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Natural and Pollution-Caused Fish Kills in Kansas during 1978

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ABSTRACT

Thirty-four fish kills were reported to the Kansas Department of Health and Environment in 1978. Of these, eleven were determined to have been resultant of natural causes. The remaining twenty-three are either known or suspected to have been caused by man-made pollutants or activities.

Where causes were identified, agricultural and industrial operations led municipal operations in numbers of pollution-related kills, producing six incidents each. The five fish kills associated with municipal sewage treatment plants and (in one case) water treatment plants accounted for 15 percent of reported 1978 fish kills. The six reports in the unknown (unidentifiable) operations category represented 18 percent of all investigations. In most of these cases intensive investigation was not possible due to late notification of our offices and the transient nature of many pollutants.

Agricultural operations killed more fish than any other pollution source in 1978. The 37,827 fish killed by feedlot runoff and other farming activities represent 73 percent of the 51,569 fish killed by pollution last year. The eleven incidents of natural mortalities investigated resulted in the death of 24,955 fish, a full 33 percent of the 76,524 fish which died in the kills reported.

The majority of the reports (64 percent) indicate that less than 1000 fish were killed per incident in 1978. Thirty percent of the kills involved 1000–10,000 fish, and 6 percent (two incidents) involved more than 10,000 fish.

INTRODUCTION AND HISTORICAL PERSPECTIVE

Since 1963 (the first year for which reliable records are available) 302 pollution-related fish kills have been investigated by the Kansas Department of Health and Environment and the Kansas Fish and Game Commission (Table 1). The most serious offender has traditionally been agricultural operations. In those fish kills for which the probable source has been determined, agricultural activities are described as having been responsible in 51

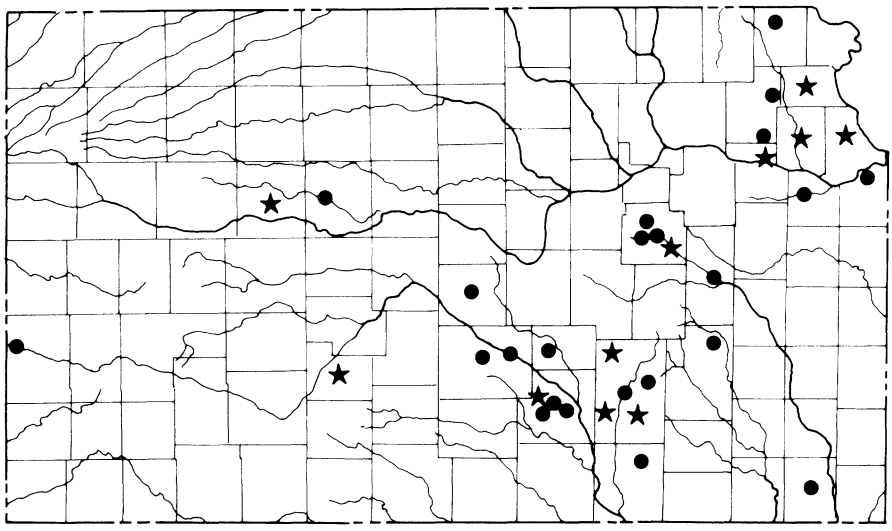

Fig. 1. Fish kills in Kansas during 1978. Stars indicate natural mortalities. Circles indicate pollution-caused mortalities.

percent of the cases, averaging about six incidents per year. It should be noted that the average annual number of agriculture-related fish kills has declined dramatically since the five year period ending in 1967 (12.6 kills per year) to an average of 4.7 per year. This may be directly attributed to feedlot control regulations adopted by the Kansas legislature in 1967, and administered by the Kansas Department of Health and Environment. The notably high number of agriculture-related fish kills in 1976 is mainly attributable to extensive misapplication of aerially applied pesticides in a campaign to control the army cutworm population in south-central Kansas.

