological diversity should be given highest priority. Consideration of a broader group of organisms than migratory birds is particularly important on Neotropical wintering grounds where resident species are usually more critically imperiled than are migrants. Although Neotropical migrants are the focus of Partners in Flight, it is not at all disingenuous to hope that a more extensive breadth of biological diversity benefits from the program.

Identifying Management Needs[1]

S. Ray Aycock and William C. Hunter[2]

INTRODUCTION

The final topic of this proceedings is information needs for implementation of management practices that benefit Neotropical migrants that are integrated as much as possible with other priority management objectives. Land managers were shown reasons for widespread concern for the future health of Neotropical migratory landbird populations, especially those occurring in the bottomland hardwood ecosystems of the Mississippi Alluvial Valley. However, few land management practices for immediate implementation were outlined.

Identifying management practices for Neotropical migrants is a high-priority issue now being addressed by the Southeast Working Group of Partners in Flight. Many of the information needs identified by managers at the workshop have led to the formation of subcommittees charged with compiling known information and formulating broad strategies on how to implement regional management guidelines at local land management units.

INFORMATION NEEDS AND ONGOING OR PLANNED ACTIONS TO ADDRESS NEEDS

1. Survey and inventory needs--which species occur, how they are distributed, and which habitats do they use:
   a. Breeding Bird Atlases near completion in Missouri, Kentucky, and Tennessee; planned in near future for Louisiana, Arkansas, and Mississippi.
   b. Continuing need for conducting local surveys and involving participants with bird identification skills--universities and/or local and State bird clubs may be sources for assistance and, if enough interest exists, bird identification workshops may be planned in the future for land managers.
   c. Paul Hamel's "Land Manager's Guide to the Birds of the South" can greatly assist land managers once they know which species are present and which species should receive priority attention (for the fatter see attached table for the Mississippi Alluvial Valley). Paul Hamel's work is available from The Nature Conservancy, Chapel Hill, NC for $20.00 (telephone: 919-967-5493).
2. Guidelines for integrating habitat management for game species, timber production, and endangered species (e.g., red-cockaded woodpecker) with the habitat needs of the full range of high priority Neotropical migrants.
   a. Specific issues such as forest-openings management, the edge concept, and area requirements for balancing the needs of both mature forest and early successional species (game and nongame), consistent with a variety of timber production objectives, are now being addressed at the regional level.
   b. Strategies for allocating habitat resources when endangered species are involved are also under investigation throughout the Southeast and probably can be addressed on a case-by-case basis.
3. Provide for consistency in survey and monitoring techniques.
   a. Winston Paul Smith and colleagues (Smith and others 1993) are working diligently on this need for information. (One technical bulletin is available through the USDA Forest Service, Southern Forest Experiment Station and a land manager's guide [i.e., "cookbook"] on how to inventory birds and habitat is now in development).
4. Silviculturally define successional stages, stand types (i.e., dominant tree species composition), burning regimes, timber stand improvement, regeneration regimes, etc Determine best time of year for forestry activities to benefit or reduce harm to the greatest variety of Neotropical migrants, keeping in mind other constraints such as flooding periods, etc. Compare the range of silvicultural regeneration alternatives (e.g., even- vs. uneven-aged systems, patch size, rotation, largely forested or largely fragmented landscape) and assess effects of each on broadly defined groups of Neotropical migrants.

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[1]Paper presented at a Workshop to Resolve Conflicts in the Conservation of Migratory Landbirds in Bottomland Hardwood Forests; 1993 August 9-10; Tallulah, LA.

[2]U.S. Department of the Interior, Fish and Wildlife Service, Jackson, MS 39213; U.S. Department of the Interior, Fish and Wildlife Service, Atlanta, GA 30345, respectively.

a. Each of the above elements is now being addressed at the regional level.

5. Develop a reading list (annotated bibliography) intended for foresters and game managers to gain a better understanding of the problems Neotropical migrants are confronted with and for nongame managers and researchers to gain a better understanding of silviculture and game management practices (the reading list should cover topics that should be of interest to all parties).
   a. Development of an annotated bibliography is under discussion at the regional level. In the meantime, increased communication among all interested parties may allow for more efficient flow of important information.

LITERATURE CITED

Smith, Winston Paul; Twedt, Daniel J.; Wiedenfeld, David A. [and others]. 1993. Point counts of birds in bottomland hardwoodforests of the Mississippi Alluvial Valley: duration, minimum sample size, and points versus visits. Res. Pap. SO-274. New Orleans, LA U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 21 p.

