

SOME IMPLICATIONS OF POPULUS
INTENSIVE CULTURE ON NONGAME BIRDS

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Abstract.--Intensive culture of Populus will affect nongame bird habitat. Conversion of old fields to Populus plantations will destroy habitat favorable to certain species and produce habitat that will attract different species. Effects of this conversion can be lessened by planting plantations with irregular shapes and by leaving patches (.4 hectares) of existing vegetation when plantation size exceeds 60 hectares.

INTRODUCTION

Demand for wood and wood products has increased rapidly in recent years. More and more of the traditional "wild" land is beginning to serve a multitude of needs to our complex society. Management of land for aesthetic purposes, game habitat, camping, snowmobiling, skiing, and water and soil conservation all have potential conflicts with efficient growing and harvesting of timber. According to Davis (1979) competing uses for land have been and will continue to be one of the most important influences on the survival of America's wildlife resources. To partially meet the increasing demand for wood, a silvicultural system called short-rotation intensive culture (SRIC) is being explored. Large plantations of intensive cultured poplars (Populus spp.) planted by paper companies and other private land owners may have important effects on nongame birds.

INTENSIVE CULTURE CHARACTERISTICS

Intensive culture techniques for trees are now being explored. One method is similar, at least initially, to farming traditional

row-crops. Existing vegetation is removed and the site is sprayed with a non-selective herbicide, plowed and disked the fall before planting. In the spring, the field is redisked and a pre-emergent herbicide such as linuron is applied just prior to planting unrooted cuttings.

Nitrogen fertilizer is applied annually at a rate of up to 170 kilograms per hectare in a split application (June and July). The plantations are irrigated to maintain a soil moisture tension below -0.5 bars. Insecticides may be used to control serious insect outbreaks if necessary.^{2/}

Optimum spacing for the trees appears to be between 1X1 and 2X2 meters. Such spacings provide for complete canopy closure during the second year so that competing vegetation will be shaded out. In trial plantations established at Rhinelander, Wisconsin, herbaceous vegetation is almost completely suppressed due to shading by the third year.^{3/}

Tree growth is rapid with heights reaching 3.6 meters after two growing seasons and over 9 meters after 5 years. Estimated rotation time of plantations varies from

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8 to 15 years depending upon spacing and desired tree size. After harvesting, the stumps will be allowed to coppice (sprout). Regrowth is very rapid and by the end of the first year, lack of light should prevent herbaceous vegetation from growing beneath the trees.

An alternate site preparation technique, the no-till method, is being tried by Packaging Corporation of America (PCA). In this procedure only chemicals are used to control weeds and to prepare the site for planting. Fields are sprayed with a non-selective herbicide the year prior to planting. Planting material consists of rooted stock, 1.3 cm in diameter X 38 cm tall. Once the trees are planted and prior to any germination of annual weeds a herbicide is applied.^{4/} Additional herbicide treatments may be required in June and again in late July to control weeds. Spacing at PCA is about 3X3½ meters for a planting goal of 625-900 trees per hectare. In this method, it may take up to 7 years to eliminate herbaceous vegetation.

Plantations of fast growing poplars will likely have characteristics that will have major effects on birds, both those within the plantation and those found in adjacent areas. The impact of these plantations will be due primarily to site preparation to establish the original plantations and physical structure of the established plantations.

ESTABLISHMENT OF ORIGINAL PLANTATIONS

Economics dictate the areas that will be planted to SRIC. Abandoned pastures and fields are likely sites for plantations. Site conversion of low producing or non-producing woodlots to more economically profitable plantations may also take place. Morin indicates that at the present time idle land is plentiful but very expensive.^{5/} This determines, to a large extent, the number of acres that industrial users will purchase and plant. Morin also mentioned that private landowners may be interested in fast growing poplars as trees for shelter belts and as a source of firewood for home heating. However, land that is suitable for good northern hardwoods is not likely to be converted to fast growing poplars. Practically, the sites that are best sites for SRIC are also the best sites for other uses (farming, hardwood production or natural regeneration).