Throughout the years, municipal operations have accounted for 10 percent of those fish kills for which the cause has been determined. The higher than average incidence of municipal-related fish kills in 1978 may be an accurate reflection, but might also quite likely be a result of recently intensified investigation programs both in the Kansas Fish and Game Commission and the Kansas Division of Environment (KDHE). Municipally caused fish kills usually occur as the result of technical problems (i.e., power outage causing lift-station bypass at sewage treatment plant) rather than design problems.

No fish kills resulting from transportation operations (usually signifying pipeline ruptures) were reported in 1978. Incidents of this sort, comprising only 8 percent of all attributable fish kills through the years, do not seem to be a major problem in Kansas. Spill containment is assigned a high and immediate priority in the state's program of pollution control.

Table 1. Pollution-caused fish kills, 1963–1978.

Year	Agricultural		Municipal		Transportation		Industrial		Other		Undetermined		Total
	Number	% total	Number	% total	Number	% total	Number	% total	Number	% total	Number	% total	
1963	5	42	—	—	—	—	6	50	1	8	—	—	12
1964	17	58	4	14	—	—	5	17	—	—	3	11	29
1965	5	46	—	—	—	—	3	27	—	—	3	27	11
1966	15	50	—	—	3	10	4	13	1	3	7	24	30
1967	21	58	—	—	2	6	6	17	—	—	7	19	36
1968	3	12	1	4	3	12	6	24	—	—	12	48	25
1969	5	23	1	4	1	4	6	27	—	—	9	41	22
1970	7	32	2	9	—	—	3	14	—	—	10	45	22
1971	2	15	1	8	2	15	—	—	2	15	6	46	13
1972	6	43	1	7	1	7	4	29	2	14	—	—	14
1973	—	—	—	—	4	50	—	—	1	12	3	38	8
1974	1	11	—	—	2	22	4	44	—	—	2	22	9
1975	5	63	—	—	—	—	2	25	—	—	1	12	8
1976	13	43	7	23	—	—	7	23	—	—	3	10	30
1977	4	40	—	—	1	10	2	20	—	—	3	30	10
1978	6	26	5	22	—	—	6	26	—	—	6	26	23
Total	115	38	22	7	19	6	64	21	7	2	75	25	302

Both the number and percentage of fish kills attributed to industrial operations were higher than average in 1978. These incidents, usually caused by human carelessness or indifference, are difficult to prevent. A bill introduced in the Kansas legislature this year by KDHE[1] providing statutory authority to recover environmental damages from parties causing such damage may help to reduce (or at least remedy) such problems in the future.

The categories "other" and "undetermined" are primarily composed of those incidents to which no cause could readily be ascribed. In addition to suspected pollution-caused kills, these categories contain fish kills caused by natural processes such as summerkills and winterkills. These natural mortalities usually occur in small impoundments (private ponds) and there is reason to believe that many incidents of this type pass unreported. In the past, the Kansas Fish and Game Commission has, through news releases, attempted to alert pond owners that such natural mortalities are not unusual under certain climatic conditions. With this in mind it would be prudent to suspect that only a portion of this sort of fish kill is reported to or investigated by KDHE or KFGC, a situation which would be reflected in the statistics given in this paper.

[1] Senate Bill 165 (1979 Legislative Session).

Table 2. Fish kill summary by source of pollution, 1978.

Source of pollution	Total reports	Reports specifying number of fish killed	
		# reports	# fish
Agricultural			
Herbicides	1	1	301
Feed drainage	1	1	1470
Manure drainage	4	4	36,056
Subtotal	6	6	37,827
Industrial			
Chemicals	3	3	2293
Petroleum	2	1	23
Other	1	1	2899
Subtotal	6	5	5215
Municipal			
Sewerage systems	4	4	3439
Water systems	1	1	1625
Subtotal	5	5	5064
Undetermined	6	5	3463
Subtotal	23	21	51,569
Natural mortalities			
Disease	2	2	22,500
Summerkill	6	6	1562
Winterkill	1	1	375
Other	2	2	518
Subtotal	11	11	24,955
Total	34	32	76,524

1978: Basic Statistics

In 1978, 34 fish kill reports were submitted. Of these, 32 (94 percent of the total) stated the number of fish killed. In the remaining 2, the number of fish lost was impossible to determine due to late notification of the incident. Counting only the 32 reports, an estimated 77,724 fish were killed in 1978 (Table 2). The majority of these incidents were relatively small; that

Table 3. Fish kill summary of type of water body—pollution-caused, 1978.

