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Bird Use of Reforestation Sites:
Influence of Location and Vertical Structure

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Bird Use of Reforestation Sites:

Influence of Location and Vertical Structure

Introduction

In the Lower Mississippi Valley, more than 300,000 acres of agricultural land have been reforested in the last 10 years. Planning decisions on how and where to restore forest are complex and usually reflect landowner objectives. However, initial planning decisions may have a large influence on the value of restored stands for birds and other wildlife.

Bottomland hardwood restoration site planted predominately with oaks (*Quercus* spp.)

Reforestation of small, isolated tracts will likely result in mature forests where reproductive output of breeding birds does not compensate for adult mortality (sink habitats). This may be due to factors such as lower reproductive success near edges (edge effects), insufficient area of habitat to attract colonizing birds (area effects), or restricted population mixing and mating opportunities because of limited dispersal among tracts (isolation effects).

Small, isolated forests are likely population "sinks" for birds.

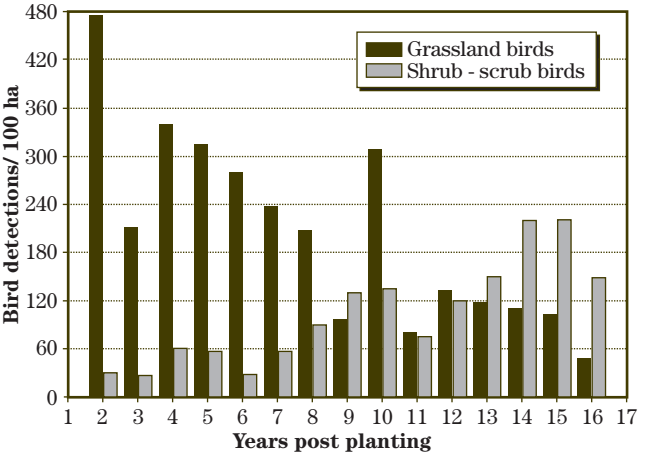
Conversely, reforestation adjacent to existing forest increases contiguous forest area and provides areas buffered from agricultural or urban habitats (interior forest core).

Bottomland reforestation has historically focused on planting relatively slow-growing tree species, particularly oaks (*Quercus* spp.). Thus, restoration sites are often dominated by grasses and forbs for up to a decade after tree planting. Grassland birds are the first birds to colonize reforested sites. However, abundance and productivity of grassland birds is generally poor on sites associated with woody vegetation, such as sites adjacent to mature forest.

Reforestation adjacent to existing forest increases forest area and adds to interior core.

As woody vegetation develops on reforested sites, birds preferring shrub-scrub habitat displace grassland species (Twedt et al. 2002) (fig. 1). Planting faster-growing trees compresses the time for colonization by shrub-scrub birds and the increased vertical stature of these trees attracts forest birds (Twedt and Portwood 1996). Additionally, planting next to existing mature forests creates transitional edges that reduce the detrimental effects of abrupt forest-agriculture interfaces.

Figure 1 Birds that use shrub-scrub habitat supplant early colonizing grassland birds as woody vegetation develops on reforested sites.



Effects of reforestation

Isolated tracts harbored more grassland birds which had poor nest success and were likely "sink" populations.

Studies of bird colonization and productivity associated with reforested sites between 2 and 15 years post-planting in Louisiana and Mississippi indicated birds were influenced by the landscapes within which reforestation occurred. Grassland birds (Red-winged Blackbird and Dickcissel) were more abundant on isolated reforested tracts whereas shrub-scrub birds (Yellow-breasted Chat and Indigo Bunting) were more abundant on reforested sites that were adjacent to forest. Grassland birds tended to have low (14% to 18%) nest success, whereas, shrub-scrub birds had higher nesting success (25% to 37%). Nesting success for most shrub-scrub species was sufficient to maintain their populations on these sites. Thus, reforested tracts are likely population sources for shrub-scrub birds.

Reforestation near mature forest attracted more shrub-scrub birds which had better nest success and were likely "source" populations.

On mature forest tracts, the amount of young reforestation in the landscape positively impacted nest survival of breeding forest birds such as Acadian Flycatchers. When reforestation was widespread in the landscape, nest survival did not vary with distance to forest edge, but when little reforestation was nearby, nests further from the forest edge survived better (fig. 2). Thus, reforestation appears to act as a buffer to mitigate detrimental edge effects. Older or taller reforestation sites appear to be more effective as buffers than are tracts dominated by grasses and forbs.

Reforestation acts as a buffer to mitigate edge effects.

Brown-headed Cowbirds were more abundant in agricultural landscapes than in more forested landscapes. Although brood parasitism did not appear to be directly related to reforestation, cowbird parasitism declined as nests were located farther from forest edges (fig. 3). Thus nest parasitism of forest birds, such as Indigo Bunting, should decline with increased reforestation adjacent to existing forests.

