

National Park Service
Northern Colorado Plateau Network
Inventory & Monitoring Program

Summary document prepared for the

Vital Signs Workshop
Water Quality Vital Signs

By the
U.S. Geological Survey,
Water Resources Division,
Colorado District

In cooperation with the
National Park Service

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NCPN Data Density and Concentration Time-Series Analysis

Project Overview

As part of Interagency Agreement #IA238099002, the National Park Service (NPS) Northern Colorado Plateau Network (NCPN) and the U.S. Geological Survey (USGS) cooperated in the acquisition, management and synthesis of existing water-quality data associated with waters of the NCPN Parks. As part of this agreement, the USGS incorporated water-quality data from the U. S. Environmental Protection Agency (USEPA) Legacy STORET and STORET X (modern STORET) databases, the USGS National Water Information System (NWIS) database, and selected additional datasets into an NCPN Microsoft® Access database.

Document Overview

This summary document was provided by the USGS to assist with the NPS NCPN Vital Signs Workshop. The purpose of the Workshop is to evaluate and prioritize candidate vital signs, and ultimately to select a suite of prioritized vital signs and monitoring locations for the Network as a whole. This document presents selected water-quality data summaries and analyses derived from the NCPN database for each park unit and is provided to aid in the evaluation and prioritization of water-quality vital signs for the Network, including:

- Summary tables of selected contents of the NCPN database (as of March 2003);
- Data density maps, bar graphs and tables for each park unit to illustrate the spatial, temporal and categorical distribution of historical sampling events;
- Site location maps indicating site types in and surrounding park units;
- Concentration graphs illustrating the historical time-series data available for selected water-quality constituents sampled within each park unit compared to USEPA or state standards, as available; and
- Summary table of data density by water-quality category and park unit (e.g., major ions, water) for sampling events that have occurred since January 1, 1990 to the present.

NPCN Database Summary

The following tables provide summary information on the NPCN database contents as of March 2003.

NCPNC Database Sites Summary (4960 total sites):

NPS Park Code	No. of Sites
ARCH	308
BLCA	308
BRCA	266
CANY	371
CARE	426
CEBR	50
COLM	406
CURE	728
DINO	1033
FOBU	75
GOSP	92
HOVE	273
NABR	33
PISP	48
TICA	198
ZION	345

NPCN Database Summary of Types of Sites:

Site Type Code	No. of Site Types
DV	35
GW	916
LK	372
MINE	3
OF	37
PL	4
SEEP	17
SP	1178
SW	2376
UNK	22

NPCN Database Results Summary:

NPS Park Code	Results by Park
ARCH	103254
BLCA	63678
BRCA	21322
CANY	93741
CARE	124570
CEBR	9687
COLM	120428
CURE	163163
DINO	259343
FOBU	9337
GOSP	17743
HOVE	72903
NABR	4691
PISP	2975
TICA	15886
ZION	61351

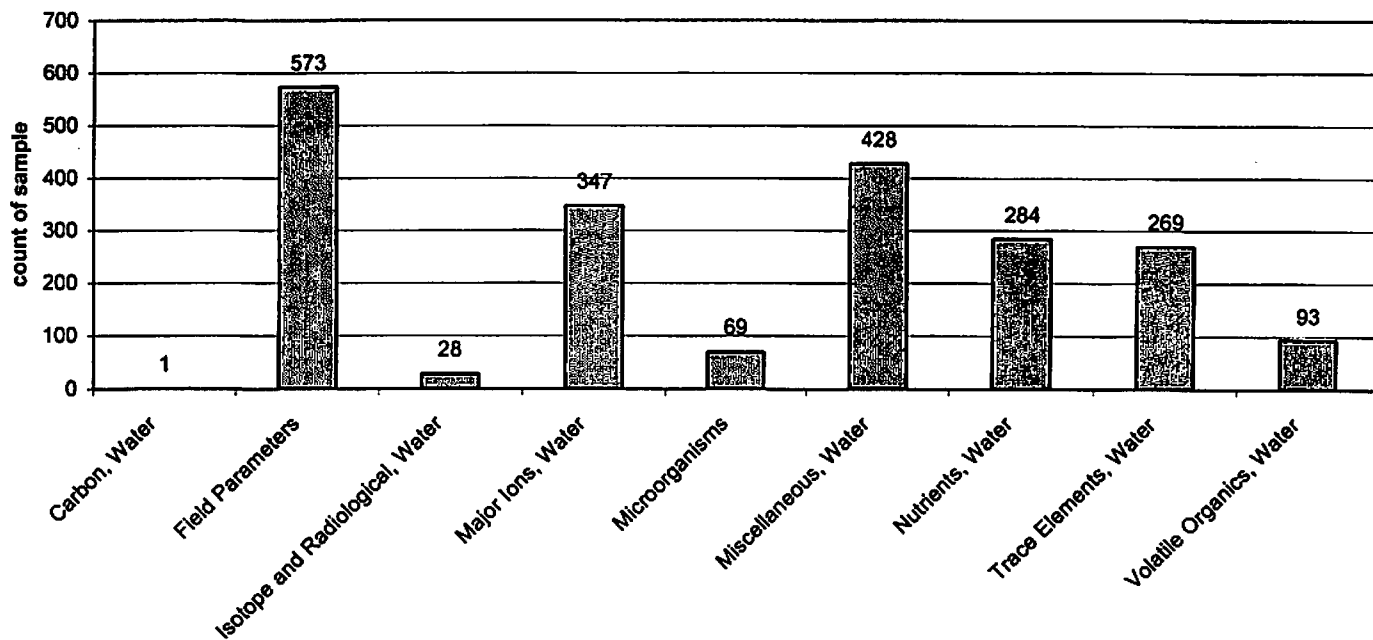
Arches National Park (ARCH) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

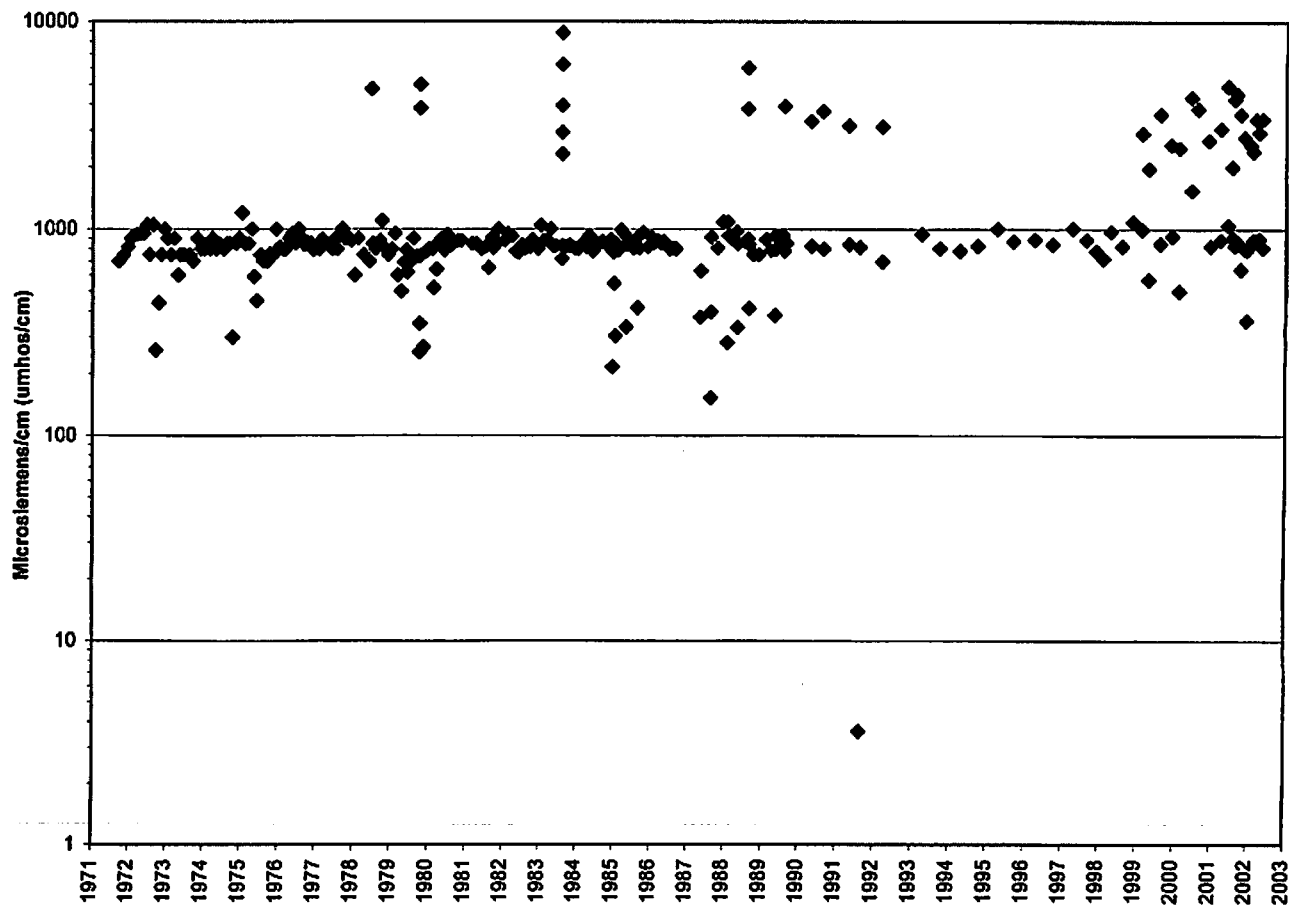
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	57	570	09/20/1971	06/04/2002
Streamflow	11	172	10/11/1974	08/31/1989
Core Field Parameters ⁽³⁾	55	551	09/20/1971	06/04/2002
Microorganisms	8	69	12/21/1984	05/05/1990
Major Ions	53	347	06/22/1978	06/04/2002
Total and Dissolved Selenium	24	170	04/17/1981	05/14/2002
Total Dissolved Solids	4	4	08/07/1986	08/08/1986
Total Suspended Solids	9	108	08/20/1990	05/15/2002
Trace Elements	34	269	06/22/1978	03/14/2002
Pesticides	0	n/a	n/a	n/a
Nutrients	37	284	04/17/1981	05/14/2002
Unionized Ammonia	9	116	04/17/1981	05/25/2000
Ammonia	0	n/a	n/a	n/a
Nitrite	2	2	04/17/1981	05/09/1991
Nitrate	36	265	04/17/1981	05/14/2002
Total Nitrogen	9	36	08/20/1990	02/13/1997
Ortho-Phosphorus	22	40	04/17/1981	05/09/1991
Total Phosphorus	9	145	08/20/1990	04/09/2002
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

