WILDLIFE AND ROADSIDE-EROSION IN CENTRAL OKLAHOMA

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Among the major problems of the wildlife conservationist today is the providing of food and cover for small game animals. By the very nature of his activities, such as plowing, deforestation, and the introduction of domestic animals, man forces out a portion of the native animals of a region when he commences his occupation.

Small animals, among which are those classed as game, can utilize the vegetation of waste land and cropland, wasted grain and weed seed to maintain themselves. In many regions there is very little waste ground and the crop-land is denuded a portion of the year. Because of these facts, wildlife is dependent upon areas such as roadsides for food and cover at least a portion of the year.

The material lost from the road and roadside is carried to lakes, ponds and streams where it adds its effect to that produced by soil from eroding farmland.

The effects of silt upon our lakes and streams are too well known to require comment at this point. In addition to the filling of the streams and lakes, silt has a direct effect upon most aquatic animals, such as the filling of gills or other respiratory structures, so that suffocation results. This effect, in the case of fish, has been brought to the public attention through the newspaper articles dealing with the dying of fish following rains which fill streams with muddy water. Fish, crustacea, larvae of amphibia, and aquatic insects all suffer in varying degrees. In addition to the silt carried in from eroding areas, colloidal material is suspended in the runoff water. This clouds bodies of water into which it is carried, shutting off much of the light from algae and other aquatic plants. This upsets the balance between the fauna and flora of the water. The total effects of silt upon aquatic life are not well understood.

METHODS

This paper deals with factors causing erosion of the roadside, the extent and degree of erosion of the roadsides, with the vegetation to be found on roadsides and its relation to animal life. This study was started in the fall of 1936 and completed during 1938. The nature of the data prevented the use of quantitative methods in most instances. A rather careful reconnaissance was made of the rural roads in Canadian, Cleveland, Kingfisher, Logan and Oklahoma counties. There are a total of about 7,200 miles of rural roads in the five counties according to the county engineer's figures for the respective counties.

The causes and physiographic result of roadside-erosion were given rather intensive study during the fall and winter of 1936, and the summer and fall of 1937. These will be very briefly treated in this paper as they have been fully analyzed and discussed in another paper (7). Special attention was paid to food and cover plants in relation to various methods of building and maintaining roads.

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OBSERVATIONS

Factors resulting in erosion of the roadway proper may be grouped under three heads:

(1) Alteration of the drainage pattern.

The failure to recognize the fact that a fundamental drainage system has developed over the earth's surface as a result of various factors at work has led to much unnecessary erosion.

(a) Roadside ditches serve as canals to carry water from one valley to another.

(b) Gullies are sometimes transected by the roadway and the water from the gully carried in the road-ditch.

(2) Methods of construction of roads:

(a) The use of a V-shaped roadside ditch.

(b) Excessive concentration of water.

(c) Misplaced drainage structures.
I Culverts too far apart, too close together.
II Culverts installed with drop-outlets.

(d) Excessive length of drainage ditches.

(e) Failure to use any method, especially vegetational, to prevent erosion of sides and bottoms of ditches.

Under this head might also be included the building of terraces with the outlet discharging over a steep roadside-ditch wall.

(3) Maintenance methods.

(a) Constant removal of accumulated plant remains and soil from the bottoms of roadside-ditches prevents stabilization of the surface of the soil.

(b) Annual removal of vegetation from the backslope prevents it from being effective as an erosion-check.

This study deals primarily with the strip of vegetation between the outer ditch-wall or bank and the fence line. The width of this strip will vary according to the width of the road and right-of-way. These are factors beyond the limits of this study. We are interested in maintaining the maximum width of this strip and to keep it covered with the best type of vegetation for the region under consideration.

The term roadway-erosion does not mean that the erosion is limited to the portion of the roadway used as a tread. This portion of the road is often very little eroded. The most common situation is to have the crown of the road bounded on either side by a wide, deep, gully, extending nearly to the fence line and often under the fence. In such cases, little or no vegetation is left that would be of any use as cover for small animals.

Fortunately, along roads that are not regularly reworked, we find examples of the types of vegetation which could be maintained if erosion were prevented. Most roadsides have soil which has been somewhat disturbed and as a result, support a more or less weedy type of vegetation. Such vegetation provides especially fine food and cover for many birds and small mammals. Rabbits are common in such habitats when food is abundant but cover lacking in adjacent fields.

During this study, special attention was paid to the composition of the vegetation on various types of soil and with various degrees of erosion or other disturbance. The list of species of plants is entirely too long to include here but below are shown soil types and condition and most common species of plants encountered in this region.

