

Introduction

Nimrod Lake is located in Yell and Perry Counties in west-central Arkansas (fig. 1). Nimrod Dam is located 9 miles southeast of Plainview, Arkansas, on Fourche LaPave River at mile 62.6. Drainage area upstream of the dam is 680 square miles. The primary land use within the basin is forested vegetation with small row crop and ranching operations nested within the Arkansas Valley and Ouachita Mountains. Nimrod Lake is used for a variety of recreational purposes such as boating, fishing, swimming, skiing and other water sports.

The U.S. Geological Survey (USGS) in cooperation with the U.S. Army Corps of Engineers, Little Rock District, initiated a bacterial study of Lake Nimrod during the spring and summer 1992. Samples were collected weekly at nine locations on the lake (table 1 and fig. 2) from May through September 1992. Three of the sampling sites were located at swim beaches around the lake, the remaining sites were located on tributaries to the lake (fig. 2). One of the tributary sites was located below the sewage treatment plant outfall of the city of Plainview (fig. 2).

Samples were collected weekly for analysis by the USGS. Additional samples were collected on alternate weeks at swim beaches for analysis by the Arkansas Department of Health (ADH) to meet their requirements for swim beach monitoring as part of their regulatory duties. These data are included in this report.

Water-quality standards have been established for three of the four bacterial analyses performed during this study. The State standard established by the Arkansas Department of Pollution Control and Ecology (1991) states "for primary contact waters, between April 1 and September 30, fecal coliform content shall not exceed a geometric mean of 200/100 milliliters (mL) nor shall more than 10 percent of the total samples during any 30-day period exceed 400/100 mL." The State standard established by ADH for total coliforms at a swimming beach is not to exceed 1,000 colonies per 100 milliliters (cols./100 mL), while the State standard established for fecal coliforms is not to exceed 100 cols./100 mL (Cathy Moore, Arkansas Department of Health, oral commun., 1992).

Collection and Analyses

Samples were collected by two methods. The swim beach samples were collected by wading into the lake to approximately knee deep and dipping a sterile bottle below the surface. Samples to be analyzed by the USGS were collected weekly at the center of the swim beach. Samples to be analyzed by ADH were collected on alternate weeks at the left and right sides of each swim beach, also by wading. Tributary samples were collected weekly by either hand dipping or lowering a sample bottle to the water using a rope and a weighted bottle holder. USGS samples were chilled after collection and were analyzed within 6 hours. ADH samples were not chilled and were transported to ADH offices in Little Rock, Arkansas, for analysis on the same day of collection (Cathy Moore, Arkansas Department of Health, oral commun., 1992).

The USGS samples were analyzed for fecal coliform bacteria and fecal streptococcal bacteria following methods described in Britton and Greeson (1987). Fecal coliform bacteria were analyzed following method B-0050-85. These results are reported in tables 2-10. Fecal streptococcal bacteria were analyzed following method B-0055-85. These results are reported in tables 2-10.

Samples collected for ADH were analyzed following methods described by the American Public Health Association and others (1985) (Cathy Moore, Arkansas Department of Health, oral commun., 1992). Colonies testing positive for total coliforms were then verified by lactose confirmation. Positives were then reported as confirmed total coliforms by lactose confirmation (cols./100 mL). These results are reported in tables 8-10. Using the same total coliform analysis, colonies testing positive for total coliforms were tested to determine if these colonies were of fecal origin. Total coliform by membrane filter or fecal coliform by use of EC broth. Positives were then reported as fecal coliforms present in total coliform test by EC broth confirmation (cols./100 mL). These results are reported in tables 8-10.

References Cited

American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1985, Standard methods for the examination of water and wastewater (16th ed.): Washington, D.C., American Public Health Association, 1,268 p.

Arkansas Department of Pollution Control and Ecology, 1991, Regulation no. 2, as amended, regulations establishing water quality standards for surface waters of the State of Arkansas: Arkansas Department of Pollution Control and Ecology, 73 p.

Britton, L.J., and Greeson, P.E., editors, 1987, Methods for collection and analysis of aquatic biological and microbiological samples: Techniques of Water-Resources Investigations of the U.S. Geological Survey, Book 5, Chapter A4, p. 37-50.

Conversion Factors

Multiply	By	To obtain
mile	1.609	kilometer
square mile	2.59	square kilometer

Table 1.--Sampling site descriptions

Station number	Station number	Station name	Latitude	Longitude
N-5	07261910	Nimrod Lake near Wards Crossing, Arkansas	345703	0931923
N-6	07261820	Nimrod Lake at Highway 27 Bridge, Arkansas	345536	0932436
N-7	07261880	Nimrod Lake at Plainview, Arkansas	345905	0931837
N-8	07261835	Nimrod Lake at Wards Crossing, Arkansas	345640	0931939
N-9	07261920	Prairie Creek at Plainview, Arkansas	345904	0931812
N-10	07261845	Browns Creek near Plainview, Arkansas	345839	0931952
N-11	07261935	Carter Cove Swim Beach near Fourche Junction, Arkansas	345738	0931423
N-12	07261970	County Line Swim Beach near Fourche Junction, Arkansas	345745	0931115
N-13	07261995	Quarry Cove Swim Beach near Fourche Junction, Arkansas	345722	0930959

