Missouri Pollution and Fish Kill Investigations 2006

Compiled by Leanna Zweig
Missouri Department of Conservation
March 2008

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Executive Summary

The Missouri Department of Conservation (MDC) has investigated reports of water pollution and fish kills since the 1940's. Reporting of these incidents provides information useful to focus regulation, for enforcement and assistance to permittees to reduce the incidence of water pollution, to protect aquatic resources, and maintain high-quality fishing and recreational opportunities for Missouri citizens.

MDC staff conducted 24 investigations of water quality problems and pollution incidents during 2006. A table of their distribution is located below. Of these 24 pollution events, 17 resulted in the loss of 51,390 fish and aquatic organisms. The remaining 7 were investigations of discharges of pollutants into Missouri waters.

	NUMBER OF INVESTIGATIONS	NUMBER OF FISH KILLS	% WITH FISH KILLS
Transportation	2	0	0%
Industrial	6	4	67%
Municipal	7	7	100%
Agricultural	3	3	100%
Other	2	2	100%
Unknown	1	0	0%
Non-regulated	3	3	100%

2006 incidents were not significantly different from previous years. Investigations were fairly evenly distributed throughout the year. February (5), June (4) and July (4) were the months with the highest number of pollution events. Sixty-three percent of all pollution investigations took place in Missouri streams and nine pollution investigations focused on public lakes. Nine investigations from 2006 and previous years requiring enforcement action by the Missouri Department of Natural Resources were resolved during the year. These settlements included almost $190,000 in penalties, mitigation, prevention components and over $99,000 in damages and investigation expense reimbursement to MDC.

Introduction

The Missouri Department of Conservation (MDC) has investigated water pollution problems and fish kills since the early 1940's. Written reports of these activities have been compiled since the mid-1960's. The purpose of these investigations is to determine the source and cause of the pollution or problem so abatement, mitigation and restitution can be achieved. In doing so, the aquatic resources of Missouri will be protected from degradation and any damage will be mitigated or compensated.

All investigations are done in cooperation with one or more of the following agencies: Missouri Department of Natural Resources (DNR); Missouri Department of Health and Senior Services (DHSS); U.S. Environmental Protection Agency; U.S. Coast Guard; U.S. Fish and Wildlife Service; U.S. Army Corps of Engineers. The goals of these efforts are to:

- Reduce the incidence of water pollution
- Protect the aquatic resources of the state
- Maintain high-quality fish habitat for the production of fish stocks
- Maintain quality fishing opportunities
- Increase public awareness of the water quality problems in Missouri.
- Recover values of damaged resources

The Missouri Department of Natural Resources (DNR) is responsible for enforcing several environmental laws including the *Missouri Clean Water Law* (Chapter 644.100, R. S. Mo. 1986 as amended). The Division of Environmental Quality protects both surface and ground waters against violations of the *Missouri Water Quality Standards*. It also establishes pollutant discharge limits for effluents contained in National Pollutant Discharge Elimination System (NPDES) permits so the beneficial uses of these waters are protected.

MDC becomes involved any time a discharge or event threatens the fish or wildlife resources of the state. If aquatic life is killed during a pollution event, MDC is responsible for determining the size of the affected area, estimating the number of organisms killed, and calculating a monetary value for those organisms where possible. Furthermore, MDC distributes the gathered information, in report form, to interested personnel and agencies. Although MDC has the authority to prosecute responsible parties for killing fish under the *Wildlife Code of Missouri* (Chapter 252.210, R. S. Mo. 1986), enforcement action for penalties, damages, and investigative expenses is deferred to the DNR under the *Missouri Clean Water Law*. The Missouri DHSS becomes involved when pollution causes fish to be unsafe for human consumption. In this instance, a health advisory is issued by that agency, warning people to limit or eliminate their consumption of all or certain species of fish from a given body of water. This report is a summary of all fish kills and water pollution investigations conducted by MDC in 2006.