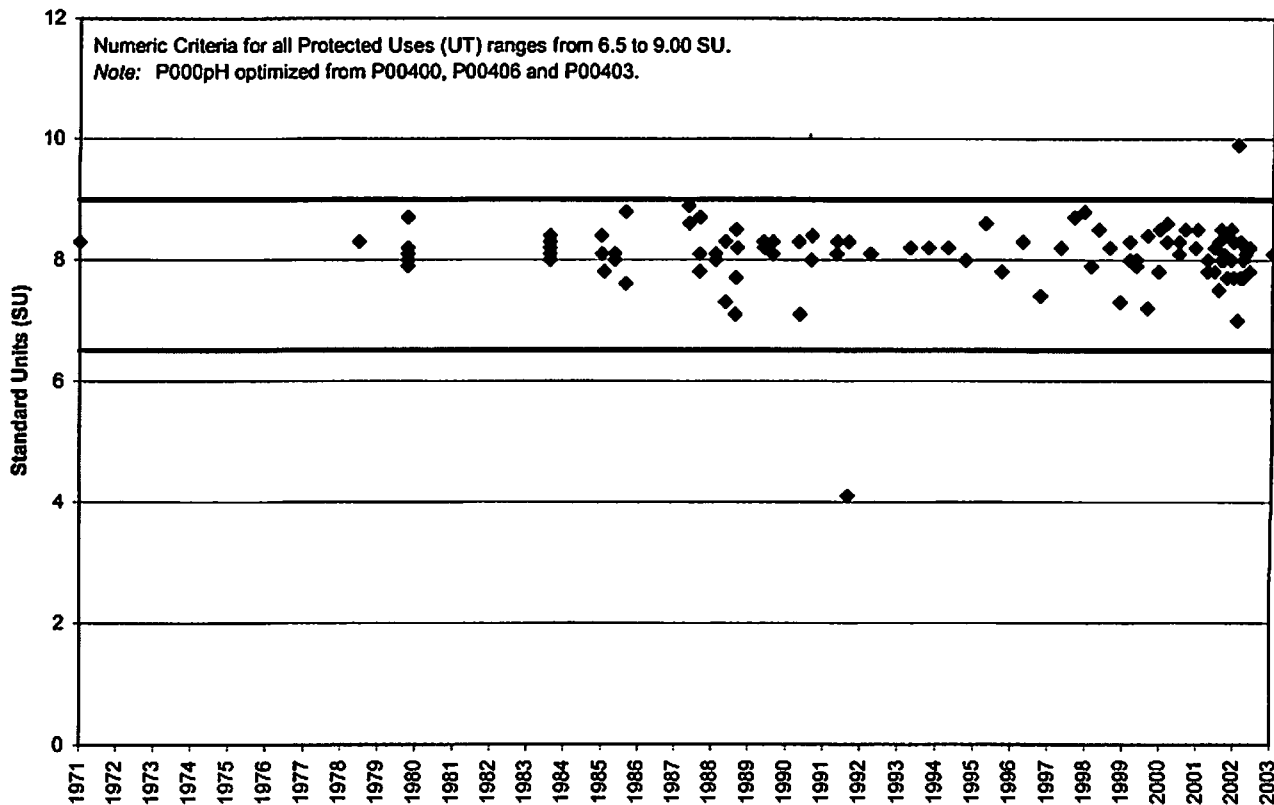
Water Sample Density by Category in Arches National Park (ARCH)



Specific Conductivity (PSPCnd) Results for Surface Water in Arches National Park (ARCH)
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



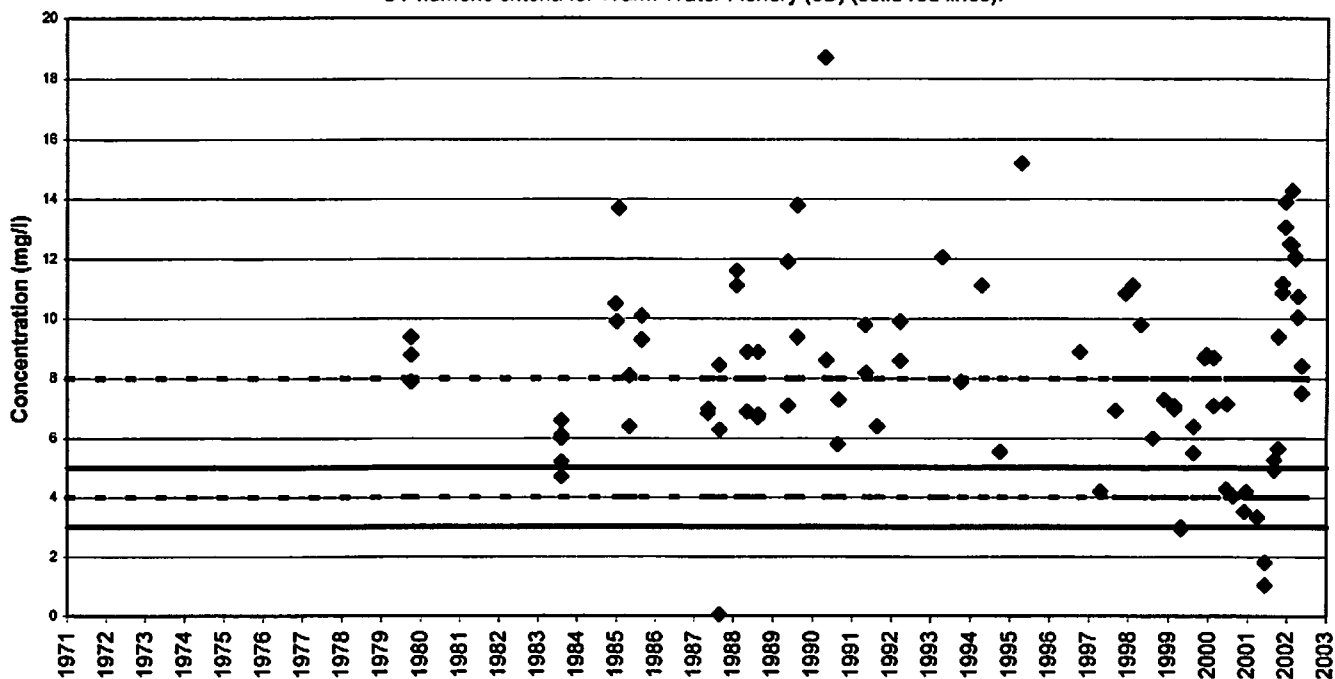
pH (P000pH) Results for Surface Water in Arches National Park (ARCH)



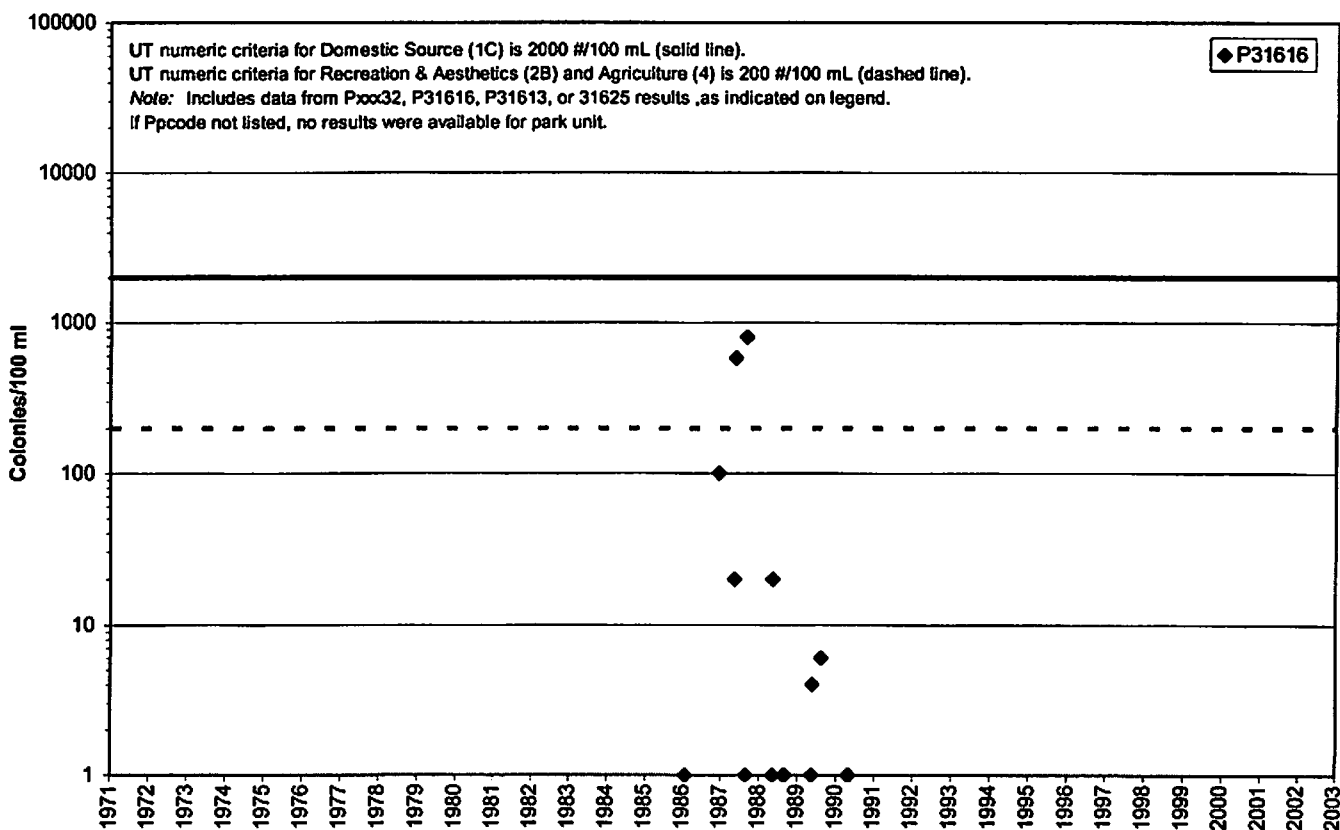
Dissolved Oxygen (P000DO) Results for Surface Water in Arches National Park (ARCH)

UT numeric criteria for Cold Water Fishery (3A) (dashed lines).

UT numeric criteria for Warm Water Fishery (3B) (solid red lines).