Soil	Most Important Species of Plants
Prairie loam	*Andropogon scoparius, Bouteloua curtipendula,* with varying amounts of many different species of perennial legumes.
Sandy Woodland	*Quercus marylandica, Q. stellata, Prunus* spp. *Rhus spp. Symphoricarpos orbiculatus*
Disturbed sandy soil	*Aristida oligantha* and spp, *Helianthus petiolaris, Sporobolus spp. Eragrostis spp. Digitaria sanguinalis, Croton spp. Cassia sp.*
Disturbed prairie loam	*Aplopappus ciliatus, Amarathus* spp., *Chenopodium* sp. *Triodia flava, Helianthus annuus, Bouteloua curtipendula, Solidago* spp. Various legumes.
Eroded sandy soil	*Aristida oligantha and basiramea, Diodia teres, Eragrostis secundiflora, Andropogon ternarius* and *scoparius, Sporobolus cryptandrus,*

Most of the plants found along roadsides are excellent food sources for small game. Legumes, composites and grasses produce palatable foliage and in many cases rather large fruits and seeds. Recent mammal studies by the writer show that sub-climax vegetation of the prairie complex in this region always supports a comparatively large population of small mammals.*

Regardless of the abundance of food, animals must always have protective cover. Vegetation composed largely of short-lived plants provides cover for most animals only for a short period each year. Perennial and shrubby plants make good feeding and protective cover for game birds and mammals. Such vegetation is also excellent for protecting the soil surface against erosion.

In order to arrive at some figure representing the total loss of soil per mile of roadway in the different counties studied, the average lowering of the roadway, the average width of the roads and the total mileage of dirt roads were estimated.*[1] From these figures the following table was prepared.

* Work done in connection with studies for Ph. D. thesis.
*[1] Assisted in this by O. W. Hunn, engineer employed by Soil Conservation Service.

County	Total mi. dirt road	Av. width	Av. lowering	Loss per Mile	Loss per County	Tons per County
Canadian	1500	40	1.5	yds.-10,169 lbs. -27,465,000	95,253,500 41,184,000,000	20,592,000
Cleveland	850	40	1.3	yds.-15,644 lbs. -42,240,000	132,297,740 35,804,000	17,902,000
Kingfisher	1500	40	2.	yds.-9386.6 lbs. -25,344,000	14,079,900 38,016,000,000	19,008,000
Logan	1200	40	1.3	yds.-15,644.4 lbs. -42,240,000	18,773,280 50,688,000,000	25,344,000
Oklahoma	2200	40	2.	yds.-11,733.3 lbs. -31,680,000	25,813,260 69,696,000,000	34,848,000
					Total	117,694,000

DISCUSSION

By the use of vegetation in combination with proper methods of road construction, it is possible to control erosion of roadsides (4, 6). By preventing such erosion, a strip of vegetation of varying widths would be preserved between the roadside and the fence line. Such vegetation is valuable for preventing erosion as well as serving to provide food and cover for various small animals.

It is interesting to note that the plants which Stoddard (128-49) found most valuable as food for quail are often the most conspicuous plants in the roadside vegetation. He lists ragweeds (*Ambrosia*), legumes of various kinds—(*Lespedeza*, *Cassia*, *Stylosanthus*, *Cercis*, and many others), among the grasses—(*Andropogon* spp, *Paspalum* spp, *Panicum*, *Sorghum*, *Digitaria*, *Setaria* and many others). Members of the spurge family are also much sought after by quail.

Gould and Bird (2) studied the winter food of the bobwhite quail in Oklahoma and found that pigweed, ragweed, thistle (*Cirsium*), Snow-on-the-mountain (*Euphorbia marginata*), sunflower, crabgrass, partridge, pea, bush clover, *Desmodium*, *Psoralea*, wild bean (*Strophostyles*), sumac, oak and chittamwood (*Bumelia*) all furnish food for these birds. All species mentioned by Gould and Bird are found on the roadsides throughout the region studied.

Many birds, particularly ground nesters, need cover to conceal nest and young. Darling (1) et al, stated that edges of fields and roadside thickets are utilized by quail, partridge, and pheasant for nesting and feeding grounds. They also stated that part of game management consists in resisting temptation to mow, trim, or burn weeds, grass, and undergrowth until rearing season is past. Neatness in roadsides adds to appearance but is an expensive luxury when it drives game and birds away.

Wallace and McAtee (1934) presented the situation in regard to bird life very clearly in the following quotation, "In many parts of the United States, roadsides are shorn of their vegetation at least once a year, either as a result of local sentiment or of legal requirements. There can be no doubt that the suppression of roadside vegetation is a potent factor in restricting the number of birds. Farmers may gain a planting row

by the destruction of weeds, but they lose their best allies in fighting insects—birds. More should be done to beautify roadsides and fence rows, not only for pleasure and comfort of man but to increase a national asset, the bird population of the country."

Other game animals have their own distinctive food habits and it would seem that a luxuriant roadside vegetation would do much toward replenishing our rapidly dwindling supply of game. It is not so much the predators and hunters as it is the lack of food and cover that reduces the number of wild animals.

SUMMARY

(1) Roadside erosion affects not only land plants and animals but also affects aquatic life because of the filling of lakes and streams and the clouding of the water by the soil carried to the lakes and streams by the roadside ditches. Silt in the water interferes with the respiration of aquatic animals and diminishes the light available for aquatic plant growth.

(2) Roadside vegetation serves as a source of food and cover for wildlife during a large part of the year, especially in regions denuded a portion of the year by agricultural operations.

(3) Almost every species of plant found growing on the roadsides serves as a source of food or provides protective and nesting cover.

(4) The occurrence of excessive roadside-erosion can be attributed to factors produced by methods of construction and maintenance of roads.

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