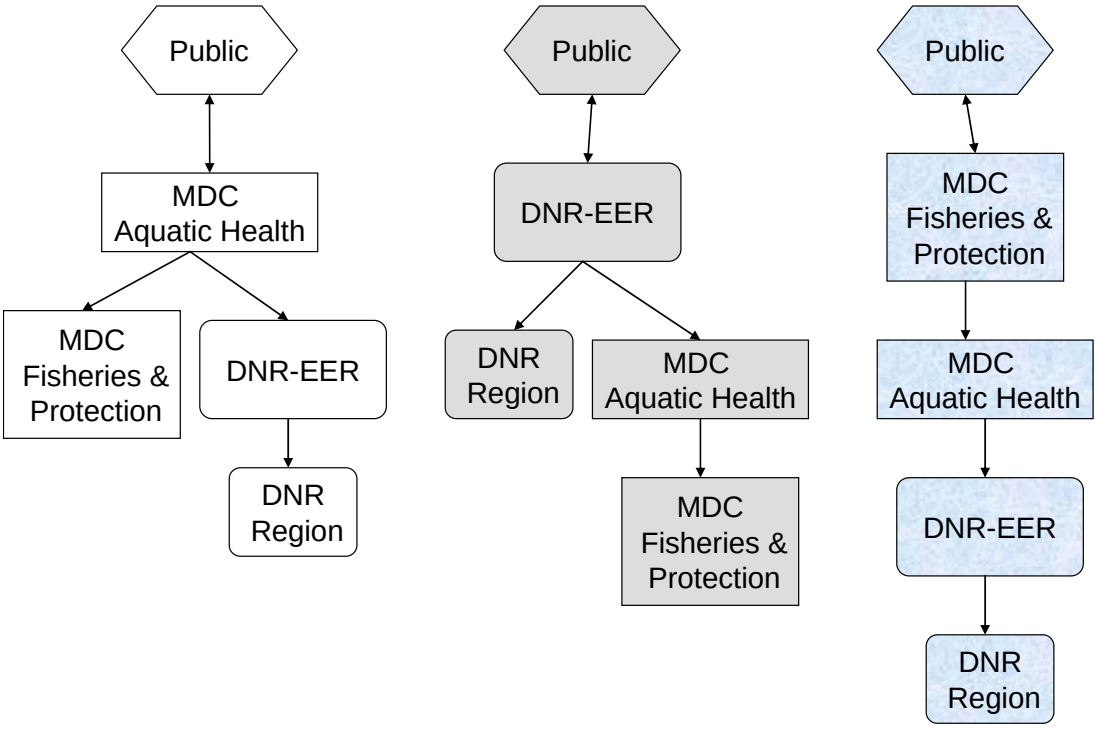
Methods

Fish kill and pollution investigation

All MDC employees are responsible for reporting water quality problems, water pollution, or fish kills that are noted during the performance of their normal duties and for assisting in the investigation, if needed. Protection and Fisheries Division employees are the personnel normally involved in these investigations.

Once notified of a problem, MDC Aquatic Health Unit attempts to make the appropriate contacts to initiate an investigation. Calls are received from one of three sources; the public, DNR personnel, or MDC personnel (Figure 1). If the call comes from the public, Aquatic Health personnel notify the DNR, Environmental Emergency Response (EER) personnel and the Conservation Agent or Fisheries Management Biologist in the county or district where the incident occurs. EER personnel relay the information to the appropriate DNR contacts for action and other agencies which may have jurisdiction. If DNR personnel report the problem to Aquatic Health personnel, the local Conservation Agent or Fisheries Management Biologist is requested to make an on-site status assessment. If the call comes from the Conservation Agent or Fisheries Management personnel, DNR-EER is notified and the investigation continues in an organized manner. The presence of Conservation Agents in each county of the state is a major asset because it allows for an immediate assessment of the situation and preventive action which may prevent greater damage. A cooperative agreement between the DNR and MDC outlines evidence gathering procedures to be used by MDC personnel. During an investigation when time is critical and/or DNR personnel cannot respond, these procedures minimize environmental damage and ensure useable evidence for prosecution that may otherwise be lost.

Figure 1. Fish kill notification between and within MDC and DNR.



The objectives of the MDC investigator are to determine the cause of the fish kill or water pollution incident, prevent further damages by containing the pollution (if possible), and to determine the area and extent of damage to the resource. Water samples are collected by MDC personnel during investigations of both pollution problems and fish kills if necessary. Water samples are analyzed at the DNR Environmental Services Program laboratory in Jefferson City. These samples are taken directly from the effluent, and upstream and downstream from its point of entry to public waters. Care is taken, however, not to duplicate sampling efforts by DNR personnel. MDC field chemistry measurements at water sample sites include pH, dissolved oxygen, total ammonia and temperature. These field measurements taken by MDC staff are used for screening purposes to provide information on the cause of the fish kill but not for evidentiary purposes.

During 2006, investigative procedures outlined in *Investigation and Monetary Values of Fish and Freshwater Mussel Kills* (Southwick and Loftus 2003) were followed. Species and sizes of dead fish were sampled within the affected area and estimates of the total number and monetary value of fish killed were made.

Investigations conducted by MDC personnel which involve the discharge of pollutants to state waters is completed by reporting the results of those investigations on a *Report of Pollution Investigation and Fish Kill* form. Copies of these reports are furnished to the DNR and other agencies involved in the investigation.