Type of water body	Total reports	Number of fish killed	Area affected	
			Miles	Acres
River or stream	16	46,822	65.36	—
Lake or pond	7	4747	—	197.21

Table 4. Pollution-caused fish kill, summary by month, 1978.

Month	Total reports	Reports specifying number of fish killed	
		# reports	# fish
January	0	—	—
February	0	—	—
March	2	2	3854
April	1	1	300
May	3	3	35,837
June	9	8	6642
July	2	2	559
August	2	1	1470
September	0	—	—
October	3	3	2707
November	0	—	—
December	1	1	200
Total	23	21	51,569

is they killed fewer than 1000 fish apiece. Most fish were killed in very few incidents. In fact, 64 percent of the fish killed were the result of only 2 incidents (6 percent) of the 34 reports (Table 2). Probable causes were identified in 17 of the 23 reports involving pollution. This information is also presented in Table 2. Two kills were reported in which the number of dead fish equalled or exceeded 10,000 each, accounting for 56,250 fish. Only one of these was caused by pollution, responsible for 33,750 fish.

In 1978, 91 percent (46,822) of the fish killed by pollution died in rivers or streams (Table 3), the remaining 9 percent (4747) died in lakes or ponds.

The greatest number of reports (70 percent) were submitted for the warm weather months (Table 4) from May through August. This is partially explained by the fact that more people are on or around the water during the summer and kills are more likely to be observed and reported. June ranked first in the number of reports (9) and second in number of fish killed (6642).

Table 5. Pollution-caused fish kills, summary by severity, 1978.

Severity	Number of reports	Average kill	Agricultural		Municipal		Industrial		Undetermined	
			Number	% total	Number	% total	Number	% total	Number	% total
Complete kill	5	1171	1	20	3	60			1	20
Heavy kill	4	9345	2	50			1	25	1	25
Moderate kill	3	421	1	33					2	67
Light kill	5	709			1	20	2	40	2	40
Not stated	6	175	2	33	1	17	1	17	2	33

Table 6. Report of fish kills, 1978.

Body of water	City or town	Date	Cause[1]	Type of fish killed: Percent game	Type of fish killed: Percent non-game	Estimated fish killed	Severity[2]	Estimated miles or acres affected[3]	Duration: Days	Duration: Hours
Private pond	Goddard	3 19	62	100	—	375	1	2.75A	—	—
Private pond	Burden	3 25	31	100	—	2014	4	5A	2	—
Neosho River	Parkerville	3 28	13	15	85	1840	2	5M	2	—
Neosho River	Parkerville	4 13	70	30	70	300	1	3M	2	—
Arkansas River	Coolidge	5 09	13	1	99	33,750	2	42M	3	—
Cow Creek	Lyons	5 10	70	10	90	600	3	5M	—	—
Private pond	Bonner Springs	5 13	24	97	3	1487	2	4A	4	—
Augusta City Lake	Augusta	6 02	61	100	—	22,500	3	180A	21	—
Private pond	Goddard	6 05	70	100	—	—	—	5A	—	—
Private pond	White City	6 06	24	100	—	500	4	1.75A	—	—
Afton Creek	Goddard	6 14	31	20	80	250	1	.2M	2	—
Terripin Creek	Morrill	6 16	70	25	75	2899	1	7.6M	3	—
East Emma Creek	Zimmerdale	6 20	70	84	16	306	2	0.3M	—	—
Private pond	Trego County	6 22	62	—	—	315	—	—	—	—
Private pond	El Dorado	6 25	70	100	—	363	3	0.5A	4	—
North Fork Slate Creek	Hamilton	6 27	25	100	—	23	4	0.1M	—	—
Private pond	Hoyt	6 28	11	100	—	301	3	0.3A	—	—
Wakarusa River	Douglas County	6 30	70	—	—	2000	—	—	—	—
Private pond	Atchison County	7 03	63	—	—	121	—	—	—	—
Private pond	Jefferson County	7 07	63	—	—	24	—	—	—	—
Labette Creek	Labette County	7 12	13	—	—	384	—	—	—	—
Private pond	Leavenworth County	7 17	63	—	—	16	—	—	—	—
Trib-Arkansas River	Wichita	7 17	31	99	1	175	—	0.25M	1	—
West Branch Walnut River	El Dorado	8 13	25	—	—	—	—	0.25M	—	—
Arkansas River	Reno County	8 26	13	—	—	1470	—	—	—	—