Table 2.--Water-quality data for Nimrod Lake near Wards Crossing, Arkansas (site N-5)

Date of sample	Time of sample	Coliform fecal, 0.7 micron membrane filter (cols./100 mL) (31625)	Streptococci fecal, KF agar (cols./100 mL) (31673)	Weather conditions	Remarks
05-08-92	1040	K1	K11	Cloudy	--
05-12-92	1055	K5	K6	Cloudy	Water was brown
05-18-92	0935	K5	K14	Cloudy	Water was brown
05-27-92	0830	K9	26	--	--
06-04-92	1120	K6	K9	Cloudy	Water was brown
06-09-92	0955	K2	K7	Light rain	Water was brown
06-15-92	1030	35	48	Cloudy	No flow
06-25-92	0946	21	33	Cloudy	Considerable flow
06-30-92	1140	K1,100	95	Cloudy	Average flow
07-07-92	0955	K5	K16	Sunny	No flow
07-14-92	0955	K5	25	Sunny	No flow
07-21-92	1030	<1	K2	Sunny	No flow
07-30-92	0830	K1	51	Cloudy	Very little flow
08-05-92	0950	K9	33	Cloudy	Very little flow
08-11-92	1025	K3	K21	Sunny	Very little flow
08-20-92	0935	K6	K57	--	Very little flow
08-24-92	0910	K2	K150	--	Very little flow
09-02-92	1040	K12	47	Rainy	--
09-11-92	1000	K36	K18	Clear	Very little flow
09-15-92	0955	K2	23	Cloudy	--
09-22-92	1100	26	78	Cloudy	--
09-29-92	1005	K6	K8	Clear	--

Table 4.--Water-quality data for Nimrod Lake at Plainview, Arkansas (site N-7)

Date of sample	Time of sample	Coliform fecal, 0.7 micron membrane filter (cols./100 mL) (31625)	Streptococci fecal, KF agar (cols./100 mL) (31673)	Weather conditions	Remarks
05-08-92	0915	K37	78	Cloudy	--
05-12-92	0935	K220	470	Cloudy	No flow
05-18-92	0930	>60,000	>100,000	Cloudy	Water was brown
05-27-92	0945	240	280	--	Very little flow
06-04-92	1000	K830	1,300	Cloudy	Water was brown
06-09-92	0840	K250	290	Cloudy	Very little flow
06-15-92	0930	320	6,000	Cloudy	Very little flow
06-25-92	0855	K390	K760	Cloudy	Considerable flow
06-30-92	1035	950	3,300	Rainy	Considerable flow
07-07-92	0850	420	550	Sunny	Very little flow
07-14-92	0855	240	550	Sunny	Very little flow
07-21-92	0925	420	430	Sunny	Very little flow
07-30-92	0745	K2, 100	2,400	Cloudy	No flow
08-05-92	0900	330	K1,100	Cloudy	Very little flow
08-11-92	0935	K1,800	7,300	Sunny	Very little flow
08-20-92	0835	290	470	--	No flow
08-24-92	0815	43	550	--	No flow
09-02-92	1000	3,500	2,500	Rainy	No flow
09-11-92	0840	210	360	Foggy	Very little flow
09-15-92	0905	K9	44	Cloudy	No flow
09-22-92	1015	4,100	41,000	Cloudy	--
09-29-92	0915	K94	K800	Clear	No flow

Table 8.--Water-quality data for Carter Cove Swim Beach near Fourche Junction, Arkansas (site N-11)