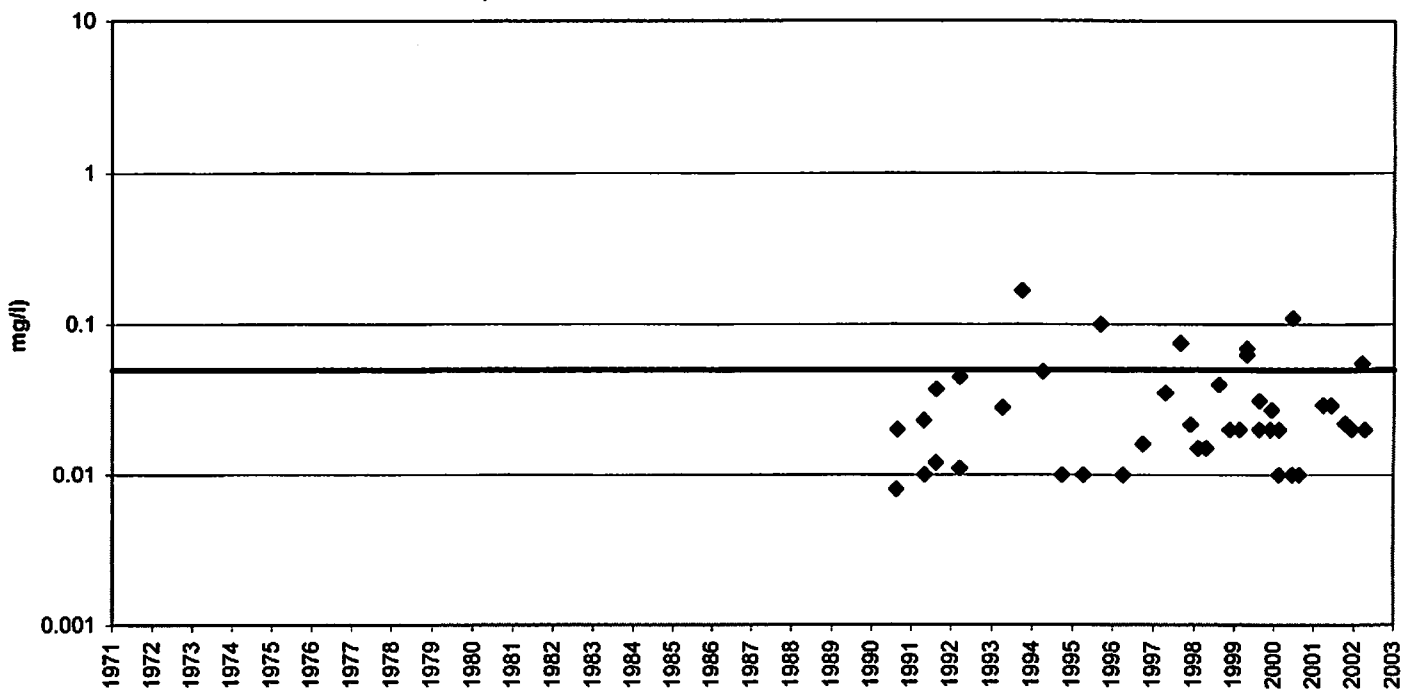
Historic Fecal Coliform Results Shown Log Scale for Surface Water in Arches National Park (ARCH)



Total Phosphorus (P_{total}P) Results for Surface Water in Arches National Park (ARCH)

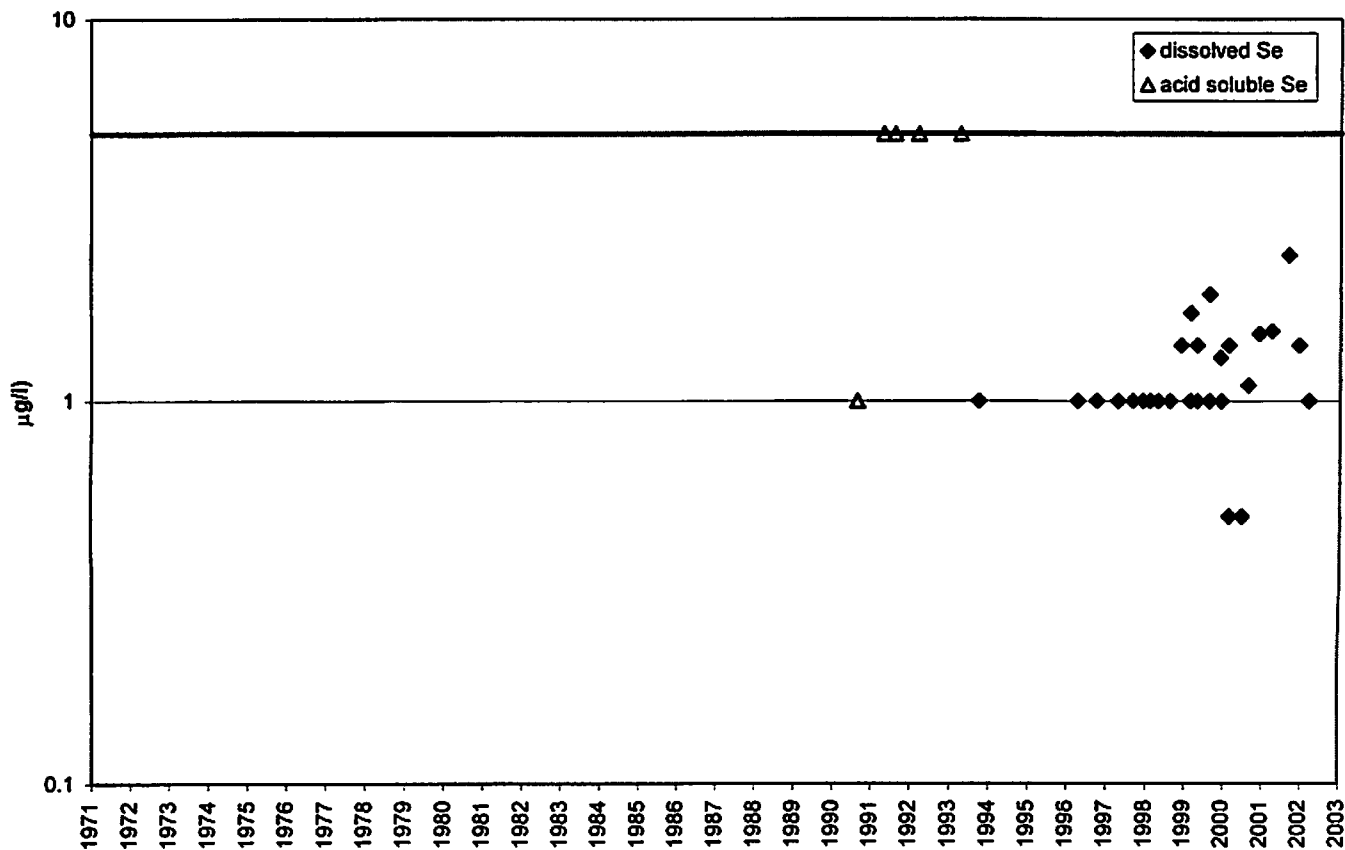
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

Note: P_{total}P optimized from P00665, P99891, P71886, P01070 and P00662.

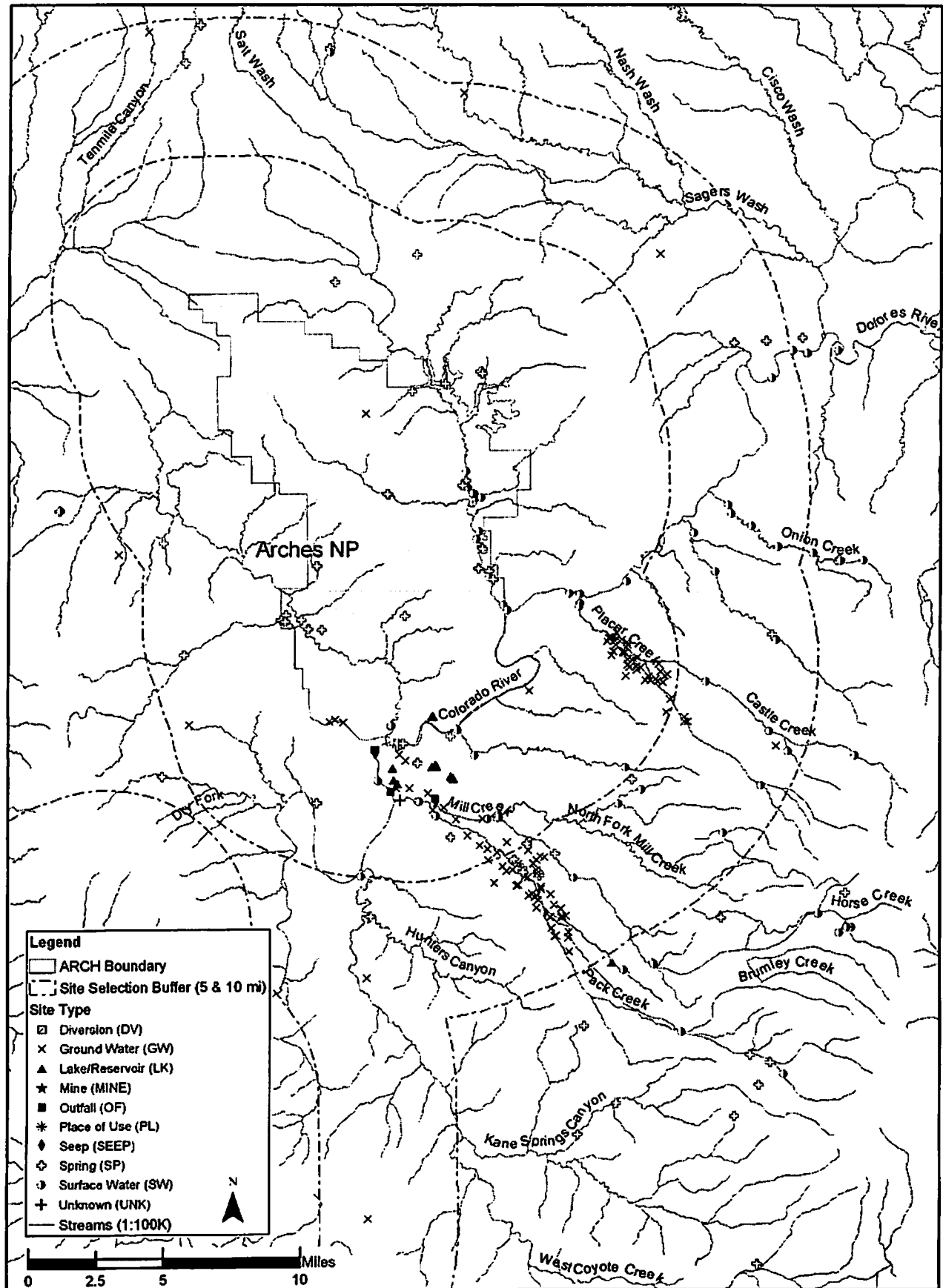


Selenium Results for Surface Water in Arches National Park (ARCH)