Changes in 2006 to the documentation of non-regulated fish kills

Non-regulated fish kills are fish kills caused by something other than a regulated pollutant, such as disease, parasites, spawning stress, low dissolved oxygen from extremely warm water temperatures in summer and ice cover in winter, drought and other environmental stressors. Historically, records of all fish kills were maintained in the MDC Fish kill and Pollution Investigation database. In 1991 a new report was initiated to recorded information on these non-regulated incidents. MDC staff recorded information on the report table developed during 1990 (Duchrow 1992). Reports were submitted at the end of the calendar year by field staff but legal action was not pursued and information was included in each annual report. This change was responsible for the increased number of fish kills associated with non-regulated causes reported from 1991 to 2005 when compared to previous years.

Non-regulated fish kill reports were intended to provide information on MDC landowner contacts and service, drought and disease trends, and as a measure of the prevalence of pond management and nutrient enrichment problems. Unfortunately, reporting was sporadic and private pond fish kills were primarily the result of poor pond construction, decreased water depth with age, watershed management, fisheries management or stocking practices. The reports did not aid in documenting the effects of drought or disease within the state as intended.

In January of 2006 the fish kill reporting procedures were modified to shift the emphasis from fish kills in private ponds to those in streams and large public lakes. Non-regulated fish kills which occurred in streams and large public waterbodies now require the MDC investigator to provide the same incident information as a fish kill caused by pollution. The new procedure now requires the investigator to determine the exact location by UTM, conduct a detailed kill assessment including, counts, species killed, and identify a suspected cause.

The goal of the reporting change is to provide more detailed information on fish kills in Waters of the State of Missouri to aid in assessing impacts and trends of disease, drought and the chronic effects of pollutants while continuing to provide technical assistance to private landowners on pond issues. Assistance to landowners by Fisheries staff is included in federal aid reporting as part of the Dingell-Johnson Sport Fish Restoration Act. The Act provides financial assistance to states for fish restoration and management plans and projects.

Results/Discussion

Incident Causes

MDC staff conducted 24 investigations in 2006 (Appendix A) (Table 1). Fish kills occurred in 17 pollution incidents. An estimated 51,390 fish and other aquatic organisms worth $17,985 were lost in 2006 pollution events. Damages were not assessed for three fish kills because either a responsible party was not identified or adequate data were not available.

Table 1. Summary of water pollution investigations conducted by MDC Staff during 2006.

Cause	Number of incidents	Incidents with loss of aquatic life	Total number of organisms lost	Total replacement values of aquatic life
Transportation	2	0	0	$0
Industrial	6	2	10,479	$1,783
Municipal	7	7	22,643	$8,618
Agriculture	3	3	4,489	$1,394
Other	2	2	10,822	$6,116
Unknown	1	0	0	$0
Non-regulated	3	3	2,957	Not assessed
Totals	24	17	51,1390	$17,911

Municipal pollution initiated in the highest number of pollution investigations (7) followed by Industrial pollution (6) (Figure 2). Since 1970, municipal and agricultural pollution have been responsible for the largest number of pollution investigations (Appendix B). The reduction in the number of reported non-regulated fish kills from 2005 to 2006 was cause by a change in the reporting procedures. Starting in 2006, fish kills in small private impoundment were not included in totals.

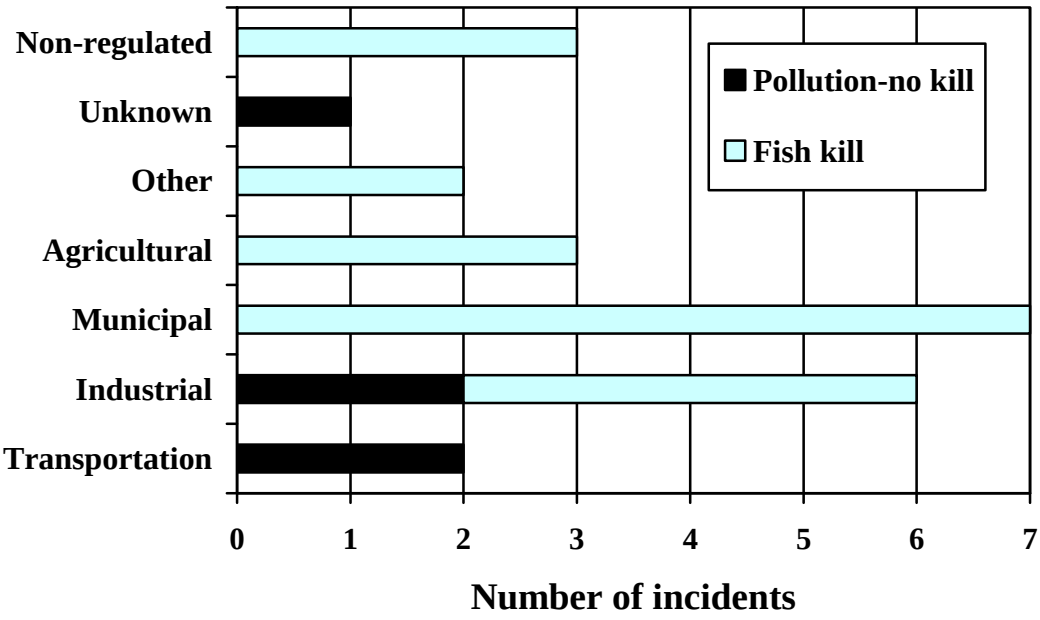
The following is a description of some of 2006 events for each category:

- The two transportation incidents in 2006 were the loss of fuel and pharmaceuticals following a truck accident and lubricating oil released from an unknown river vessel.
- Industrial incidents included releases of latex glue draining from a dumpster, antifreeze from a carwash, degreaser illegally discharged into a stream and lime/water slurry released from a broken pipe.
- The municipal incidents were three sewage releases, a single kill associated with the release of chlorinated drinking water to a stream, a sodium bentonite clay release during pipeline drilling and dewatering of a hydropower reservoir for excavation.

- Agriculture-related incidents included two kills resulting from oxygen depletion from storm runoff following excessive application of hog manure on fields. One kill in the southeastern part of the state was suspected to have been caused by pesticide overspray.
- In the Unknown category the source of limestone-like material in one cave spring could not be identified.
- Non-regulated incidents included 2 post-spawning stress kills and a fish kill in a hydropower dam tailwater from low dissolved oxygen from lack of water flow.

Determining the cause of non-regulated fish kills can be difficult for several reasons. Often MDC staff is not contacted until the evidence of the cause of the kill is no longer present. Many factors such as drought, extreme water temperature, breeding stress, low water, poor water quality and watershed impacts can act simultaneously to impact fish individuals and populations. Environmental stresses can also make fish more susceptible to disease and parasites. The possibility of numerous stresses acting on a fish population and late notification times can make identifying the cause or causes of fish mortality difficult or impossible.

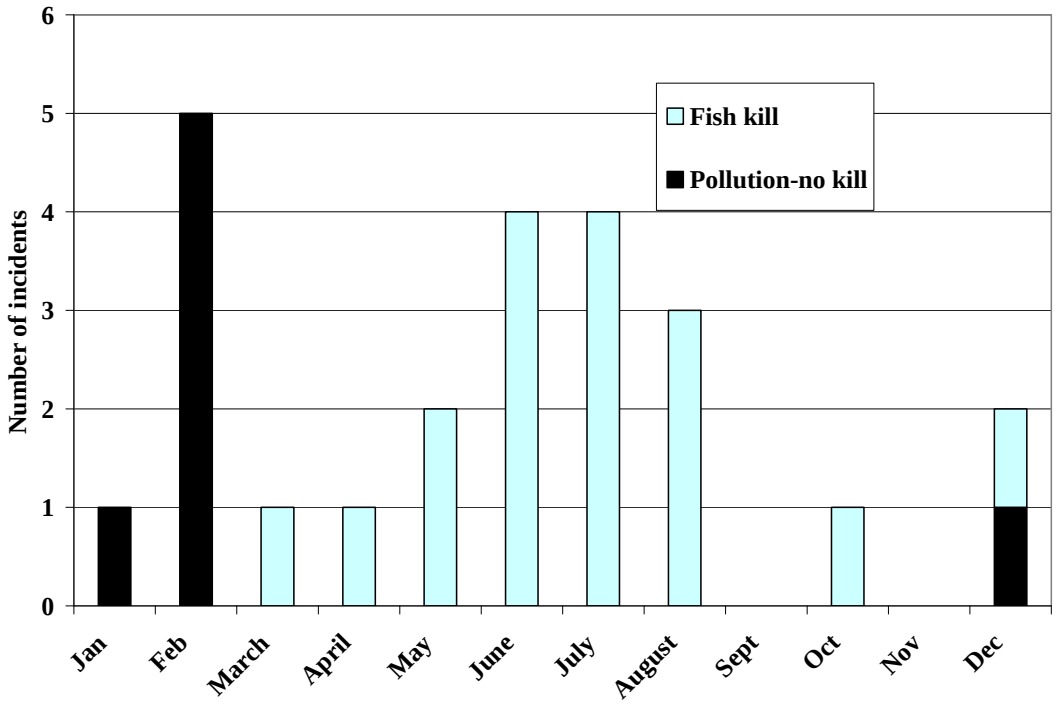
Figure 2. Sources of water pollution and fish kill incidents reported to MDC during 2006.



Distribution by month

Investigations were fairly evenly distributed throughout 2006 (Figure 3). February (5) and June (4) were the months with the highest number of pollution events. Pollution events occurring in the summer months always resulted in a fish kill whereas pollution evens in the winter months (December-February) only cause a fish kill in 1 out of 8 spills.