Female Brown-headed Cowbirds lay eggs in nests of other forest birds.

Figure 2 Acadian Flycatchers have increased nest survial near forest edges when a greater proportion (average – high) of the landscape is reforested (K. Hazler, unpublished data).

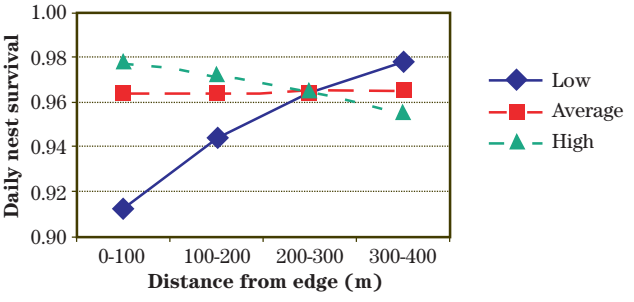
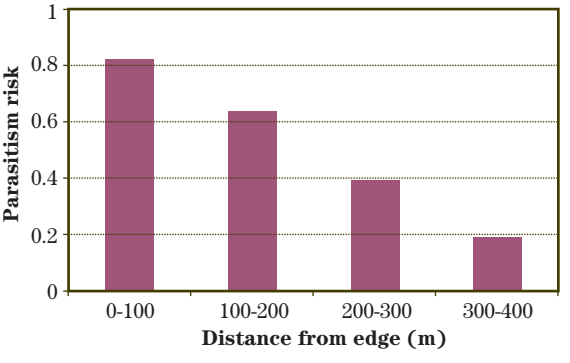


Figure 3 Cowbird parasitism of Indigo Bunting nests declines with distance from forest edge (K. Hazler, unpublished data).



Planning and management

Where to reforest

Because reforestation appears to buffer detrimental effects of habitat edges, we recommend restoration adjacent to existing forests. Similarly, because parasitism appears to decrease with distance from forest edge, placement of reforestation near large forest tracts is more beneficial than restoration near small forest patches.

Reforestation near large forest tracts is more beneficial than restoration near small forest patches.

Planting trees <100 meters from existing forest is not required to promote reforestation.

However, because recruitment of naturally invading woody plants is greatest near woody edges (Twedt 2004) (fig. 4), planting trees within 100 meters of an existing forest is likely not required to promote forest restoration.

A forest bird decision support model was constructed to aid in decision making regarding placement of restoration sites within the landscape (fig. 5). This spatial model was designed to create or enlarge contiguous forest blocks with interior core habitat of 2,000 hectare (~5,000 acres) and 5,000 hectare (~12,000 acres). Secondary emphasis was on increasing the area of existing forest core, regardless of its' size and on increasing the proportion of forest within local (10 km) landscapes. Additionally, this model gave higher priority to less flood-prone sites provided their restoration would not increase existing forest fragmentation. The forest bird decision support model established quantitative reforestation priorities for all areas within the Mississippi Alluvial Valley. An ArcView shapefile of the model output can be viewed and downloaded at:

http://www.lmvjv.org/cpa_volume1.htm

Figure 4 Density of naturally invading trees decreases with distance from forest edge.