Table 6. Continued.

Body of water	City or town	Date	Cause[1]	Type of fish killed: Percent game	Type of fish killed: Percent non-game	Estimated fish killed	Severity[2]	Estimated miles or acres affected[3]	Duration: Days	Duration: Hours
Private pond	Topeka	8 28	63	100	—	86	3	0.4A	2	—
W. Branch Whitewater River	Butler County	9 03	63	—	—	493	—	—	—	—
Council Grove Reservoir	Morris County	9 06	61	—	—	1200	—	—	—	—
Private pond	Butler County	9 17	63	—	—	25	—	—	—	—
Sand pit	Edwards County	9 23	63	—	—	1000	—	—	—	—
Private pond	Larkinburg	10 10	13	56	44	82	1	0.01M	2	—
Neosho River	Emporia	10 19	33	38	62	1625	1	1M	1	—
Big Creek	Ellis	10 22	31	20	80	1000	1	.75M	—	—
Cow Creek	Reno County	12 27	70	—	—	200	—	—	—	—

CODES:

[1] CAUSE:

10 Agricultural operations
- 11 Pesticides (herbicides, insecticides, etc.)
- 12 Fertilizers
- 13 Manure, silo, feedlot drainage, etc.

20 Industrial operations
- 21 Mining
- 22 Food & kindred products
- 23 Paper & allied products
- 24 Chemicals
- 25 Petroleum
- 26 Metals
- 27 Combinations
- 28 Other

30 Municipal operations
- 31 Sewerage system
- 32 Refuse disposal
- 33 Water system
- 34 Swimming pool
- 35 Power

40 Transportation operations
- 41 Rail
- 42 Truck
- 43 Barge or boat
- 44 Pipeline

50 Other operations

60 Natural causes
- 61 Disease
- 62 Winterkill
- 63 Summerkill

70 Cause unknown

[2] SEVERITY:
1 Complete
2 Heavy
3 Moderate
4 Light

[3] ESTIMATED MILES OR ACRES AFFECTED
A = Acres
M = Miles

The severity of a fish kill is reported as "complete," "heavy," "moderate," or "light" (Table 5). Five "complete" fish kills were reported, averaging 1171 fish killed per report. "Heavy" kills averaging 8345 fish were reported on 4 occasions. "Moderate" kills were reported on 3 occasions, averaging 421 fish per kill. "Light" kills were reported on 5 occasions, averaging 709 fish per kill. The severity of the kill was not stated on 6 occasions, averaging 175 fish killed. Table 5 also indicates the source of the kills, where known.

All of the fish kills but one (Arkansas River at Coolidge, Hamilton County) were wholly contained within the state (Table 6). The remaining incident was attributed to drainage from feedlots in Colorado. This particular kill was the largest reported last year both in numbers of fish killed and area affected. A comprehensive listing of 1978 Kansas fish kills identifying the cause, number of fish killed, and area affected is presented in Table 6.

Acknowledgments

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