Appendix A.--*Common and scientific names of mammal and bird species referenced in papers included in this publication*

Common name	Scientific name
Mammals	
Opossum	*Didelphis virginiana*
Gray squirrel	*Sciurus carolinensis*
Fox squirrel	*S. niger*
Swamp rabbit	*Sylvilagus aquaticus*
White-tailed deer	*Odocoileus virginianus*
Spotted skunk	*Spilogale putorius*
Striped skunk	*Mephitis mephitis*
Raccoon	*Procyon lotor*
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*
Gray fox	*Urocyon cinereoargenteus*
Bobcat	*Lynx rufus*
Black bear	*Ursus americanus*
Birds	
Black-crowned night-heron	*Nycticorax nycticorax*
Yellow-crowned night-heron	*N. violaceus*
Kildeer	*Charadrius vociferus*
Wood duck	*Aix sponsa*
American swallow-tailed kite	*Elanoides forficatus*
Mississippi kite	*Ictinia mississippiensis*
Eastern wild turkey	*Meleagris gallopavo*
Northern bobwhite	*Colinus virginianus*
Yellow-billed cuckoo	*Coccyzus americanus*
Blue jay	*Cyanocitta cristata*
American crow	*Corvus brachyrhynchos*
Gray catbird	*Dumetella carolinensis*
Wood thrush	*Hylocichla mustelina*
White-eyed vireo	*Vireo griseus*
Red-eyed vireo	*V. olivaceus*
Bachman's warbler	*Vermivora bachmanii*
Northern parula	*Parula americana*
Yellow-throated warbler	*Dendroica dominica*
Cerulean warbler	*D. cerulea*
Prothonotary warbler	*Protonotaria citrea*
Swainson's warbler	*Limnothlypis swainsonii*
Kentucky warbler	*Oporornis formosus*
Common yellowthroat	*Geothlypis trichas*
Hooded warbler	*Wilsonia citrina*
Yellow-breasted chat	*Icteria virens*
Indigo bunting	*Passerina cyanea*
Painted bunting	*P. ciris*
Brown-headed cowbird	*Molothrus ater*

Appendix B.--*Common and scientific names of tree and shrub species referenced in papers included in this publication*-*Continued*

Common name	Scientific name
Spruce pine	*Pinus glabra* Walt.
Baldcypress	*Taxodium distichum* (L.) Rich.
Cottonwood (eastern)	*Populus deltoides* Bartr. ex Marsh.
Cottonwood (swamp)	*P. heterophylla* L.
Black willow	*Salix nigra* Marsh.
Sweet pecan	*Carya illinoensis* (Wangenh.) K. Koch
Water hickory (bitter pecan)	*Carya aquatica* (Michx. f.) Nutt.
Black birch (sweet birch or cherry birch)	*Betula lenta* L.
River birch	*B. nigra* L.
American hornbeam	*Carpinus caroliniana* Walt.
Beech	*Fagus grandifolia* Ehrh.
Bur oak	*Quercus macrocarpa* Michx.
Overcup oak	*Q. lyrata* Walt.
Swamp chestnut oak	*Q. michauxii* Nutt.
Northern red oak	*Q. rubra* L.
Shumard oak	*Q. shumardii* Buckl.
Pin oak	*Q. palustris* Muenchh.
Cherrybark oak	*Q. falcata* var. *pagodifolia* Ell.
Nuttall oak	*Q. nuttallii* Palmer
Water oak	*Q. nigra* L.
Willow oak	*Q. phellos* L.
Swamp laurel oak	*Q. laurifolia* Michx.
American elm	*Ulmus americana* L.
Sugarberry (hackberry)	*Celtis laevigata* Willd.
Water-elm	*Planera aquatica* J.F. Gmel.
Red mulberry	*Morus rubra* L.
Sweetgum	*Liquidambar styraciflua* L.
American sycamore	*Platanus occidentalis* L.
Red maple	*Acer rubrum* L.
Silver maple	*A. saccharinum* L.
Boxelder	*Acer negundo* L.
Blackgum	*Nyssa sylvatica* Marsh.
Water tupelo	*N. aquatica* L.
Persimmon	*Diospyros virginiana* L.
Green ash	*Fraxinus pennsylvanica* Marsh.
Carolina ash	*F. caroliniana* Mill.
Swamp-privet	*Forestiera acuminata* (Michx.) Poir.
Buttonbush	*Cephalanthus occidentalis* L.