Figure 3. Monthly distribution of fish kill and pollution investigations conducted by MDC staff during 2006.

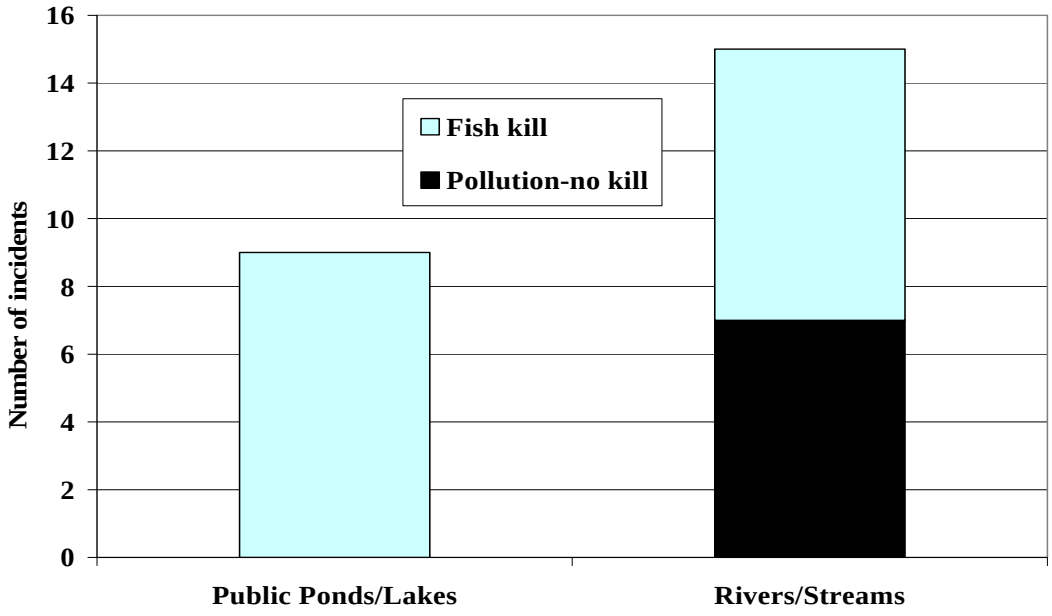


Distribution by waterbody type

During 2006, the majority of 24 investigations occurred in streams (63%) (Figure 4). The remaining 37% investigations occurred in public ponds and lakes.

Within stream investigations, there were 8 fish kills and 7 pollution events. All incidents in public pond and lake investigations were fish kills.

Figure 4. Distribution of fish kill and pollution investigations in 2006 by waterbody type.



Distribution of incidents throughout the state
Pollution investigations occurred in 17 counties throughout the state (Map 1). St. Charles (3) and Boone (3) counties had the highest number of pollution investigations.

Settlements of Missouri Clean Water Law
The State of Missouri concluded 9 pollution cases involving MDC staff which occurred during or prior to 2006 (Table 2). MDC collected a total of $99,377.51 in fish damages and reimbursement for investigative costs. Penalty monies assessed to the responsible party by DNR were transferred to the county school district of the county in which the pollution occurred.

Other significant fish kill program accomplishments during 2006
As part of a continuous effort for complete and thorough investigations, timely and more efficient response to pollution incidents by MDC personnel, and enhanced protection of the fish and wildlife resources of the state, the following accomplishments were achieved by the Fish Kill Program during 2006:

- Completed the 2003 and 2004 annual reports of Missouri Pollution and Fish Kill Investigations.
- The program provided technical assistance to MDC and DNR for resource injury assessment and valuation following the Taum Sauk Reservoir failure (Reynolds County) in December of 2005.
- Completed the second year of a two-year survey of fish mortality from hydropower turbine passage and injury in the Osage River below Bagnell Dam that was initiated in 2005. The objectives of the survey were to develop a cost-efficient method to survey dead fish and to determine the economic impact of the fish mortality.
- Continued to serve as technical advisor with the Eastern and Western Division Environmental Crimes Task Force on cases involving forest, fish and wildlife impacts.
- Served as Chair of the 2006 AFS Southern Division Pollution Committee. The Pollution Committee's past work established replacement values for fish in the 1970's. Revisions are currently used by Missouri and numerous other states to assess aquatic life damages from pollution.
- Altered the way the program documented non-regulated or non-pollution fish kills. See the Methods section for details.
- Fish kills in impoundments are often associated with excessive nutrient inputs from inadequate best management practices in agricultural watersheds. In 2006 Resource Science and the Fish Kill Program cooperated with Dr. Jack Jones (University of Missouri) on a survey of nutrient levels in small agricultural impoundments. The survey documented the limnological characteristics, including the status of nutrients in 59 small agricultural impoundments impacted by land use. Many of the sites included impoundments on MDC-managed lands.