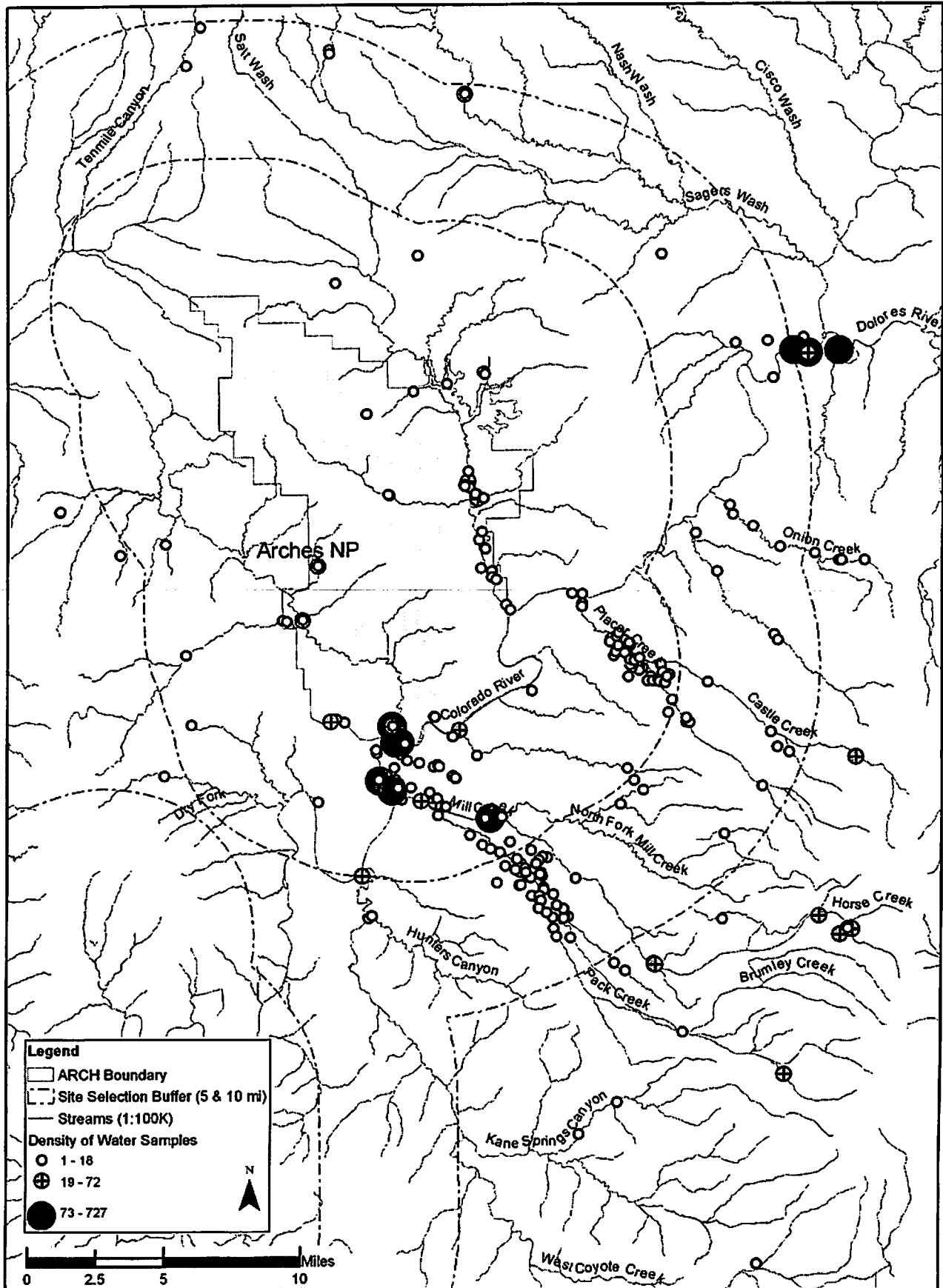
USEPA Numeric Criteria for Aquatic Wildlife = 5 mg/l.



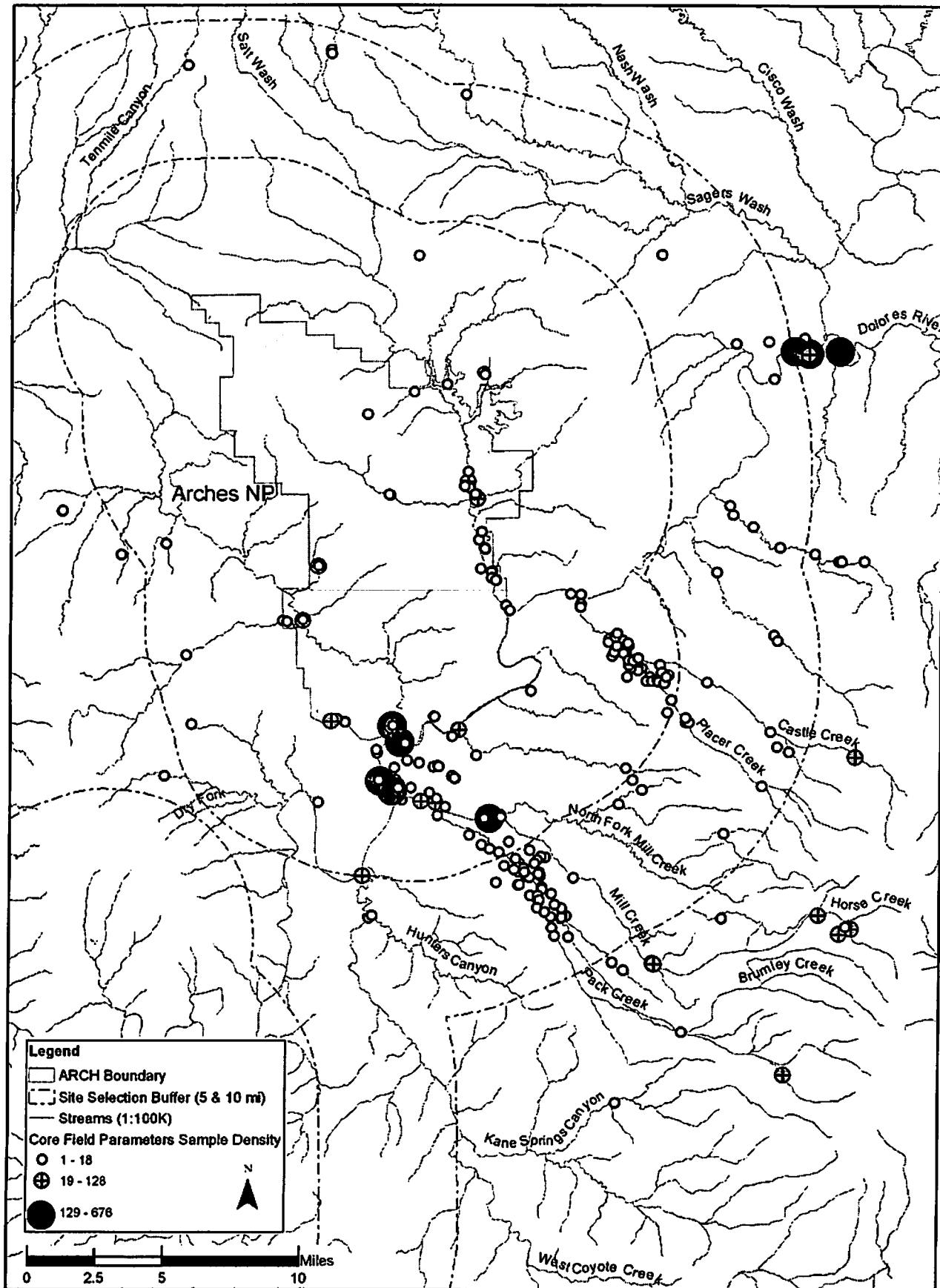
Historic Sample Site Locations by Site Type, Arches National Park (ARCH), 1951-2002



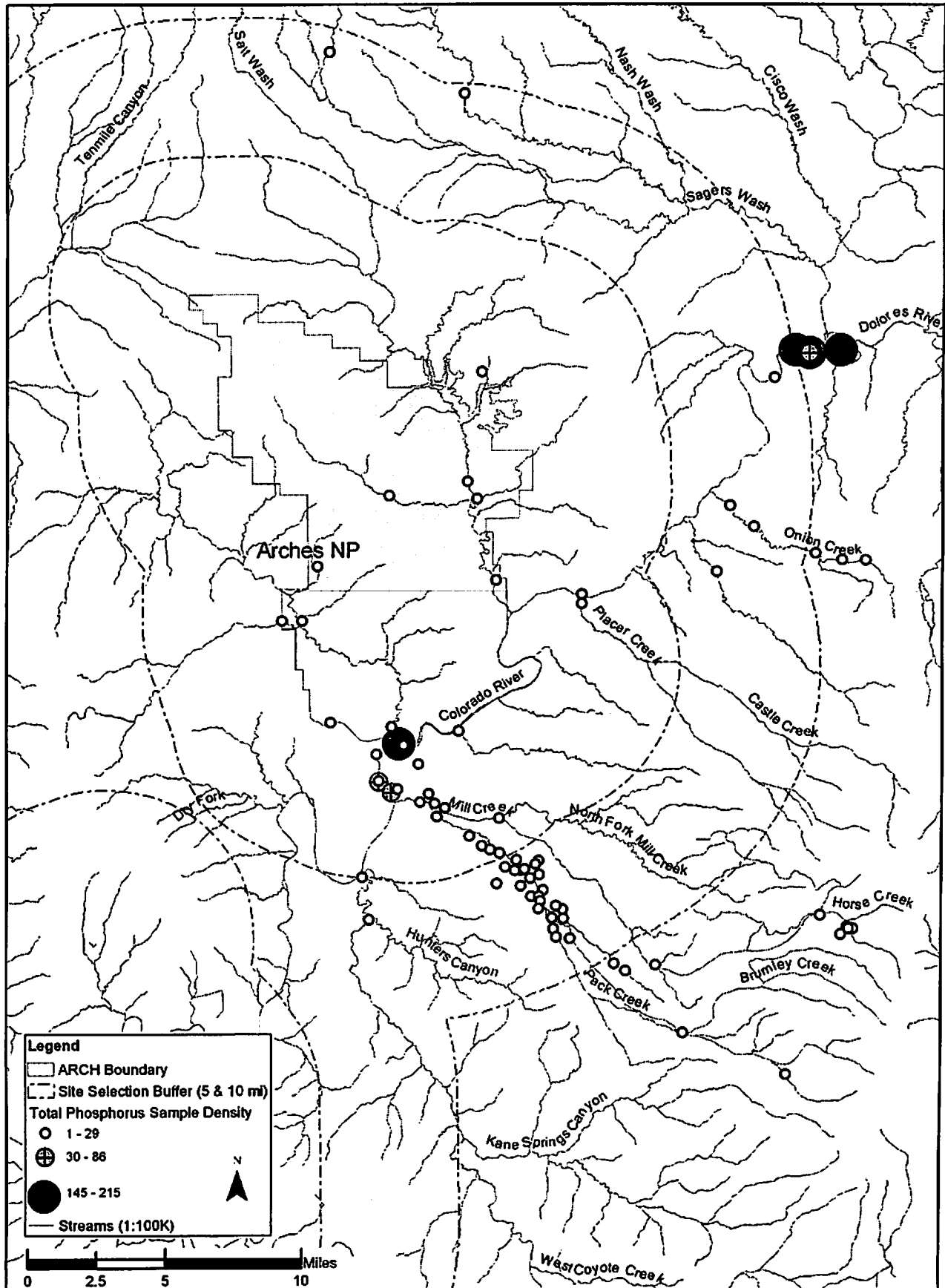
Water Sample Density, Arches National Park (ARCH), 1951-2002



Core Field Parameters Sample Density, Arches National Park (ARCH), 1953-2002



Total Phosphorus Water Samples Density, Arches National Park (ARCH), 1974-2002



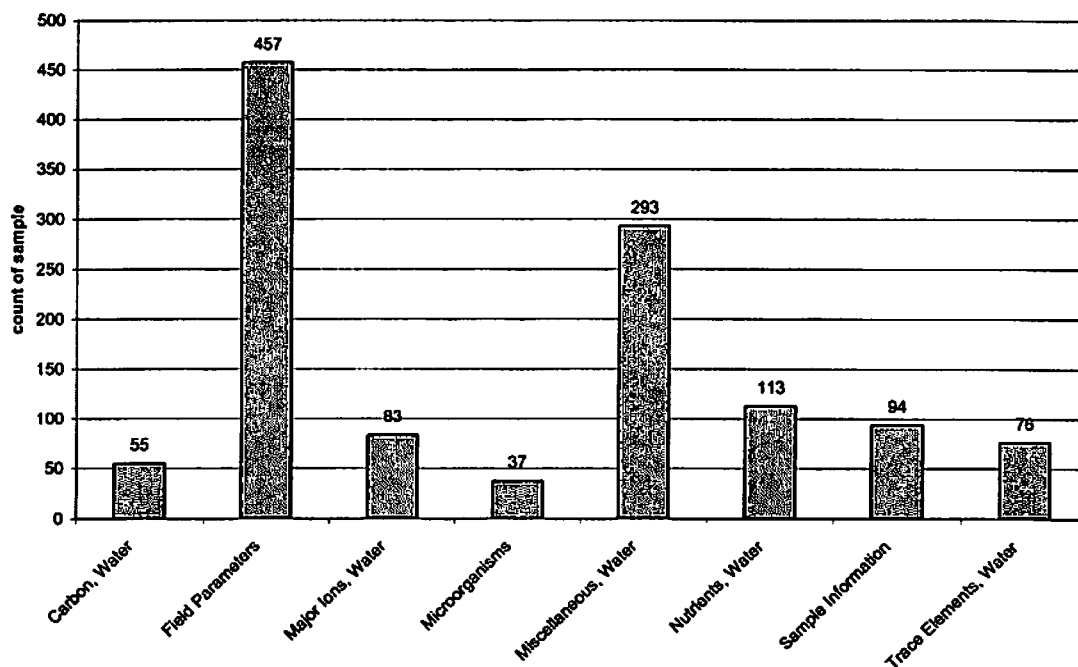
Black Canyon of the Gunnison National Park (BLCA) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