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Field studies on the environmental effects of intensively cultured tree plantations are just beginning. Curtis (1978) indicates a need for research that could provide indices of quantitative avian use of forest habitats under various management systems.

Initial effects during the conversion of fields and forest openings to Populus plantations will have a distinct impact on the existing habitat. Wood and Niles (1978) indicate intensive culture site preparation for planting essentially eliminates all bird habitat for a period of time. Bird activity that does exist on a newly planted site generally will be restricted to feeding on worms and insects that are exposed by the tilling of the soil. During the early growing seasons some avian species requiring early successional stages may benefit. Fields prepared by the no-till method will still have dead vegetation on them in which some species may forage and nest. In addition the dead vegetation provides cover for small rodents which in turn may be preyed upon by various raptors. Use of available niches during succession of plantations may have an overall favorable effect on the number of birds and species in the area.

Both methods of site preparation completely change the existing habitat. This is of particular concern for birds of Wisconsin fields (Table 1) that are in the 1980 Blue List (Arbib 1979). The Blue List is a list, compiled by the editors of American Birds, of species recently or currently giving indications of non-cyclic population declines or range contractions.

Table 1.--Blue listed birds (1980) of Wisconsin fields.

Northern Harrier	<u>Circus cyaneus</u>
Upland Sandpiper	<u>Bartramia longicauda</u>
Short-Eared Owl	<u>Asio flammeus</u>
Sharp-Tailed Grouse	<u>Pedioecetes phasianellus</u>
Eastern Meadowlark	<u>Sturnella magna</u>
Dickcissel	<u>Spiza americana</u>
Vesper Sparrow	<u>Pooecetes gramineus</u>
Grasshopper Sparrow	<u>Ammodramus savannarum</u>

A second consideration becomes apparent if plantations should be established in upland forest openings. Taylor and Taylor (1979) point to the controversy that exists concerning forest openings: to timber managers they represent non-producing land; to wildlife managers they represent a unique vegetative association of the forest.

The importance of woodland openings to bird life has been discussed by Lay (1938). Avian diversity varies in forest openings. Size of the opening and the surrounding vegetation (type and size) have an important influence on the animal species present (Bond 1957). Taylor and Taylor (1979) report that vegetation species composition of openings seems to be less important than the overall structure of the vegetation. Bird populations have been observed to increase while physical size of the opening was reduced (Evans 1978). The population increase appears to have been the result of the development of more suitable nesting sites as the field passed through successional stages.

If forest openings are converted to SRIC sites or if large openings are interspersed with plantations the type and amount of edge will change. Edges have been considered especially productive areas for many species of birds. Lay (1938) found margins of clearings to contain 41% more species and 95% more individual birds than do the corresponding woodland interiors. Lay indicated that the edge effect usually extends less than 93 meters into the interior of the woodland.

PHYSICAL STRUCTURE OF PLANTATIONS

SRIC plantations will be even aged monocultures with little or no understory, herbaceous vegetation, fallen or dead trees and snags. All these characteristics reduce bird diversity and numbers. Wood and Niles (1978) indicate that simple plant communities such as an even aged monoculture will not support as large a number of bird species as a more heterogeneous community. Habitat and niches which allow diversity are simply not present.

Moss (1978) compared three areas showing increasing structural diversity. His conclusions were that maximum density of song birds depends on diverse structured woody vegetation with a good understory. He found four bird species in spruce (Picea) plantations that lacked an understory, eight bird species in more open spruce plantations and fifteen to eighteen species on multi-structured mixed wood plots. Moss (1978) reported that von Haartman found that the two most important factors to influence song bird diversity are vegetation structure (particularly the presence or absence of an understory) and tree species.^{6/} Probst (1979)

has indicated that tree species composition of eastern deciduous forests has little effect on bird communities because most birds select habitats by vegetation structure. He does mention that smooth barked tree species (some Populus) may contain fewer arthropods than those with rough bark. This could limit bark foragers on some plantations.