Map 1. 2006 Missouri fish kill and pollution investigations locations.

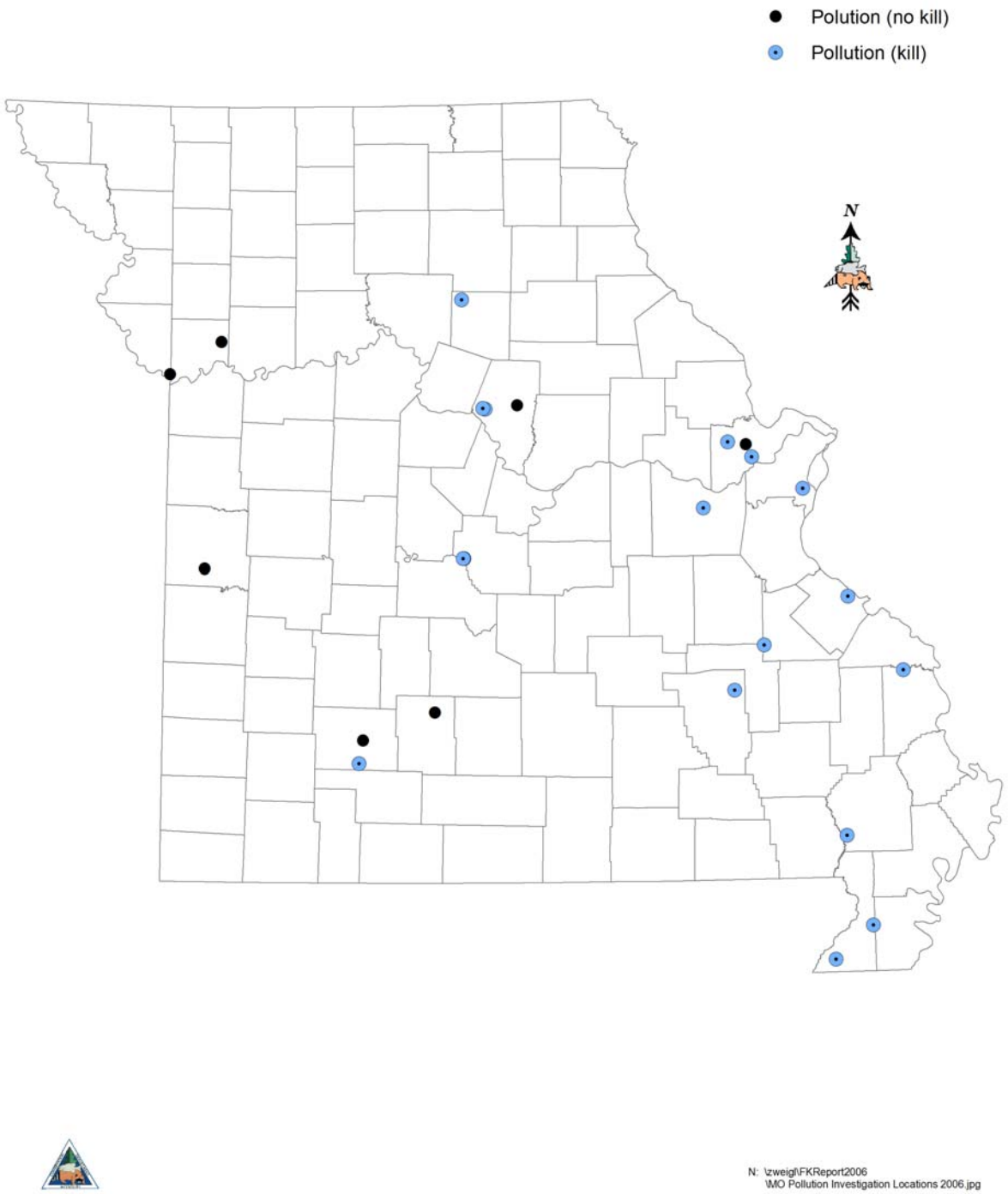


Table 2. Clean Water Law settlements reached by the State of Missouri during 2006 from incidents involving the Missouri Department of Conservation, including penalties and damages.