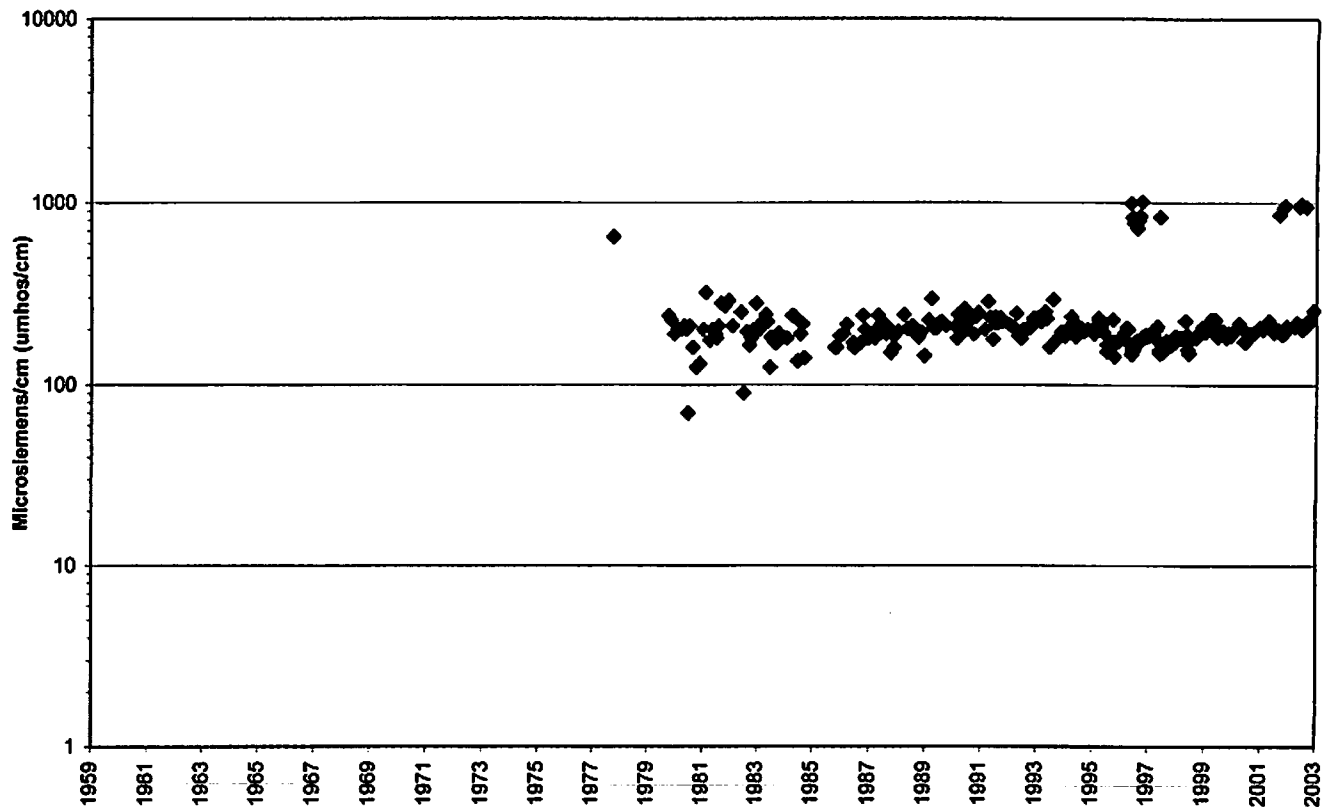
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	5	453	06/16/1959	11/23/2002
Streamflow	4	241	10/06/1983	11/23/2002
Core Field Parameters ⁽³⁾	5	363	06/16/1959	11/23/2002
Microorganisms	3	37	05/08/1996	09/05/2002
Major Ions	4	83	09/26/1977	09/18/2002
Total and Dissolved Selenium	2	33	11/18/1987	09/18/2002
Total Dissolved Solids	1	62	11/18/1987	09/05/2002
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	3	76	09/26/1977	09/18/2002
Pesticides	0	n/a	n/a	n/a
Nutrients	4	113	11/18/1987	09/18/2002
Unionized Ammonia	3	96	07/16/1991	09/18/2002
Ammonia	3	96	07/16/1991	09/18/2002
Nitrite	2	88	07/16/1991	09/18/2002
Nitrate	3	100	11/18/1987	09/18/2002
Total Nitrogen	3	49	01/18/1995	09/18/2002
Ortho-Phosphorus	4	106	07/16/1991	09/18/2002
Total Phosphorus	4	105	12/13/1994	09/18/2002
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

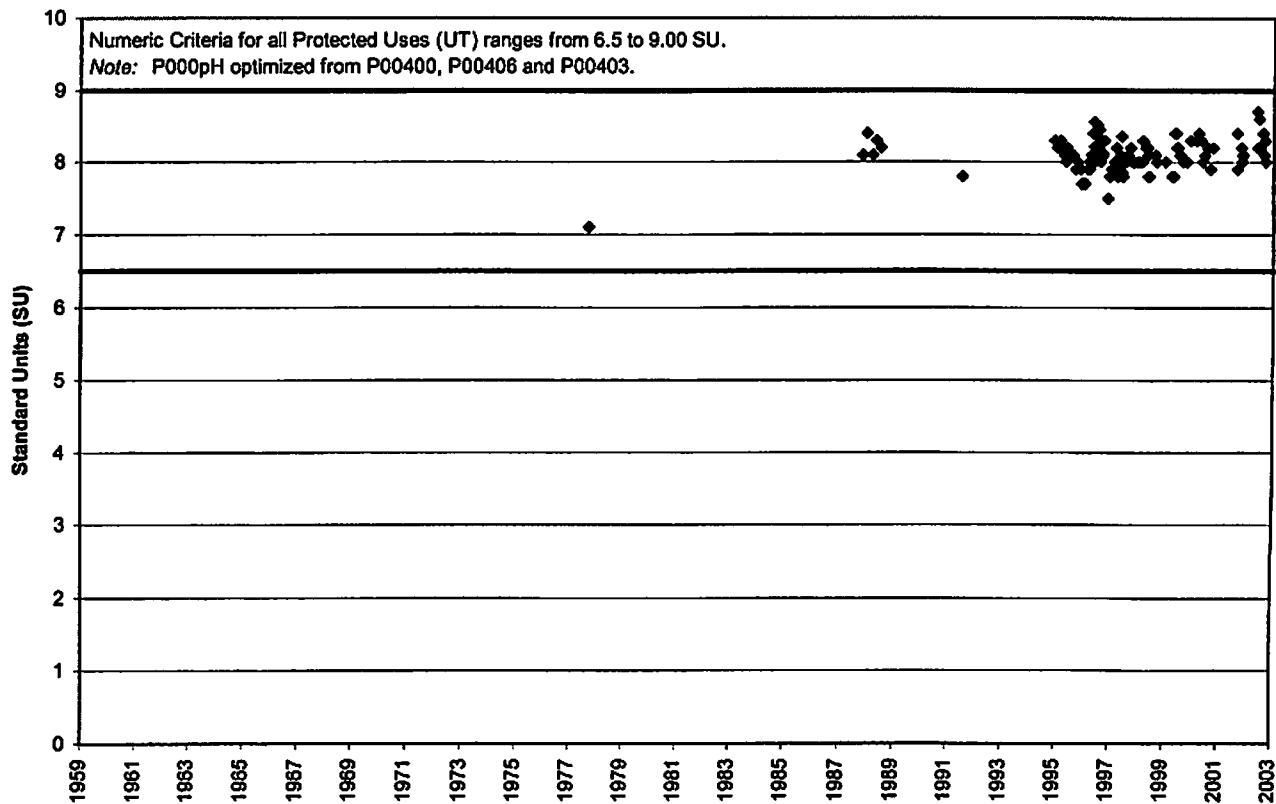
Water Sample Density by Category in Black Canyon National Park (BLCA)

