

is carried out by fewer than 7000 permanent employees, who include district administrative and supervisory personnel. The only major maintenance activity contracted out is plant-mixed asphalt resurfacing. With their rather limited resources, maintenance forces are accomplishing

a reasonably productive, efficient operation on this vast highway system.

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Abridgment

Wildlife Considerations in Managing Highway Rights-of-Way

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Over the years there has been an increasing public awareness and concern for our natural environment and a demand that we manage our public lands to ensure their protection and wise utilization.

Highways are often attacked as destroyers of wildlife habitat and detrimental to wildlife populations. Although this is sometimes true, highways often provide a wildlife habitat better than that before the highway was built. In many agricultural states, highways often provide the only habitat for many miles, because the surrounding land is under cultivation.

Few people are aware of the great challenge and responsibility state highway departments have in managing highway rights-of-way. There are over 4.9 million km (3.1 million miles) of rural U.S. highways (1). The Interstate highway system alone accounts for more than 67 500 km (42 000 miles) (1) and each kilometer (0.62 mile) of Interstate utilizes up to 12 hm² (30 acres) (2). It has been estimated that the soil and planted portions of highway, railroad, and utility rights-of-way embrace some 20 million hm² (50 million acres) of the contiguous United States (3).

Highway rights-of-way are unique compared to other intensively managed land areas, such as parks, forest, and wildlife refuges, most of which are in large single blocks. Highways, however, are long, narrow ribbons. This configuration has both advantages and disadvantages for wildlife management.

The major disadvantages are primarily problems associated with managing these large tracts of land as one unit. For example, to manage a 260-hm² (640-acre) wildlife refuge, one would seldom have to travel more than 3 km (2 miles) to reach any one spot within the area. To manage the same amount of highway, an engineer would have to travel at least 21 km (13 miles) to get from one end to the other.

The extensiveness of the highway system is also an advantage. Highways traverse areas of very diverse land use, such as intense agriculture, industry, and city. Because of this, there is increased potential for these areas to support wildlife populations. Highways preserve habitat in urban areas and are often the only large green spaces around. In agricultural areas, highways provide habitat diversity to land devoted primarily to monocultures.

In addition to preserving habitat, highway rights-of-way often create a boundary or transition, called an "edge," between plant communities. Edges increase plant species diversity and often create habitat conditions that were missing before the highway was constructed.

All animals require food, shelter, and water to survive. Most plant communities supply these requirements to at least a few species. Often, however, the number of species or the total number of animals that can be supported by a particular community is low because one or more of these requirements is limited. Highway rights-of-way, in creating an edge, often increase the ability of the area to support a larger and more varied wildlife community; they often supply a requirement for a species that had previously been limited or missing.

In addition to providing habitat for species indigenous to an area, highways may also be responsible for a species extending its range. The kangaroo rat has apparently increased its range northward across the Columbia and Snake rivers via highway and railroad bridges (4). In Illinois, the meadow vane is extending its range southward in response to the state's reduced mowing practices along the Interstate highway system.

Vegetation is not the only aspect of highway rights-of-way that can benefit wildlife. Many species, especially birds, have taken advantage of the various structures associated with highways. Cliff and barn swallows build nests under bridges and in culverts (5, 6). The cave swallow was once considered threatened, because it was thought to be restricted to nesting in sinkholes and caves. Recently, however, they were also discovered nesting in culverts (6).

These few examples demonstrate the great potential highway rights-of-way have for preserving or enhancing wildlife habitat. In order to fully realize this potential, however, highways need to be properly managed. In most cases, this will not require any significant increase in effort or expense on the part of the highway agencies. In some instances, proper wildlife management may result in an overall reduction in highway maintenance expense and effort.

The question now arises of how we can optimize the wildlife potential of highway rights-of-way while providing a safe and pleasant driving experience for the motorist.

The presence of birds and small mammals in rights-of-way is not a significant safety hazard. Collisions, however, with large animals such as deer cause extensive property damage and even human fatalities. Proper wildlife management includes managing against unwanted species. When a highway passes through an area with a high potential for collisions between large animals and motor vehicles, management must focus on reducing collisions.