Appendix C.--*Concern scores for Neotropical migrant birds (NTMB's), temperate migrant birds, and resident landbird species that breed within the Mississippi Alluvial Valley. Importance of area codes (C = center of abundance; IP = isolated population; S = significant population; P = peripheral in distribution or abundance; IR = individual reports) and population trends (-- is reasonably definite decrease; - is possible decrease; 0 is no trend; ? is inadequate data to determine trend; + is possible increase; ++ is reasonably definite increase) are given in parentheses. Bold lines separate concern categories (see footnote below)*

Concern score*	NTMB's†	Temperate migrants‡	Resident species”
35	Bachman's warbler¶		Ivory-billed woodpecker¶
30	Swainson's warbler (C,--)		
28	Prothonotary warbler (C,--)		
27	Mississippi kite (C,--)		
26	Yellow-billed cuckoo (C,--)		
	Cerulean warbler (C,?)		
	Orchard oriole (C,--)		
25	American swallow-tailed kite (S,?)		
	Wood thrush (S,--)		
	White-eyed vireo (C,--)		
	Northern parula (C,--)		
	Hooded warbler (C,--)		
	Painted bunting (S,--)		
24	Eastern wood-pewee (S,--)	Loggerhead shrike (S,--)	
	Acadian flycatcher (S,-)	Field sparrow (S,--)	
	Great crested flycatcher (S,-)		
	Bell's vireo (P,--)		
23	Gray catbird (S,--)	Red-headed woodpecker (C,-)	
	Worm-eating warbler (P,?)		
	Louisiana waterthrush (P,?)		
	Yellow-breasted chat (C,--)		
	Northern Baltimore oriole (S,--)		
22	Ruby-throated hummingbird (C,--)	Bald eagle (S,?)	
	Prairie warbler (P,--)	Red-shouldered hawk (C,+)	
	Scarlet tanager (P,?)		
	Dickcissel (C,+)		
	Grasshopper sparrow (P,--)		
21	Blue-gray gnatcatcher (S,--)	Carolina chickadee (S,--)	
	Yellow-throated vireo (S,++)		
	Yellow-throated warbler (S,+)		
	Summer tanager (S,0)		
20	Broad-winged hawk (S,?)	American woodcock (P,?)	Northern bobwhite (S,--)
	Chuck-will's widow (S,0)		Eastern screech-owl (S,?)
	Eastern kingbird (S,--)		Red-bellied woodpecker (C,O)

Appendix *C.--Concern scores for Neotropical migrant birds (NTMB's), temperate migrant birds, and resident*
landbird species that breed within the Mississippi Alluvial Valley. Importance of area codes (C =
center of abundance; IP = isolated population; S = significant population; P = peripheral in 9
distribution or abundance; IR = individual reports) and population trends (-- is reasonably
definite decrease; - is possible decrease; 0 is no trend; ? is inadequate data to determine trend;
+ is possible increase; ++ is reasonably definite increase) are given in parentheses. Bold lines
separate concern categories (see footnote below)-Continued

Concern score'	NTMB's†	Temperate migrants‡	Resident species"
20	Red-eyed vireo (S,--)		Tufted titmouse (S,-)
	Ovenbird (P,?)		Carolina wren (C,+)
	Kentucky warbler (S,++)		
	Indigo bunting (S,--)		
	Lark sparrow (P,?)		
19	Whip-poor-will (P,?)	Marsh wren (P,?)	Boat-tailed grackle (S,-)
	Willow flycatcher (P,?)	Eastern bluebird (S,-)	
	Scissor-tailed flycatcher (P,?)	Brown thrasher (S,--)	
	Purple martin (C,++)		
	Warbling vireo (S,0)		
18	Chimney swift (S,0)	Cooper's hawk (P,?)	Wild turkey (S,+)
	Common yellowthroat (C,--)	Common grackle (C,--)	Barn owl (S,?)
	Blue grosbeak (S,0)	Barred owl (C,0)	Pileated woodpecker (S,+)
			Northern cardinal ((CO)
17	Common nighthawk (S,-)	Eastern phoebe (P,O)	
	Northern rough-winged swallow (C,++)		
	American redstart (S,++)		
16	Osprey (P,+)	Fish crow (S,+)	White-breasted nuthatch (P,-)
	Bank swallow (P,?)	Northern mockingbird (S,--)	
	Yellow warbler (P,--)	Rufous-sided towhee (S,0)	
	Black-and-white warbler (P,++)	Eastern meadowlark (S,-)	
	Brown-headed cowbird (C,--)		
15	Cliff swallow (P,?)	Mourning dove (C,--)	Black vulture (S,--)
	Chipping sparrow (S,-)	Pine warbler (P,++)	Hairy woodpecker (S,0)
		American goldfinch (P,--)	
14		Belted kingfisher (S,0)	Downy woodpecker (S,0)
		Tree swallow (P,++)	
		Blue jay (S,0)	
13	Bronzed cowbird (IR,++)	Turkey vulture (S,0)	Great homed owl (S,-)
		Killdeer (C,0)	
12		American kestrel (S,0)	
		Northern yellow-shafted flicker (S,-)	
		Red-winged blackbird (C,++)	
11		Homed lark (S,0)	
		American crow (S,++)	