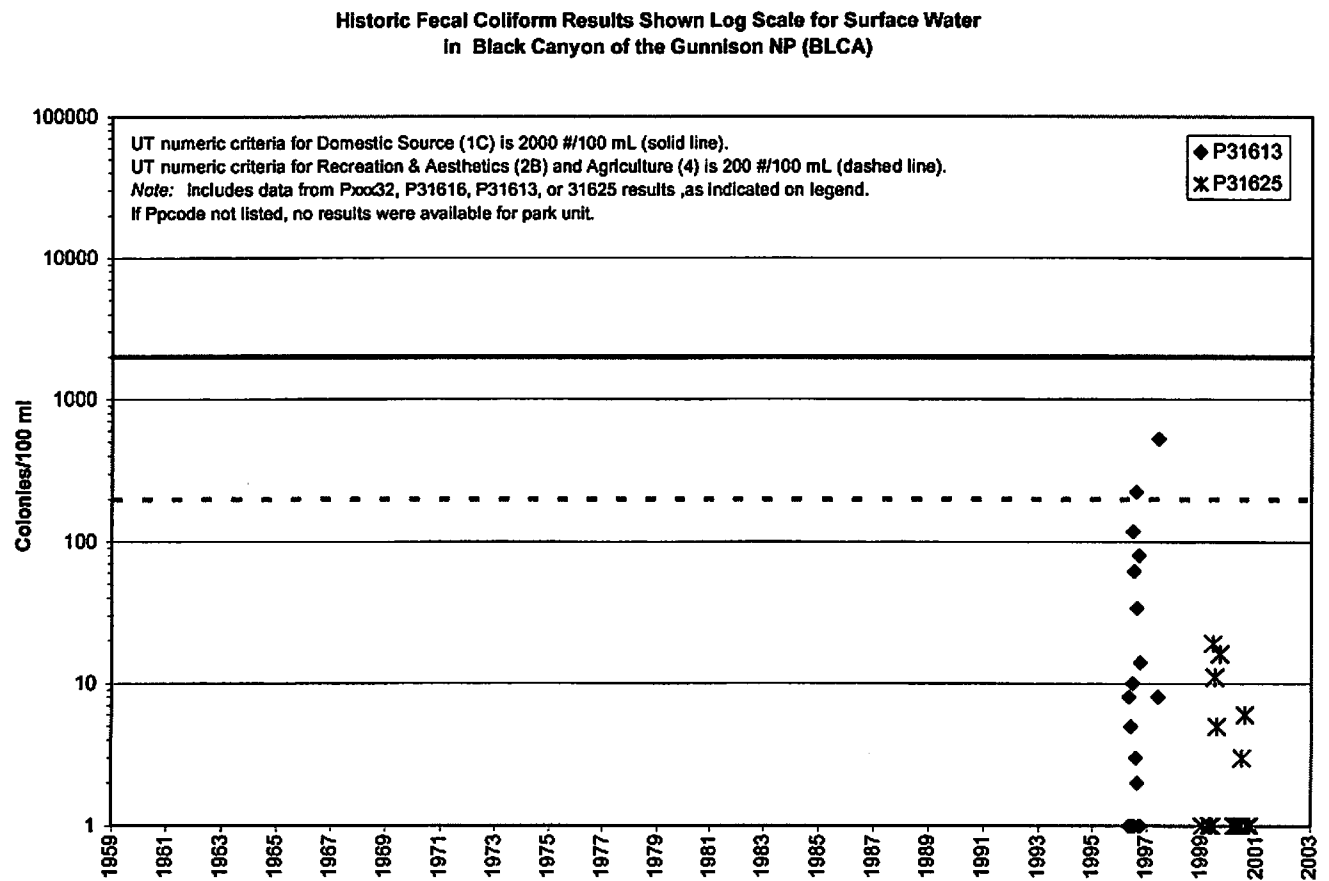
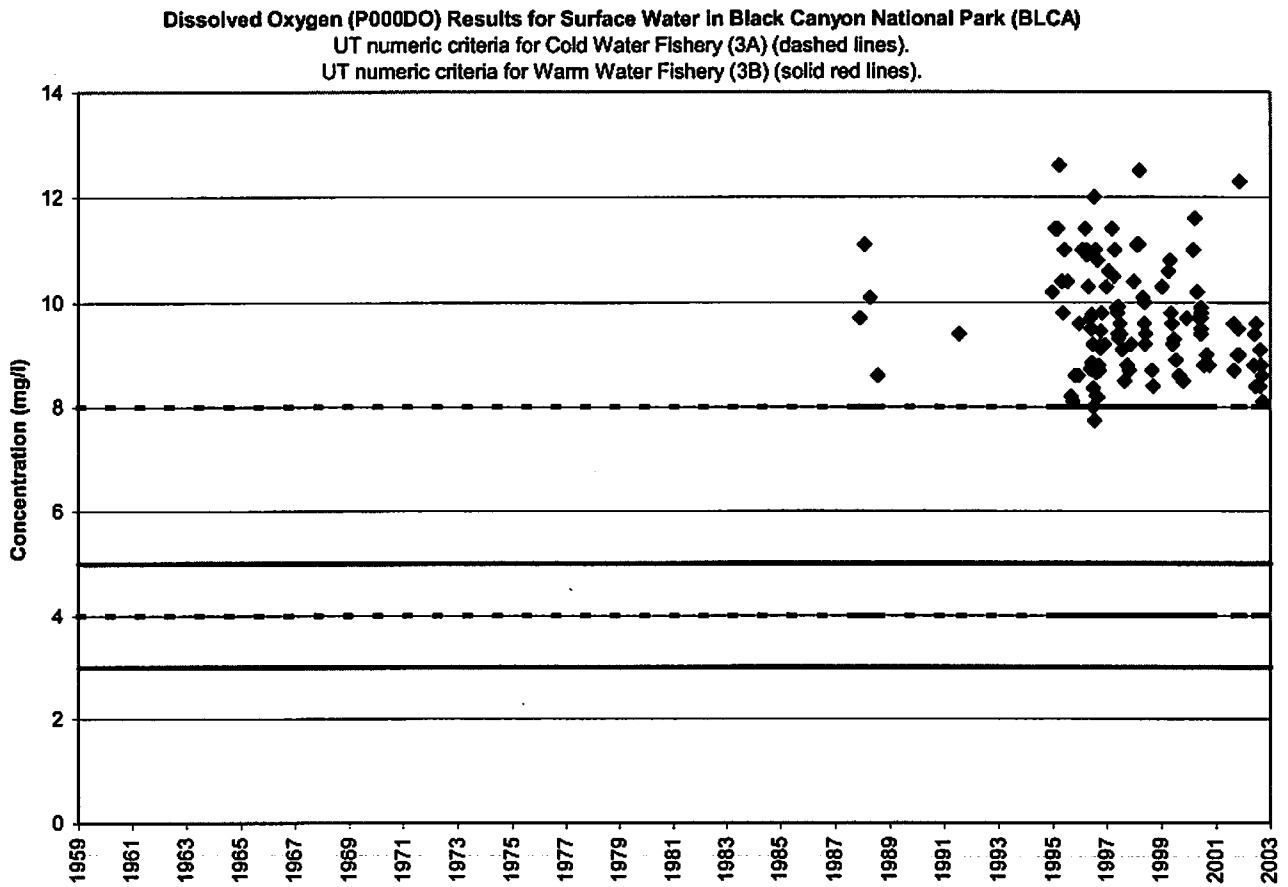


Specific Conductivity (PSPcnd) Results for Surface Water in Black Canyon National Park (BLCA)
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

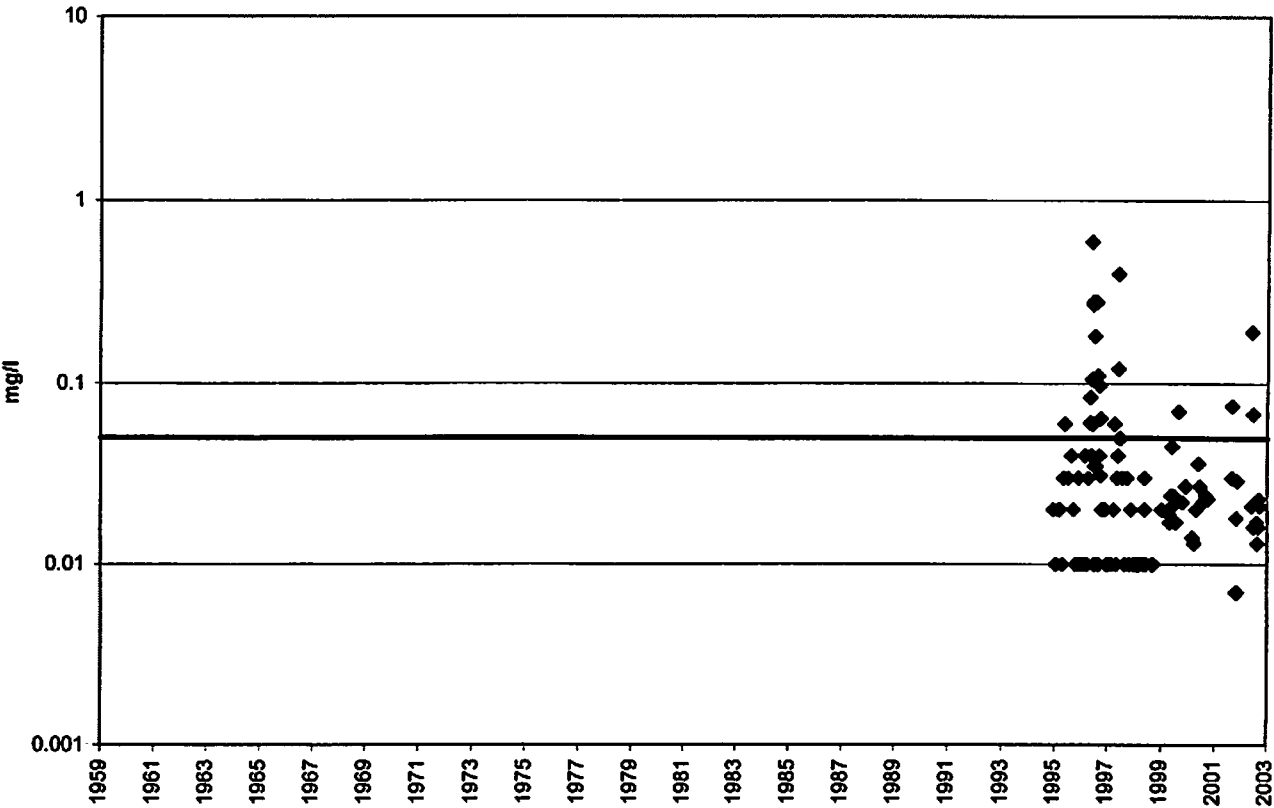


pH (P000pH) Results for Surface Water in Black Canyon National Park (BLCA)