Date of Incident	Waterbody	Responsible Party	County	Cause	Penalty/Corrective Action	Fish values reimbursed	MDC investigative costs reimbursed	MDC Total
7/9/99	Dry Auglaize Creek	City of Lebanon	Laclede	Recurring sewage releases	$72,000 penalty 35.7 acres of green space in city	$385.56	$940.64	$1,326.20
6/4/02	James River	City Utilities	Greene	Power plant cooling water	New NPDES permit, real-time temperature monitoring	$44,860.19	$4,871.22	$49,731.41
10/23/03	Indian Camp Creek	Schrieter Concrete	Warren	Concrete dumping in creek	$15,637.52 penalty $40,000 to the DNR Natural Resource Protection Fund	No observed fish kill	$3,821.30	$3,821.30
7/25/04	Dardenne Creek	Duckett Creek Sewer District	St. Charles	8.7 million gallons of raw sewage	$120,000 penalty ($100,000 suspended), operate biomembrane plant, develop bypass response plan	$34,783.53	$3,317.94	$38,101.47
9/17/04	St. Francis River, tributary	City of Farmington	St. Francois	Sewage release, construction accident	None	$109.53	$513.76	$623.29
12/04	Peruque Creek	Weber quarry	St. Charles	Limestone waste in stream	None	No observed fish kill	$2,214.90	$2,214.90
7/13/05	Four Mile Branch	Sinclair Research	Callaway	Hog effluent, equipment failure during land application	$7,000 penalty ($2,000 suspended)	(<$10 fish value)	$203.11	$203.11
7/21/05	Burgher Branch	City of Rolla	Phelps	Chlorine, improper chemical use	Required improved employee training	$1,816.65	$984.50	$2,801.15
					Total	**$81,569.90**	**$12,660.11**	**$99,377.51**†

† includes an unidentified disbursement of $554.68.

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Southwick, R. I. and A. J. Loftus, editors. 2003. Investigation and monetary values of fish and freshwater mussel kills. American Fisheries Society, Special Publication No. 30, Bethesda, Maryland.

Duchrow, R.M. 1992. Missouri fish kill and water pollution investigations - 1991. Missouri Department of Conservation. 41 pp.

Appendix A. Pollution incidents and fish kills investigated by MDC in 2006.

Date	County	Waterbody name	Cause	Fish kill	Fish killed	Fish value
1/21/2006	St. Charles	Schote Creek	Latex glue	No		
2/15/2006	Bates	Marais des Cygnes	Oil & pharmaceuticals	No		
2/16/2006	Webster	Bowen Creek, trib to	Kerosene	No		
2/24/2006	Greene	Doling Cave Spring	Limestone-based material (suspected)	No		
2/27/2006	Clay	East Fork Fishing River, trib to	Antifreeze	No		
2/28/2006	Platte	Missouri River	Lubricating oil (suspected)	No		
3/7/2006	Greene	Workman Branch	Sewage	Yes	1176	$169.32
4/21/2006	Franklin	Flat Creek	Citrol (degreaser)	Yes	5868	$910.68
5/23/2006	Boone	Dairy Lake #3 (Univ. of Missouri)	Land applied manure	Yes	1484	
5/29/2006	Stoddard	Cypress Lake	Post-spawn shad die-off	Yes	750	$75.00
6/2/2006	Randolph	Thomas Hill Reservoir	Hot water	Yes	3444	$2,351.63
6/2/2006	Dunklin	Jerry P Combs Lake	Post spawning stress, disease or weather	Yes	2007	
6/14/2006	St. Francois	St. Francis River at DiSalvo Lake Dam	Low dissolved oxygen	Yes	200	
6/28/2006	Jackson	Poor Creek	Sodium bentonite	Yes	3	$0.30
7/17/2006	Miller	Osage River	Turbine injury	Yes	12400	$5,087.68
7/18/2006	Reynolds	Lower Taum Sauk Reservoir	Dewatering	Yes	5822	$6,115.54
7/20/2006	Miller	Lake of the Ozarks	Warm lake water, limited dissolved oxygen	Yes	5000	
7/23/2006	Boone	Dairy Farm Lake #1 (Univ. of Missouri)	Land applied manure	Yes	500	
8/3/2006	St. Charles	Peruque Creek (Quail Ridge Park)	Sewage	Yes	250	$238.49
8/15/2006	St. Charles	Crooked Creek, un-named tributary	Sewage	Yes	1338	$358.43
8/17/2006	Dunklin	Honey Cypress Ditch	Insecticide overspray suspected	Yes	2505	$1,393.73
10/12/2006	St. Louis	Gravois Creek	Chlorinated water	Yes	4032	$412.24
12/5/2006	Boone	Hinkson Creek	High pH wastewater	No		
12/13/2006	Ste. Genevieve	South Gabouri Creek	Lime and water slurry	Yes	4611	$872.25

Appendix B. Pollution investigations (I), fish kills (K) and estimated mortality (#) (1970-2006).

