Wildlife Habitat Management Institute

Conservation Tillage Systems and Wildlife

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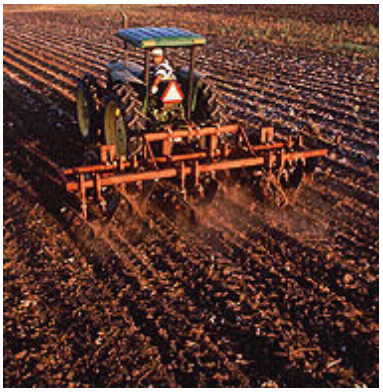


Cultural farming practices have a major influence on the quality of wildlife habitat provided by croplands on the agricultural landscape. In considering tillage practice alternatives, measures that reduce the amount of soil erosion are generally considered to help protect and enhance aquatic resources. However, it also is important to consider how various tillage practices affect terrestrial wildlife such as birds, mammals, reptiles and amphibians, and beneficial insects found in cropland situations.

The various tillage systems affect wildlife habitat and populations in cropland settings in four primary ways:

- Amount and height of cover provided by crop residue
- Availability of wildlife food in crop residue
- Timing and frequency of disturbance (equipment passes)
- Toxicity of pesticides (direct and indirect effects)

Crop Residue and Wildlife

Residue increases wildlife cover—The general rule is that the greater the amount of crop residue a tillage practice leaves on the surface, particularly standing residue, the better the practice is for birds and small mammals. Studies have shown that no-till fields have a greater diversity and a higher density of birds and nests than reduced till or conventionally tilled fields. The exception to this rule might be species such as the horned lark or the killdeer, which prefer sparse vegetative cover for nesting.

Some small mammals are known to use cultivated fields, with the deer mouse being the predominant species because of its ability to tolerate agricultural disturbance. Increases in crop residue amounts tend to increase the diversity (number of species) of small mammals in crop fields rather than increasing individual species population sizes. Improving habitat for rodents and other small mammals may increase crop damage concerns among some producers. While the extent of crop damage attributed to small mammals is variable and could increase as conservation tillage practices are adopted, damage is generally localized and controllable.

Residue increases wildlife food—Waste grain left in crop residue on the soil surface following harvest provides an important food source for both resident and migrating wildlife in the fall and winter. Waterfowl, songbirds, upland game birds (turkey, quail, pheasants, etc), deer, and small mammals all consume waste grain when it is available. Standing residue in crop fields also provides

a measure of cover for wildlife feeding on waste grain in harvested fields. The amount of waste grain in crop residue varies greatly among the different crops and tillage systems. Leaving standing residue on crop fields from harvest to the following spring maximizes the availability of waste grain as a food source for wildlife.

Crop residues also harbor insects and other arthropods, another important food source for birds and mammals. Some studies have shown that abundance and diversity of arthropods in no-till fields compared to conventionally tilled fields are greater. However, others did not detect differences in arthropod populations between conventional tillage fields and no-till fields.

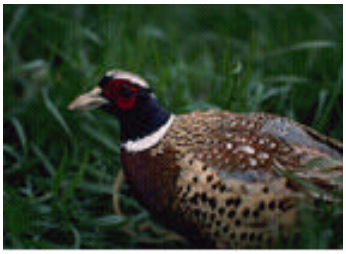
Tillage-Associated Disturbance and Wildlife

Adverse impacts to wildlife using crop fields for nesting include direct mortality, nest abandonment, and nest destruction caused by equipment during the crop production cycle. Waterfowl, shorebirds, songbirds, and upland game birds use croplands for nesting, and equipment passes for primary tillage, disking, rotary hoeing, and herbicide and fertilizer application occur during the nesting season. Therefore, any tillage system that reduces equipment passes and leaves standing residue should increase nesting success. However, this is not always the case. Some reduced tillage systems (e.g., mulch till and ridge till) do provide residue that attracts nesting, but the timing and number of equipment passes in some reduced tillage systems is comparable to conventional tillage. This becomes an "ecological trap" to nesting birds because residue on reduced tillage fields appears more attractive than conventionally tilled fields, but nesting success is low due to the high frequency of disturbance. Such problems occur in row crops such as corn and soybeans and in summer fallow wheat of the high plains. No-till appears to be the only tillage system that reduces disturbance enough to have a positive influence on nesting birds, not because the nesting habitat quality is high, but because the low frequency of disturbance gives birds that attempt to nest in these fields an opportunity to do so successfully.

Pesticides and Wildlife Risks

Increased use of pesticides for weed and insect control can have adverse effects on wildlife. This potential for increased chemical exposure can be caused by contact transfer from adults to young, direct spraying of eggs and young, or contamination from ingesting poisoned insects or granular forms of pesticides.

However, increased pesticide use is not always necessary when using conservation tillage, and producers can be encouraged to use the less toxic herbicides and insecticides. Herbicides such as glyphosate have low toxicity and have little direct effect on animals and their nests. These results differ from previous reports on herbicides such as paraquat, which was shown to have adverse effects on mallards, northern bobwhite, ring-necked pheasant, and deer mice.



Although insecticides also are of concern, recent studies that exposed northern bobwhite chicks to direct spraying and the consumption of poisoned insects show that some of the modern insecticides are less harmful than those used in the past. Also, the use of insecticides is associated more with the cropping sequence that the tillage system used.

Conservation Tillage and Wildlife Benefits

Producers should be encouraged to use conservation tillage on croplands because aquatic resources are improved by the soil protection and water quality benefits of increased crop residue. Croplands are emphasized because benefits are accrued only if the producer shifts from a more intensive tillage system to one that leaves more residue on the surface (e.g., conventional tillage to ridge till or ridge till to no-till). Using conservation tillage to convert grassland to rowcrop production, an attractive option if the producer can remain in compliance, is generally without wildlife benefits. To better help wildlife, using no-till provides the most benefits to birds and mammals because of the cover and food it produces and the reduced disturbance during nesting season. Remember, some forms of reduced tillage, although they provide many benefits, can be an ecological trap for nesting birds because the number of equipment passes is about the same as conventional tillage.

Bird species found to nest in conventionally-tilled (T) and no-till (NT) corn and soybeans (from Best 1986)

	Corn		Soybeans	
Species	T	NT	T	NT
Ring-necked pheasant		x	x	x
Killdeer	x	x		
Mourning dove	x	x	x	x
Horned lark	x		x	
American robin		x		
Common yellowthroat		x		
Bobolink		x		
Eastern meadowlark		x		
Western meadowlark		x		x
Red-winged blackbird	x	x		
Brown-headed cowbird	x	x	x	x
Dickcissel		x	x	
Savannah sparrow		x		
Grasshopper sparrow		x		
Vesper sparrow	x	x	x	x
Field sparrow		x		x

Wildlife will generally benefit from any tillage system that leaves standing residue after harvest in the fall until spring planting. The exception to this is in areas with heavy snowfall, when the snow trapping characteristics of standing residue make waste grain unavailable.

Risks to wildlife can be avoided by using the least toxic herbicides and insecticides and adopting integrated pest management (IPM) procedures. The benefits to wildlife from IPM also are increased when no-till is adopted as part of a conservation management system and used in conjunction with crop rotation, nutrient management, and conservation buffers.

For Additional Information

See a more detailed literature review on the Wildlife Habitat Management Institute homepage at http://www.ms.nrcs.usda.gov/whmi.

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