At the present time, the only practical method for

keeping deer and other large animals off the highway is the use of 2.4-m (8-ft) fencing. In many of the western states, deer migrate from summer to winter ranges. Highways often cut through their migration routes, creating a safety hazard. In these situations, if deer-proof fencing is to be used, overpasses or underpasses or both should also be provided to allow the deer to cross safely. In areas that support large deer populations, care should be taken to avoid planting species that may attract these animals to the highway.

The Federal Highway Administration, in cooperation with several state highway agencies and other state and federal agencies, is sponsoring, through the Federally Coordinated Program of Highway Research and Development (FCP), several studies investigating methods for reducing collisions between large animals and motor vehicles. There have been many recommendations for optimizing wildlife habitat, and several are just as appropriate for managing against unwanted species or for any other management objectives.

One recommendation is to develop a close working relationship with state wildlife agencies, which most state highway agencies have already done. Often, however, the agencies only work together on the initial planning and construction of a highway. Coordination and cooperation should extend to the operation and maintenance of the highway.

The maintenance engineer and the wildlife biologist should work closely with one another. The biologist can help the engineer realize wildlife values along rights-of-way, while the biologist will gain a better appreciation of the problems associated with highway operation and maintenance.

Another recommendation is to develop a management plan as early as possible and to implement it during design, construction, and maintenance. The development of a management plan for existing highways is as important as plans for new construction.

A rights-of-way management plan must establish and address many different goals, of which wildlife management along the highway is only one. The wildlife management portion of a rights-of-way plan must be integrated with other goals or objectives such as safety, aesthetics, and highway compatibility with surrounding land use.

When developing a wildlife management plan, the highway engineer must also consider such things as the surrounding ecosystem, the species present, and the plant community within the right-of-way and its effect on the system. In addition, consideration must be given to how the highway facility impacts the system, and how potentially hazardous large animals are. After addressing these basic questions, a decision can then be made concerning how the right-of-way can be managed to benefit specific species or certain types of wildlife.

These recommendations are steps that should be incorporated into the general highway planning and operational program of a state highway agency. The following recommendations are more specific ways of enhancing habitats of birds and small mammals and can be easily applied to current highway programs.

Rescheduling and reduction of rights-of-way mowing are probably the easiest solutions to implement and cost the least. The area immediately adjacent to the highway needs to be cut for safety, but this mowing can be reduced in most situations to once a year. Outside of this safety area, there is little need even for yearly mowing.

The reduction of mowing not only provides better habitat for certain wildlife species, but it can also reduce maintenance costs and be aesthetically more pleasing than a heavily mowed section of highway. The reduction

in mowing will also encourage wildflowers to colonize the right-of-way, thus providing an attractive and pleasant driving experience.

In areas where mowing is necessary, it should be scheduled to avoid the nesting season for ground-nesting birds, which usually occurs between early spring and mid-July (7). Studies have shown that numerous bird species such as ducks and ring-necked pheasants will move into the right-of-way soon after mowing has stopped (8).

If it is necessary to mow the entire right-of-way, one should try to allow woody vegetation to establish itself around the right-of-way fence. This is especially valuable in agricultural areas where the fence rows, even though not very wide, provide excellent habitat for small animals.

Wildlife habitat can also be enhanced by planting species that will provide food and shelter. In developing a landscaping plan, try to select plant species that will both meet the landscape objectives and benefit wildlife. Many shrub and tree species beneficial to wildlife are also good landscape plants.

In addition to proper selection of plant species, thought must be given to the planting design. Shrub species used for wildlife benefit are often most effective when planted in groups. This type of arrangement makes them an effective cover and a good food source.

In selecting plants to be used along highway rights-of-way, it is advisable to have the help of a landscape architect, a botanist, or a plant ecologist, as well as a wildlife biologist. It is impossible to give a list of plants that will suit all situations. This is where close coordination between the highway agency and the state wildlife agency can pay off.

Another recommendation concerns the development of borrow pits, byproducts of highway construction, that have long been considered a necessary evil. Recently, however, some of their potential value has been recognized. The state of Nebraska has developed many of the their borrow pits along the Platte River into recreation sites. Borrow pits can also be of great benefit for wildlife. Given adequate soil and other environmental conditions, they can be turned into excellent aquatic and wetland habitats that can support a wide variety of fish and wildlife. The final contouring of the borrow pit to maximize its value to wildlife should add little or no cost to a highway construction project.