	MUNICIPAL			AGRICULTURAL			INDUSTRIAL			TRANSPORTATION			OTHER			NON-REGULATED		
Year	**I**	**K**	**#**	**I**	**K**	**#**	**I**	**K**	**#**	**I**	**K**	**#**	**I**	**K**	**#**	**I**	**K**	**#**
1970		9	221,000		6	39,000		6	201,500		3	45,550		2	130,000			
1971		13	187,000		8	33,000		8	170,500		4	38,500		3	110,000			
1972		10	183,600		7	32,400		7	167,400		3	37,800		3	100,800			
1973		9	34,000		6	6,000		6	31,000		3	7,000		2	20,000			
1974		12	54,400		7	9,600		7	49,600		3	11,200		3	32,000			
1975		12	105,400		8	18,600		8	96,100		3	21,700		3	62,000			
1976		7	8,500		5	1,500		5	7,750		2	1,750		2	5,000			
1977		7	47,600		4	8,400		4	43,400		2	9,800		2	28,000			
1978	39	7	14,421	19	12	16,740	36	7	13,953	40	3	855	14	2	422,185	27	27	16,003
1979	37	17	25,057	23	15	14,442	39	6	89,314	44	3	44,733	21	17	161,772	29	29	9,155
1980	31	14	114,817	18	10	16,476	34	5	98,729	21	N/A	N/A	18	14	38,438	35	35	23,443
1981	46	10	200,463	34	20	22,366	37	4	2,317	23	2	37,000	13	10	16,612	40	39	9,495
1982	25	8	4,728	16	12	14,693	24	2	4,424	34	1	N/A	19	12	1,414	18	18	7,074
1983	17	9	20,023	15	9	6,328	26	6	12,730	18	4	6,227	24	21	10,834	9	9	4,765
1984	28	13	12,433	17	10	62,522	41	3	853	23	3	1,285	13	12	14,615	11	11	105,578
1985	22	9	3,854	24	13	41,599	25	2	2,843	22	3	21,118	18	13	15,277	21	19	52,817
1986	40	18	38,010	25	12	12,086	26	7	4,236	28	2	N/A	44	18	955	42	14	28,848
1987	38	17	38,333	22	8	11,033	19	7	7,915	24	1	200	41	21	19,679	45	43	45,641
1988	16	4	13,006	13	7	32,263	19	8	20,925	14	1	1,112	25	12	12,286	35	35	113,016
1989	27	8	1,015	22	12	27,546	25	7	13,684	11	1	186	19	14	5,991	37	36	35,122
1990	33	11	7,462	25	11	49,983	23	5	36,496	16	5	12,334	25	14	17,089	31	28	281,161
1991	21	8	20,436	28	14	14,639	38	12	55,114	15	3	2,952	36	23	5,962	223	220	60,864
1992	33	16	16,018	22	6	14,063	24	6	31,006	17	2	57	20	8	69,211	207	203	30,934
1993	37	10	6,288	23	8	26,234	42	8	17,646	17	3	5,500	16	6	23,950	137	135	89,748
1994	50	18	78,385	23	9	59,603	33	8	106,743	24	2	9,684	23	8	247,292	206	196	83,017
1995	40	20	30,419	25	12	304,222	21	7	16,176	13	0	0	33	21	20,560	238	236	87,718
1996	36	14	10,875	37	9	54,999	22	10	379	12	2	10,875	37	16	66,135	139	136	105,031
1997	37	15	8,481	25	8	1,504	17	5	2,404	9	1	14	31	22	7,127	229	222	55,984
1998	15	6	155	22	6	92,052	16	6	40	9	4	13,204	27	12	24,905	148	146	31,893
1999	22	11	28,840	13	5	3,038	10	4	22,993	5	1	43	18	7	31,589	192	187	42,829
2000	16	8	36,405	7	4	55,160	4	3	662	6	2	1,042	11	7	43,206	153	153	163,051
2001	18	10	22,711	12	7	1,588	7	6	1,043	13	5	4,696	10	9	14,752	233	233	68,459
2002	20	3	81,960	14	5	45,028	15	4	3,615	7	2	74	12	6	36,618	121	121	33,461
2003	10	4	1,022	5	2	8,068	10	1	523	2	1	1,374	11	9	15,821	113	113	16,307
2004	17	10	82,183	5	0	0	1	0	0	3	1	1,146	1	1	18,476	72	72	8,253
2005	7	4	73,785	5	4	12,020	5	1	3,436	1	0	0	1	0	4,334	154	154	69,466
2006	6	4	22,643	3	3	4,489	6	4	10,479	2	0	0	2	2	10,822	3	3	2,957
TOTAL	784	385	1,855,728	542	304	1,173,284	645	205	1,347,928	473	81	349,011	583	357	1,865,707	2,948	2,873	1,682,090
AVG	25	12	56,234	17	10	35,554	20	6	40,846	15	3	10,576	18	11	56,537	92	90	50,972
	Avg mortality/kill=4,686			**Avg mortality/kill=3,555**			**Avg mortality/kill=6,807**			**Avg mortality/kill=3,525**			**Avg mortality/kill=5,139**			**Avg mortality/kill=566**		