River Pollution by Feedlot Runoff

CARL W. PROPHET, Kansas State Teachers College, Emporia

INTRODUCTION

During recent years, few problems have produced more controversy among sportsman, cattleman, fisheries biologists, and health officials in Kansas than those arising from feedlot runoff. Although the 1967 Kansas Legislature passed a bill which provided measures for controlling drainage from large commercial feedlots, the problem is far from being solved. Many feedlot operators recognize that runoff from their lots constitutes serious water pollution, and some have undertaken corrective action. However, others contend that feedlot runoff has no appreciable effect on rivers, and have done nothing.

The purpose of this paper is to draw attention to the problem of feedlot runoff and to report on a preliminary study concerning its effect on the Cottonwood River in the vicinity of Emporia, Kansas.

GROWTH OF CATTLE INDUSTRY

Some feedlot operators question whether feedlot runoff is a primary source of water pollution. They argue that the current concern for pollution is of recent origin, developing over the past decade; but since cattle have been in Kansas for over a century, they fail to see why the cattle industry should be blamed for a recently developing problem. They also contend, correctly, that there are other sources of water pollution.

Examination of available information leads to disagreement with the above argument. First, the number of cattle on feed in Kansas has steadily increased over the past decade. On 1 January 1967, there were over 585,000 head of cattle on feed in the state, representing an increase of 22% over the previous year. Prior to 1963, 75% or more of the cattle were scattered throughout the state in small herds or in farm feedlots, but by 1967, 53% were in some 100 commercial lots (personal communication, Kansas Crop and Livestock Reporting Service). In 1967 there were over three times the number of cattle on feed in Kansas than in 1956 and more than 10 times the number of cattle in commercial lots than in 1956. Thus, one can see that there has been a marked increase in cattle feeding since 1956.

If relatively large numbers of cattle are concentrated into pens which drain directly into a river or stream, large quantities of organics may be introduced. Miner et al. (1966) demonstrated that the organic matter carried by a one-inch rain from a one-acre unsurfaced lot containing 10 steers was equal to the untreated sewage derived from approximately 250 people. On this basis, runoff from feedlot operations located in Emporia could introduce into the Cottonwood River organic matter exceeding the daily sewage production of a city several times larger than Emporia. The amount of contamination would vary depending upon the number of cattle present, the amount of accumulated wastes, and the precipitation.

FISH KILL RECORDS

To date, the most evident result of the introduction of runoff from

large feedlots has been fish kills. From 17 June 1963, through 4 August 1967, there were 125 separate fish kills reported in Kansas (Personal communication, Roy Schoonover, Chief, Fisheries Division, Kansas Forestry, Fish, and Game Commission). Of this total, 46% were directly attributed to feedlot runoff. About 35% of all kills caused by feedlot runoff in Kansas occurred in the Neosho-Cottonwood drainage in the vicinity of Emporia (Table I). The number of these kills has been greatest during periods of low to normal river flow when the runoff was local.

Effects of Runoff on River Conditions

Since February, 1967, various limnological features have been surveyed along a 10-mile reach of the Cottonwood River near Emporia. Conditions were monitored at six locations both above and below the point where runoff enters. The most notable effects of feedlot runoff are decreased dissolved oxygen, increased ammonia, and increased fecal coliform bacteria. Adverse conditions can develop quickly, and are most likely to occur following a local shower of 1-2 inches unaccompanied by any appreciable rise in the river.

TABLE I. Reported fish kills in Kansas from 17 June 1963 through 4 August 1967.*

Year	Total Kills Reported	Kills Caused by Feedlot Runoff	
		Total in State	Cottonwood-Neosho Rivers
1963	12	4	1
1964	32	15	4
1965	14	5	0
1966	32	15	8
1967	35	18	7
TOTALS	125	57	20

*Source: Kansas Forestry, Fish and Game Commission.

During the absence of runoff, dissolved oxygen at all points in the study tended to exceed 4 ppm, ammonia was generally less than one ppm, and fecal coliform bacteria rarely exceeded 1000 cells per 100 ml. Following runoff, ammonia was frequently greater than 10 ppm and dissolved oxygen was decreased. For example, during the second week of May dissolved oxygen along the study reach was zero to 2 ppm and ammonia was as high as 20 ppm. This condition persisted downstream a distance of more than 30 miles and resulted in an extensive fish kill. Such events were common throughout the first six months of 1967 when the river flow was less than normal and only local runoffs occurred. Since early June, 1967, river flow has been above normal and low oxygen and high ammonia values have not been observed. However, the fecal coliform counts rose whenever there was runoff. In September, they averaged 250,000 or more cells per 100 ml in the river below the feedlots. During this same month fecal coliforms averaged more than 11×10^6 cells per 100 ml in the single ditch draining most of the local lots.

Efforts are now underway to determine the effects of the feedlot runoff on the physicochemical conditions and fish food organisms in the river, and to study the survival of the fecal coliform bacteria.

LITERATURE CITED

Miner, J. R., R. I. Lipper, L. R. Fina, and J. W. Funk. 1966. Cattle feedlot runoff—Its nature and variation. J. Water Pollut. Contr. Fed. 38: 1582-1591.