Appendix *C.--Concern scores for Neotropical migrant birds (NTMB's), temperate migrant birds, and resident landbird species that breed within the Mississippi Alluvial Valley. Importance of area codes (C = center of abundance; IP = isolated population; S = significant population; P = peripheral in distribution or abundance; IR = individual reports) and population trends (-- is reasonably definite decrease; - is possible decrease; 0 is no trend; ? is inadequate data to determine trend; + is possible increase; ++ is reasonably definite increase) are given in parentheses. Bold lines separate concern categories (see footnote below)-Continued*

Concern score*	NTMB's†	Temperate migrants‡	Resident species”
11		Song sparrow (P,+)	
10	Barn swallow (S,++)		
9		Red-tailed hawk (S,++) American robin (S,++)	
8	House wren (S,++) Shiny cowbird (IR,++)		

‘Concern scores are provided to offer some basis for setting priorities on each species relative to all other species. These scores combined with scores identifying action needs (survey, management, monitoring, and research) are intended to help in Appendix C allocating limited resources species by species or preferably according to species assemblages among habitats or ecosystems. Scores are based on seven criteria, with each criterion having a value from 1 to 5 points in order of concern. These criteria are: (1) global abundance, (2) global breeding distribution, (3) global wintering distribution, (4) threats during breeding season (local or global), (5) threats during nonbreeding seasons (migration and winter), (6) local population trend, and (7) importance of physiographic area (i.e., local distribution and abundance relative to remainder of species’ range). Importance of area and population trend is identified for all species occurring in each physiographic area. Concern scores are subject to revision as new data become available or as the consensus of local expertise dictates. The following concern categories (i.e., generalized definitions of scores) are intended to guide, not mandate, decisions for allocating resources: 35 to 30 = extremely high concern, most vulnerable and likely in need of immediate management or monitoring attention; 29 to 24 = very high concern, more vulnerable and likely in need of management or monitoring attention; 23 to 19 = high concern, average vulnerability or relative degree of vulnerability unknown but likely in need of at least monitoring; 18 to 13 = moderate concern, less vulnerable and possibly in need of monitoring; 12 to 7 = low concern, least vulnerable and not likely to need attention.

†Those species with at least some populations breeding in Temperate Zones and with at least some populations migrating to and from the New World Tropics during other periods of their annual cycle (i.e., temperate winters).

*Those species with most temperate breeding populations migrating to and from other temperate areas north of the Mexico-United States border. However, many temperate migrants include some populations that migrate to and from the Neotropics.

“Those species having populations present at all times of the year throughout their ranges, even though there may be some movement of individuals or populations within those ranges.

“Believed to be extinct.

*U.S.GPO:1994-665-017/00023

Smith, Winston Paul; Pashley, David N., comp., eds. 1994. A workshop to resolve conflicts in the conservation of migratory landbirds in bottomland hardwood forest; 1993 August 9-10; Tallulah, LA. Gen. Tech. Rep. SO- 114 . New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 37 p.

Proceedings of a workshop to provide an overview of the basic ecology of southern bottomland forests, summarize potential conflicts that exist in managing wildlife species with different habitat needs, especially Neotropical migrant landbirds, and provide participants with a realistic view of the diversity of perspectives and expectations that exists among bottomland hardwood forest protagonists.

Keywords: Ecological succession, ecology, ecosystem management, forest management, game species, Neotropical migrants, nongame species, silviculture, wildlife habitat.