Sample location	Date of sample	Time of sample	Coliform fecal, 0.7 micron membrane filter (cols./100 mL) (31625) ¹	Streptococci fecal, KF agar (cols./100 mL) (31673) ¹	Confirmed total coliforms by lactose confirmation (cols./100 mL) ²	Fecal coliforms present in total coliform test, EC broth confirmation (cols./100 mL) ²	Weather conditions	Remarks
Center	05-08-92	1115	K1	34	--	--	Cloudy	--
Left side	05-12-92	1120	--	--	1,000	1,000	Cloudy	Water was brown
Center	05-12-92	1125	32	40	--	--	Cloudy	Water was brown
Right side	05-12-92	1130	--	200	100	100	Cloudy	Water was brown
Left side	05-18-92	1005	--	--	1,000	<1	Cloudy	Water was clear
Center	05-18-92	1010	K810	1,100	--	--	Cloudy	Water was clear
Right side	05-18-92	1015	--	<1	<1	<1	Cloudy	Water was clear
Center	05-27-92	1110	K4	K4	--	--	--	--
Left side	06-04-92	1200	--	--	1,000	<1	Cloudy	--
Center	06-04-92	1205	K7	K10	--	--	Cloudy	--
Right side	06-04-92	1210	--	--	1,000	<1	Cloudy	--
Center	06-09-92	1045	<1	K1	--	--	Cloudy	--
Left side	06-15-92	1100	--	--	900	<1	Clear	--
Center	06-15-92	1105	32	72	--	--	Clear	--
Right side	06-15-92	1130	--	--	200	<1	Clear	--
Center	06-25-92	1020	K10	<10	--	--	Cloudy	--
Left side	06-30-92	1140	--	--	10	10	Cloudy	--
Center	06-30-92	1145	K64	<1	--	--	Cloudy	--
Right side	06-30-92	1150	--	--	100	100	Cloudy	--
Center	07-07-92	1030	K1	K1	--	--	Sunny	--
Center	07-14-92	1030	K1	53	--	--	Cloudy	--
Center	07-21-92	1100	K1	K3	--	--	Sunny	--
Left side	07-27-92	1015	--	40	<1	<1	--	--
Right side	07-27-92	1020	--	40	10	10	--	--
Left side	07-30-92	0900	--	--	1,000	<1	Cloudy	Water was dingy
Center	07-30-92	0930	K3	58	--	--	Cloudy	Water was dingy
Right side	07-30-92	0935	--	<1	--	--	Cloudy	Water was dingy
Center	08-05-92	1020	K7	21	--	--	Cloudy	--
Left side	08-11-92	1050	--	500	<1	<1	Cloudy	--
Center	08-11-92	1055	41	29	--	--	Cloudy	--
Right side	08-11-92	1100	--	300	<1	<1	Cloudy	--
Center	08-20-92	1005	<1	K4	--	--	--	--
Left side	08-24-92	0945	--	<1	--	--	--	--
Center	08-24-92	0950	K1	K94	--	--	--	--
Right side	08-24-92	0955	--	100	<1	<1	--	--
Center	09-02-92	1010	120	360	--	--	Rainy	--
Left side	09-11-92	1025	--	<1	<1	<1	Clear	--
Center	09-11-92	1030	82	K9	--	--	Clear	--
Right side	09-11-92	1035	--	<1	<1	<1	Clear	--
Center	09-15-92	1015	K3	K14	--	--	Cloudy	--
Left side	09-22-92	0950	--	1,000	<1	<1	Cloudy	--
Center	09-22-92	0955	59	270	--	--	Cloudy	--
Right side	09-22-92	1000	--	10	<1	<1	Cloudy	--
Center	09-29-92	1025	K2	K13	--	--	Clear	--

¹ Analyses performed by U.S. Geological Survey.
² Analyses performed by the Arkansas Department of Health.

Table 9.--Water-quality data for County Line Swim Beach near Fourche Junction, Arkansas (site N-12)

Sample location	Date of sample	Time of sample	Coliform fecal, 0.7 micron membrane filter (cols./100 mL) (31625) ¹	Streptococci fecal, KF agar (cols./100 mL) (31673) ¹	Confirmed total coliforms by lactose confirmation (cols./100 mL) ²	Fecal coliforms present in total coliform test, EC broth confirmation (cols./100 mL) ²	Weather conditions	Remarks
Center	05-08-92	1140	K2	K5	--	--	Cloudy	--
Left side	05-12-92	1140	--	70	10	10	Cloudy	Water was brown
Center	05-12-92	1145	K9	39	--	--	Cloudy	Water was brown
Right side	05-12-92	1150	--	--	100	<1	Cloudy	Water was brown
Left side	05-18-92	1035	--	--	16,000	<1	Cloudy	Water was clear
Center	05-18-92	1040	--	23	32	--	Cloudy	Water was clear
Right side	05-18-92	1045	--	--	300	--	Cloudy	Water was clear
Center	05-27-92	1125	K3	K4	--	--	Cloudy	Water was clear
Left side	06-04-92	1235	--	--	70	<1	Cloudy	--
Center	06-04-92	1240	K16	K14	--	--	Cloudy	--
Right side	06-04-92	1245	--	--	1,000	<1	Cloudy	--
Center	06-09-92	1100	K1	K15	--	--	Cloudy	--
Left side	06-15-92	1120	--	--	100	100	Clear	--
Center	06-15-92	1125	42	61	--	--	Clear	--
Right side	06-15-92	1130	--	--	1,000	<1	Clear	--
Center	06-25-92	1040	K18	<10	--	--	Cloudy	--
Left side	06-30-92	1310	--	--	100	<1	Cloudy	--
Center	06-30-92	1315	K14	K1,600	--	--	Cloudy	--
Right side	06-30-92	1320	--	--	200	<1	Cloudy	--
Center	07-07-92	1050	K3	K18	--	--	Sunny	--
Center	07-14-92	1105	K45	K150	--	--	Cloudy	--
Center	07-21-92	1115	K4	K13	--	--	Sunny	--
Left side	07-27-92	1045	--	--	10	10	--	--
Right side	07-27-92	1050	--	--	60	20	--	--
Left side	07-30-92	0925	--	--	70	<1	Cloudy	Water was dingy
Center	07-30-92	0930	K4	K2	--	--	Cloudy	Water was dingy
Right side	07-30-92	0935	--	--	400	30		