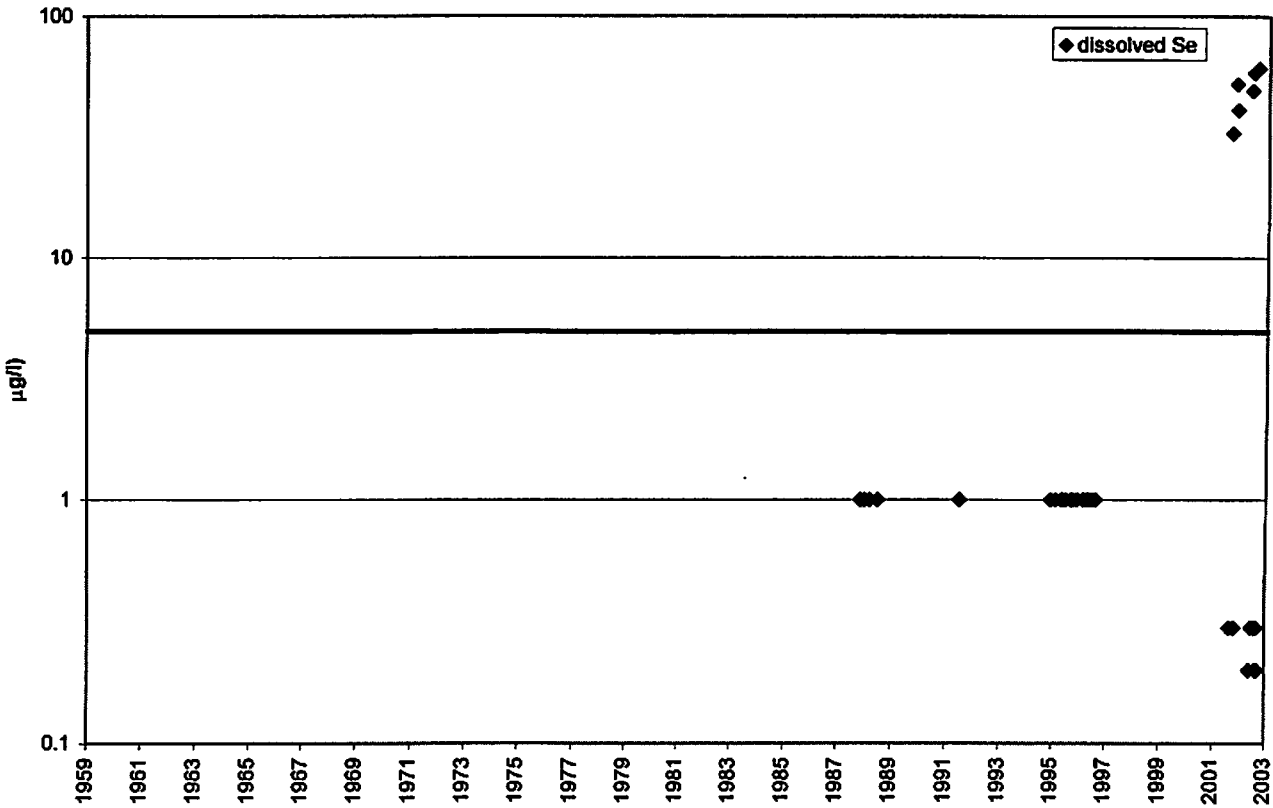




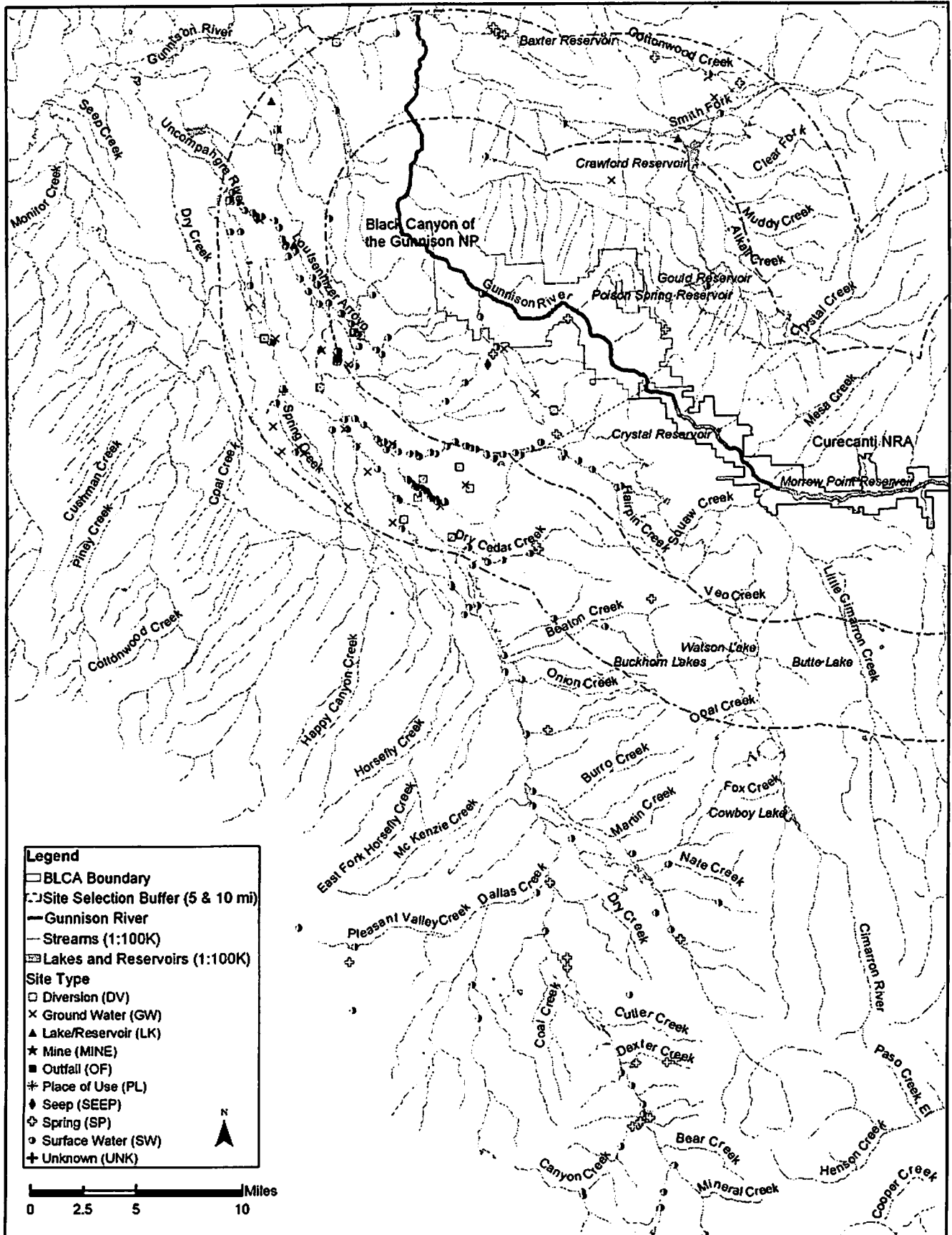
Total Phosphorus (PtotalP) Results for Surface Water in Black Canyon National Park (BLCA)
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.
Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.



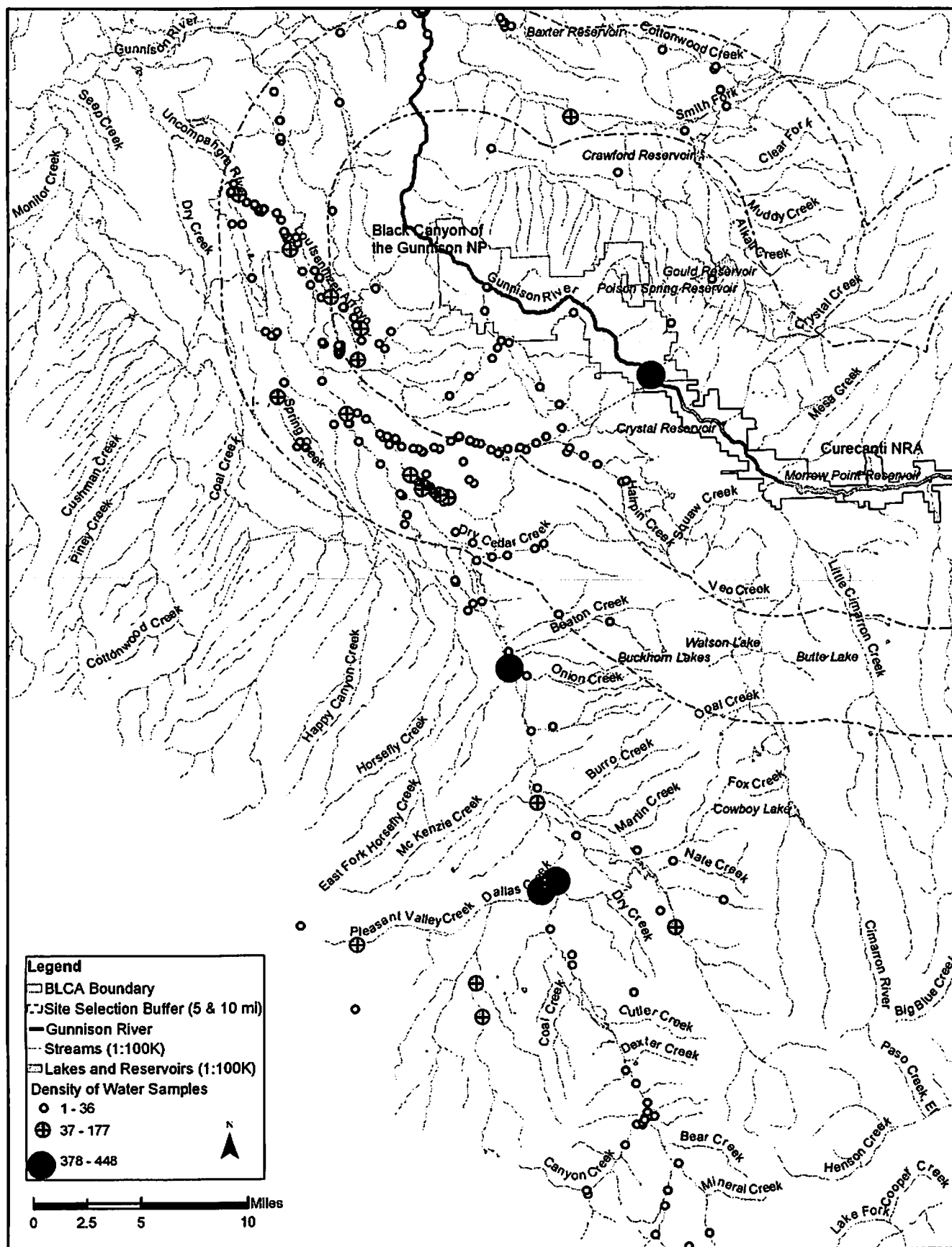
Selenium Results for Surface Water in Black Canyon National Park (BLCA)
USEPA Numeric Criteria for Aquatic Wildlife =5 µg/l.



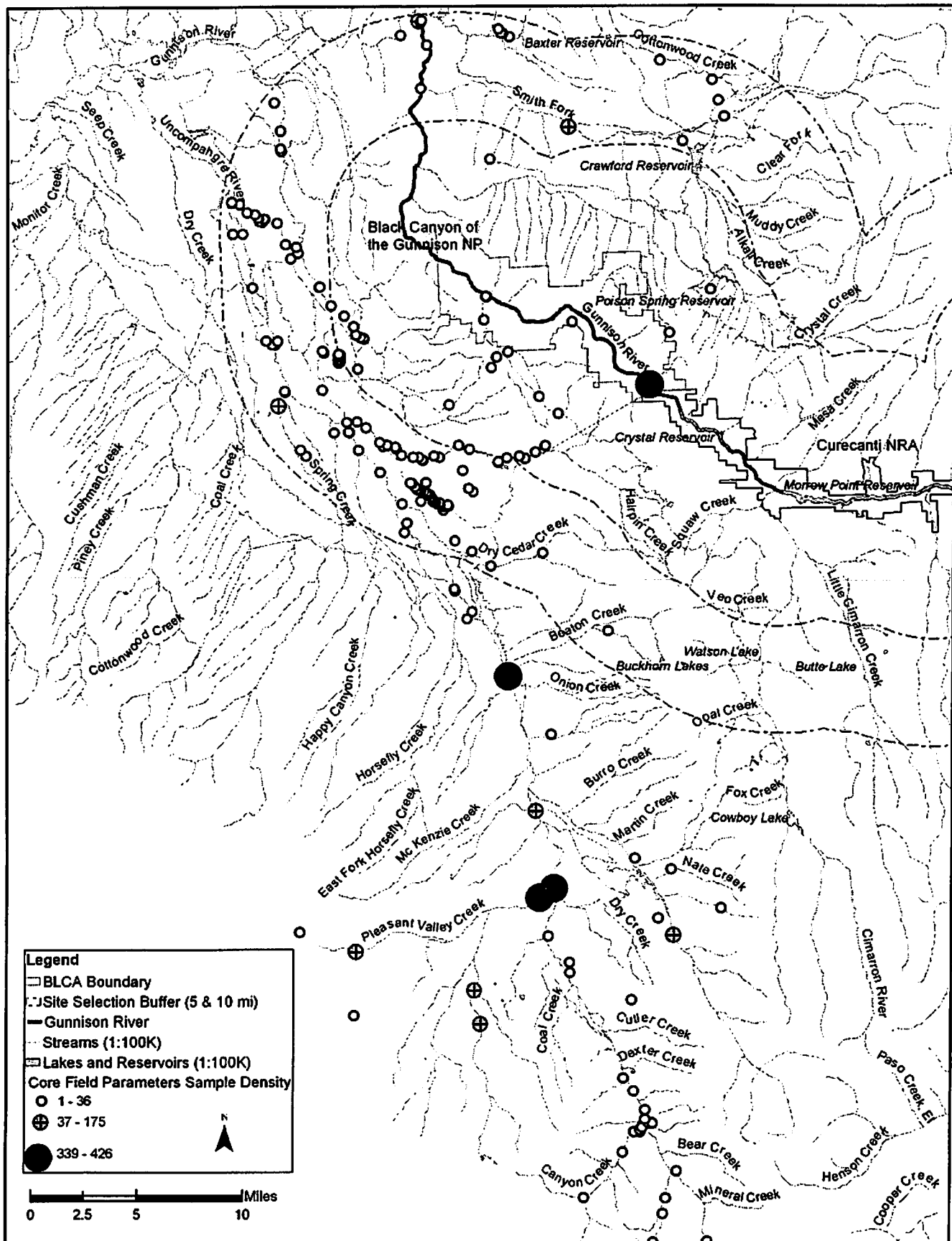
Historic Sample Site Locations by Site Type, Black Canyon of the Gunnison National Park (BLCA), 1959-2003