Wesley et al (1976) compared bird populations in three areas in Mississippi. One area was a natural riverfront hardwood stand characterized by pecan (Carya illinoensis), green ash (Fraxinus pennsylvanica), box elder (Acer negundo) and sugar berry (Celtis laevigata). The second area was a thinned cottonwood plantation (every other row of trees removed from plantations with 3X3 or 3.6X3.6 meter spacings) and the third area was an unthinned cottonwood plantation with tree spacings again 3X3 or 3.6X3.6 meters. Both the thinned and unthinned plantations had high understory biomass. Songbird numbers were significantly less in the unthinned plantation than they were in the thinned plantation or the natural stand. Preliminary studies showed plantations to be favored by certain species and avoided by others. Wesley et al. (1976) cautioned that while their data indicate a general preference for the natural riverfront hardwood stands it does not necessarily follow that cottonwood plantations are detrimental to songbirds. While plantations remove one type of habitat prized by some species, it may provide food, cover and nesting sites vital to other species.

Temple et al. (1979), while not dealing specifically with plantations, details some disadvantages of even aged forest management that apply to intensive culture. He indicates that vertical diversity is reduced with a concomitant reduction in the number of foraging opportunities available to birds. He also discusses the effects of reducing or eliminating dead or diseased trees from an area. The loss of insects and cavities affects a number of birds particularly members of the winter bird community which feed on insects in bark or wood.

Traditional long rotation forestry that removes small stands of timber through selective logging or clearcutting has a major impact on the avian community (Anderson 1979). Overall the removal of timber attracts edge species and provides a temporary mixture of both forest specialists and edge generalists. Conner and Adkisson (1975) in studies in Virginia found breeding bird diversity to be lowest in a one year old clearcut (mixed oak forest) and highest in a seven year old clearcut. They also noted that forest dwelling birds first appeared in a twelve year old clearcut. The

^{6/} L. von Haartman, "Population Dynamics," Avian Biology 1, D.S. Farner and J.R. King (eds.), London, Academic Press, 1971, pp. 392-459.

short rotation periods (eight to fifteen years) on the Populus plantations may have similar effects.

Disturbance of woodlands adjacent to SRIC plantations may also occur. Robbins (1979) clearly documents the effects of forest fragmentation on certain species of birds. When plantations are interspersed in isolated plots, harvesting of trees will impact the areas where cutting is taking place as well as in the areas where access trails are located.

Practices are possible that could enhance plantations to certain species of birds. "Island refuges" of existing trees and scrub about 0.4 hectares in size could be left in various places in large plantations (60 hectares +). Williamson (1970) indicates that the diversified habitat provided will enrich bird life, even in extensive new forests. Connor and Adkisson (1975) found that leaving dead snags, slash and other debris scattered in certain areas of the plantation also benefits bird life.

A second practice that may serve to increase bird diversity is to allow small openings (less than fourteen hectares) to remain in forested areas. Taylor and Taylor (1979) say the present objective is to maintain 1-5% of the forest land in upland openings. These openings should be managed as part of the forest and should furnish particular life forms including grass, and grass-shrubs as well as stumps, snags and hollow logs.

SUMMARY

Intensive culture of Populus will impact bird communities. At the present time it appears the major impact will be on bird species of old fields and pastures. The conversion of these areas to SRIC will completely change the niches found in each area. The loss of field niches will impact a number of species and is of particular concern for the birds found on the Blue List (Table 1) and other bird species that nest or feed on the grasses and weeds of the field. Other species not found in fields may find conditions in the plantations favorable so that the total effect on number of bird species in an area may not decrease and may actually increase.

It should be noted that effects of monoculture on wildlife are closely related to the size and shape of the plantation. If plantations make up only a small portion of the total defined land area effects on wildlife including songbirds may be beneficial. Conversely if plantations become the dominant land use pattern the wildlife will be adversely affected. If plantations

have irregular shapes and provide lengthy edges this will help mitigate the influence of size as will leaving small stands of existing trees and shrubs.

Wesley et al. (1976) indicates that there is a need for continued study in order to answer the questions about cottonwood plantations as wildlife habitat. Present studies should provide data on the use of plantations by each bird species throughout the growth (age) cycle. Use of the plantations, by birds, on a seasonal basis is also a question being investigated.

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