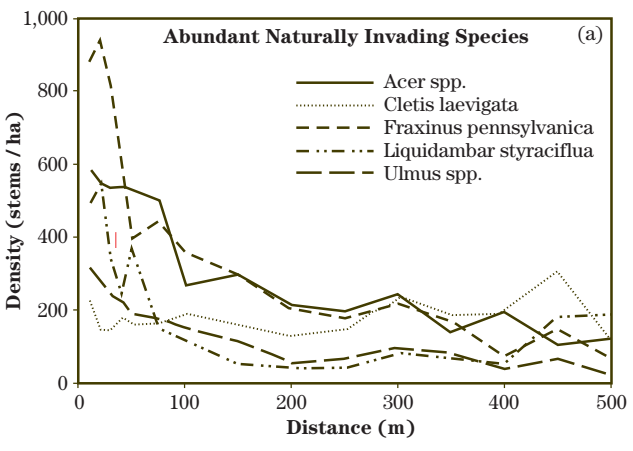
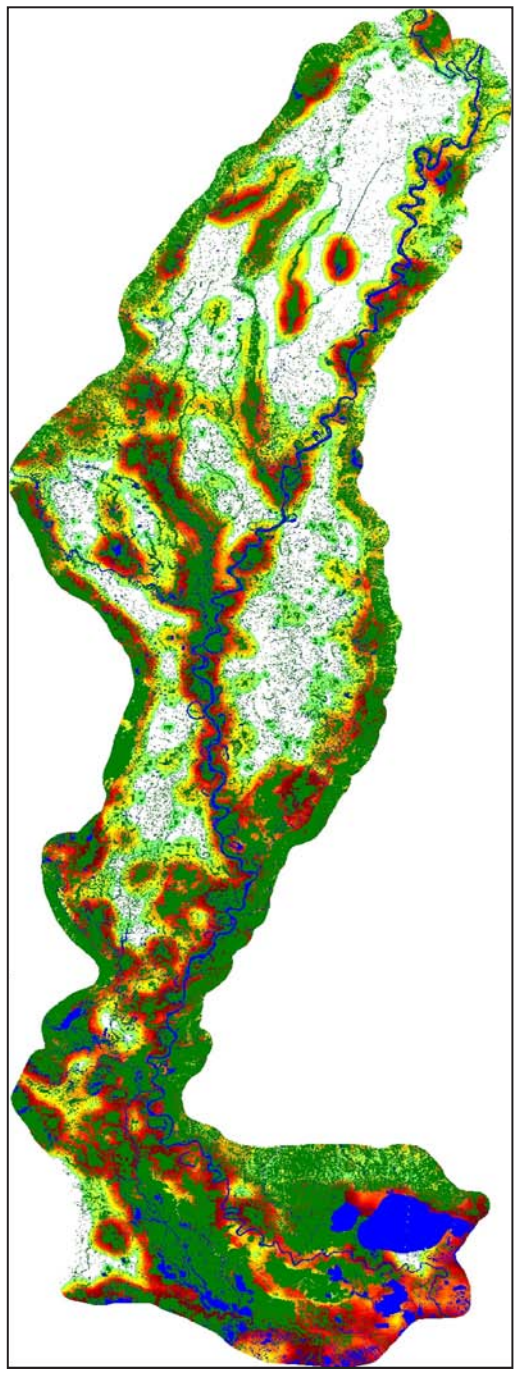


Figure 5 Decision support model used to guide forest restoration within the Mississippi Alluvial Valley. Warm colors (red) are high priority; cool colors (white) are low priority. Water is blue and existing forests are dark green.



What to plant

Opportunities to benefit grassland birds at reforestation sites are limited; therefore, managers should encourage rapid succession from colonizing grassland birds towards shrub-scrub and forest birds. Restoration near existing forest stimulates colonization by shrub-scrub birds, but development of vertical forest structure within reforested sites is essential for attracting forest birds. Therefore, including a high proportion (30% to 50%) of fast-growing, early successional tree species (table 1), along with the traditional mix of slow-growing, heavy-seeded species will encourage colonization by high priority forest birds.

Planting a diverse mix of species is particularly important when restoration sites are distant from existing mature forests. At least one planted species should produce soft-mast. Heavy-seeded oaks and pecans should be limited to 25 to 40 percent of planted seedlings. We recommend planting at least 10 tree species at a combined density of ≥302 seedlings/acre with no more than 80 seedlings/acre of any single species (Twedt and Best 2004).

How to manage

Research suggests that in mature second growth forests, selective timber harvest will benefit many species of forest birds. Harvest should encourage two forest conditions:

- a reduced forest canopy, which encourages light penetration to the forest floor, resulting in an increase in understory vegetation, and
- retention or development of dominant trees with crowns that are emergent above the average forest canopy.

Management actions on reforested sites can be undertaken to promote these favorable conditions. Competition among densely stocked trees will encour-

Table 1 Trees recommended (when compatible with soils and hydrology) for planting along with heavy-seeded oaks and pecan. Many additional species are also suitable for planting.

Faster-growing trees	Soft-mast trees/shrubs
Eastern cottonwood	Red mulberry
Honey locust	Hawthorn spp.
Black willow	Dogwood spp.
Sweetgum	Possumhaw
American sycamore	Plum spp.
Tulip popular	American snowbell
Black locust	American beautyberry

Plant up to 10 tree species at a total density of ≥302 seedlings/acre with no more than 80 seedlings/acre of any one species.

Sunlight on the forest floor stimulates understory vegetation.

A patchwork harvest will provide open canopy areas with thick understory vegetation and closed canopy areas of densely stocked trees to stimulate vertical growth.

age development of tall emergent stems.Unfortunately, dense stands rapidly develop closed canopies that reduce understory vegetation. On reforested sites with densely stocked, closed canopy stands, selective harvest should be undertaken to increase understory vegetation. However, the management action most beneficial to birds would heterogeneously distribute harvest within a reforested site; some areas would be subjected to intense harvest whereas other areas would remain unharvested. This patchwork management should provide areas with suitable understory vegetation for nesting and foraging birds, yet retain patches that are densely stocked with competing trees to encourage increased vertical development of dominant trees.

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