These examples are only a few of the many ways in which the wildlife value of highway rights-of-way can be enhanced without adding to highway construction or maintenance costs; in many instances costs can even be reduced.

Proper rights-of-way management, including management for wildlife, requires a carefully prepared management plan developed on an area-by-area basis. What is right for one section of highway may be completely wrong for another. Consideration of wildlife in managing highway rights-of-way requires these basics: an awareness of and an appreciation for the roadside ecosystem, a set of management goals or objectives, and a good working relationship between the highway engineer and the wildlife biologist.

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Abridgment

South Dakota's Harvesting of Crops in Highway Rights-of-Way

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South Dakota has 40 470 hm² (100 000 acres) of roadside rights-of-way in vegetation, approximately 5.1 hm² per km (20 acres per mile) of Interstate highway road ditch, and 2.5 hm² per km (10 acres per mile) of primary and secondary highway road ditch. Since the 1940s we have allowed ditch mowing by the abutting owner or other interested party for no charge, and crop removal was satisfactory during the early years.

In the early 1960s, after Interstate roadside vegetation developed, we tried letting out mowing contracts in 8.1-km (5-mile) sections. This was not successful because feed was abundant elsewhere and contract administration was somewhat of a nightmare. We continued this policy through the 1960s and early 1970s and allowed abutting owners or others to mow on a first come, first served basis. No permit was required, and the unit foreman usually gave oral permission. The system worked satisfactorily with a minimum of complaints from the public and problems for the highway division.

Then came 1973 and dry weather. Pastures began drying up, which considerably heightened competition for mowing highway rights-of-way. The highway division attempted to administer an equitable system by requiring written permits to mow Interstate rights-of-way, but used oral permission for primary and secondary systems. Still, complaints came in from agricultural people about their not being able to obtain a mowing permit. Then the game people began encouraging nonmowing of road ditches or at least restricting permit dates until after the pheasant hatch.

Complaints to state legislators from rural land owners about alleged discrimination in issuance of permits brought others into the problem in 1973 and 1974. The result was a 1975 statute authorizing the Department of Transportation to establish roadside mowing regulations, after which the department held 1975 spring hearings to obtain public testimony concerning private mowing regulations.

Considerable testimony was taken, mostly concerning proposed mowing dates between June 15 and September 1. The agriculture people sought earlier and later dates, while the game people wanted only a short period in late July and early August.

The game people in South Dakota are convinced that highway rights-of-way should be a wildlife nursery and sanctuary.

In April 1976 the Department of Transportation board adopted the following rules and regulations in which an owner is the person or persons entitled to the possession of real property abutting a state trunk or Interstate highway; abutting means any land that adjoins the state trunk or Interstate highway system; rights-of-way include state trunk and Interstate highway systems being maintained by the Division of Highways; and division refers to the South Dakota Department of Transportation, Division of Highways.

1. Mowing permits—by whom issued. No person shall mow and remove any grass from the rights-of-way unless such persons shall first have been issued a permit by the district engineer or his authorized representative.
2. Form of permit, application, fee. The Office of Maintenance of the division shall prepare the application for the permit as to form and content, and there shall be no fee for the permit.
3. Reservation of right to issue permits. The division reserves the right not to issue permits for mowing on any or all portions of the rights-of-way.
4. Application for permit by nonlandowner. If a nonlandowner makes application for a permit, such application must be accompanied by a waiver signed by the landowner.
5. Commencement of mowing. No mowing of rights-of-way may commence west of the Missouri River prior to June 15, and no mowing may commence east of the Missouri River prior to July 10, and all mowing must be completed by September 1 of each year.
6. Mowing of newly constructed right-of-way. Mowing of newly constructed sections of highway will not be allowed for a period of 3 years or until the grass has become permanently established.
7. Liability insurance. Any person mowing within the rights-of-way must carry liability insurance in the minimum amount of \$50 000 property damage and \$100 000 in personal liability.
8. Area of rights-of-way that may be mowed. The area of the highway rights-of-way that may be mowed will be limited to the following: (a) mowing up to the edge of roadway shoulder will be allowed; (b) mowing the median of divided highways is prohibited; and (c) mowing of the areas inside interchanges will be allowed provided