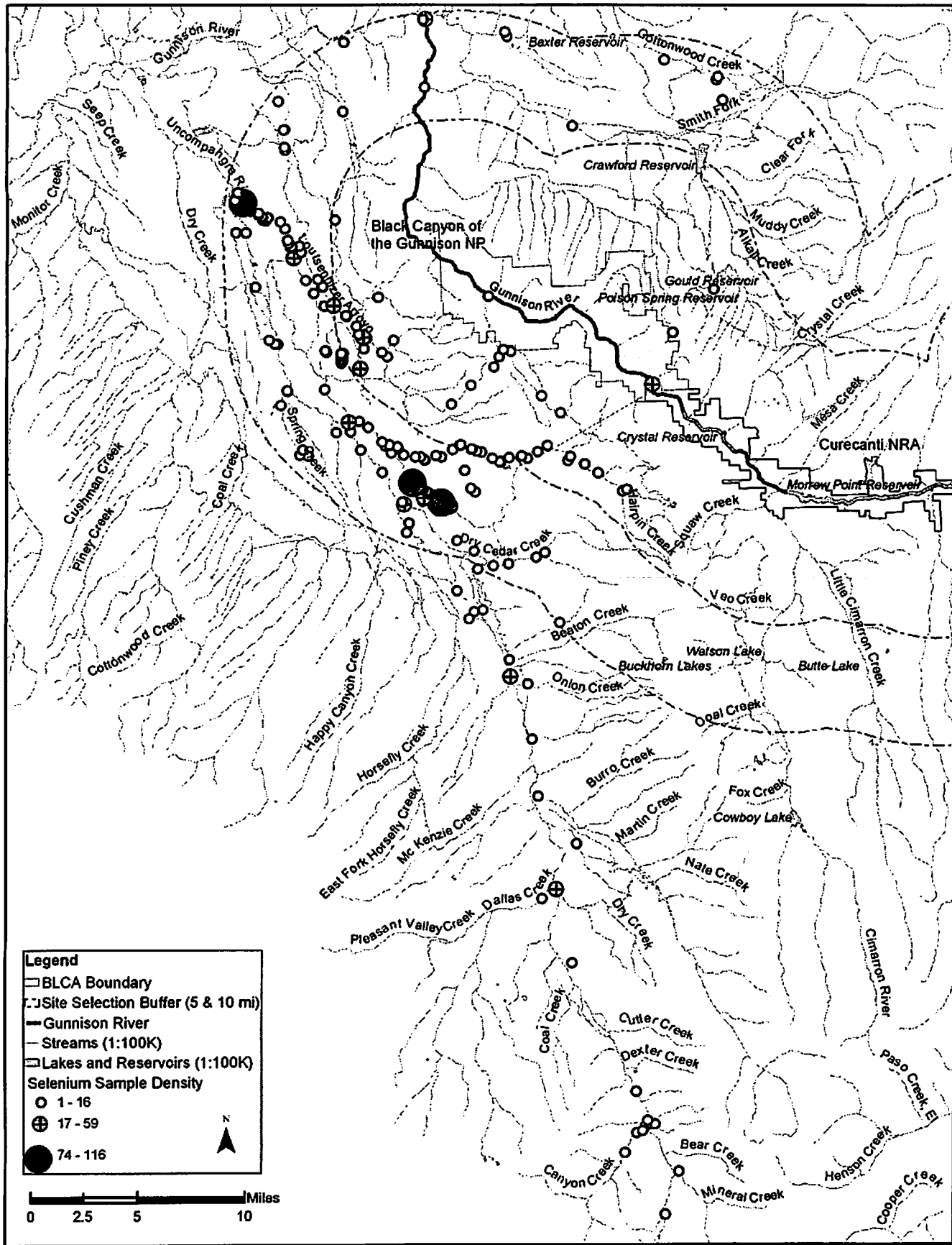
Water Sample Density, Black Canyon of the Gunnison National Park (BLCA), 1959-2003



Core Field Parameters Sample Density, Black Canyon of the Gunnison National Park (BLCA), 1959-2003



Total and Dissolved Selenium Water Sample Density, Black Canyon of the Gunnison National Park (BLCA), 1960-2002



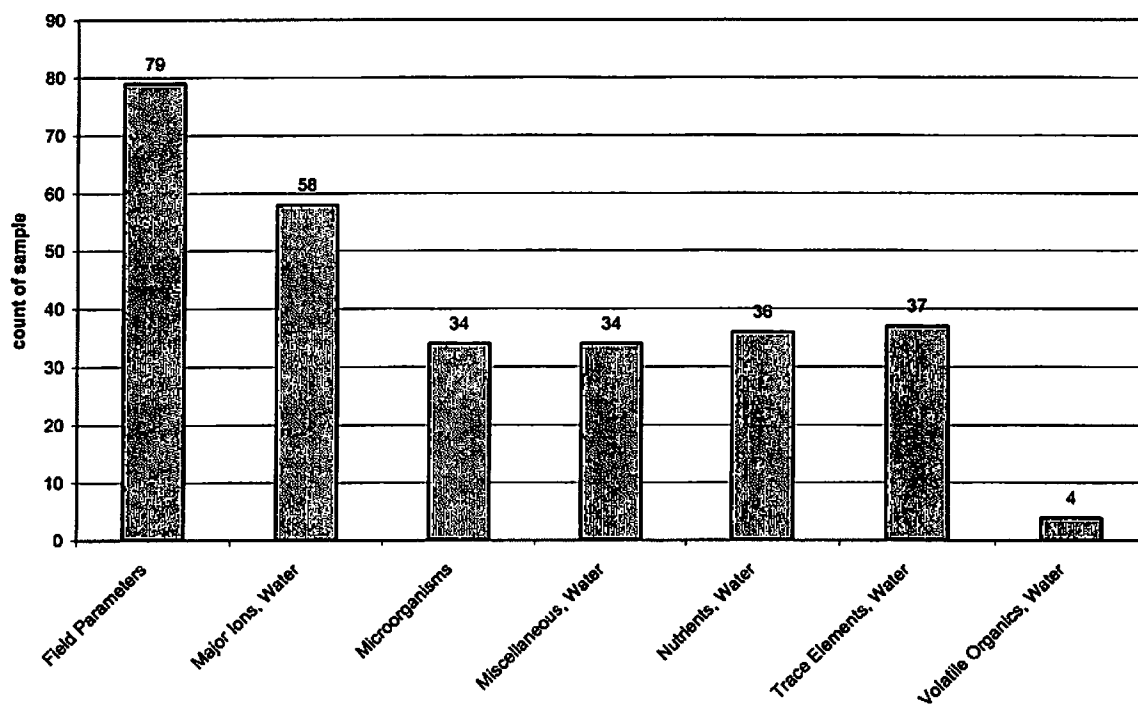
Bryce Canyon National Park (BRCA) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

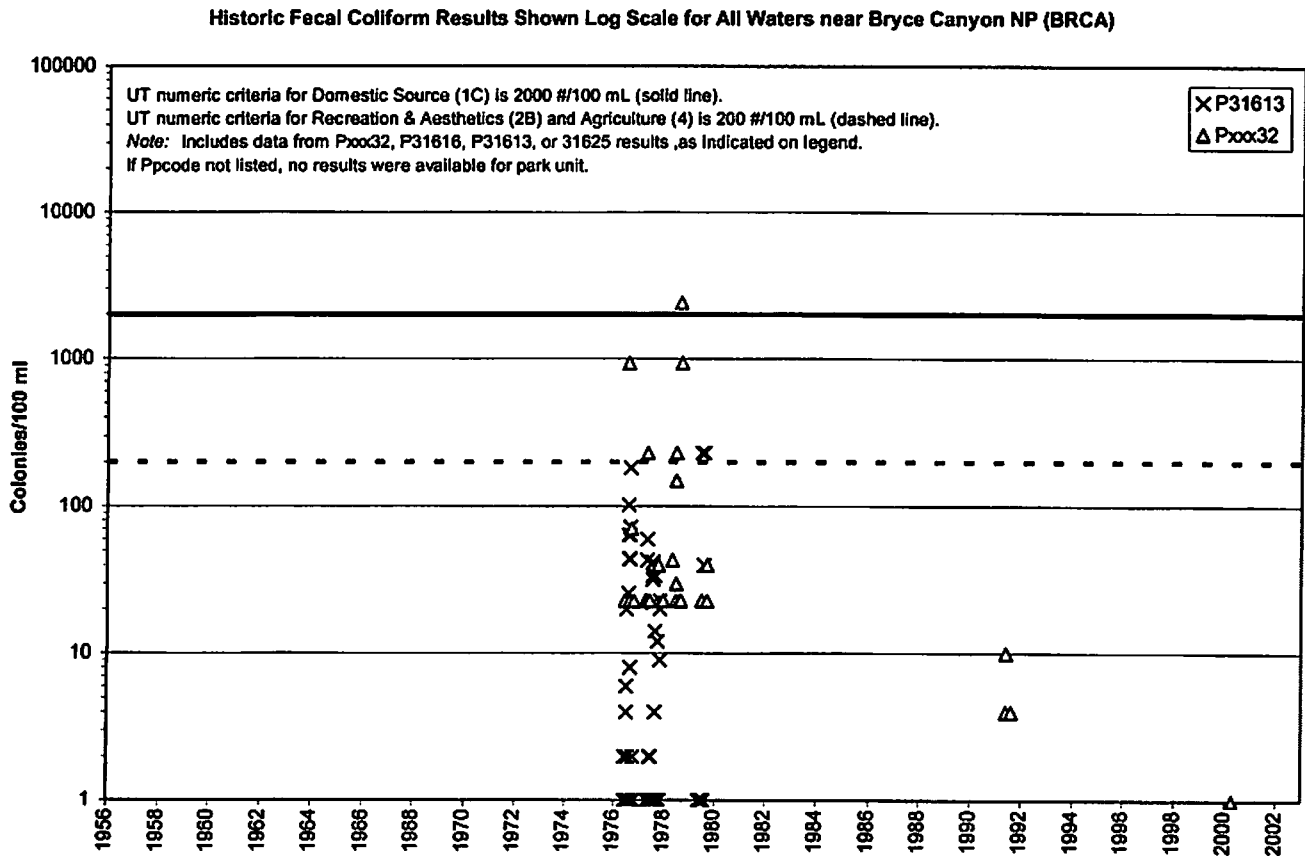
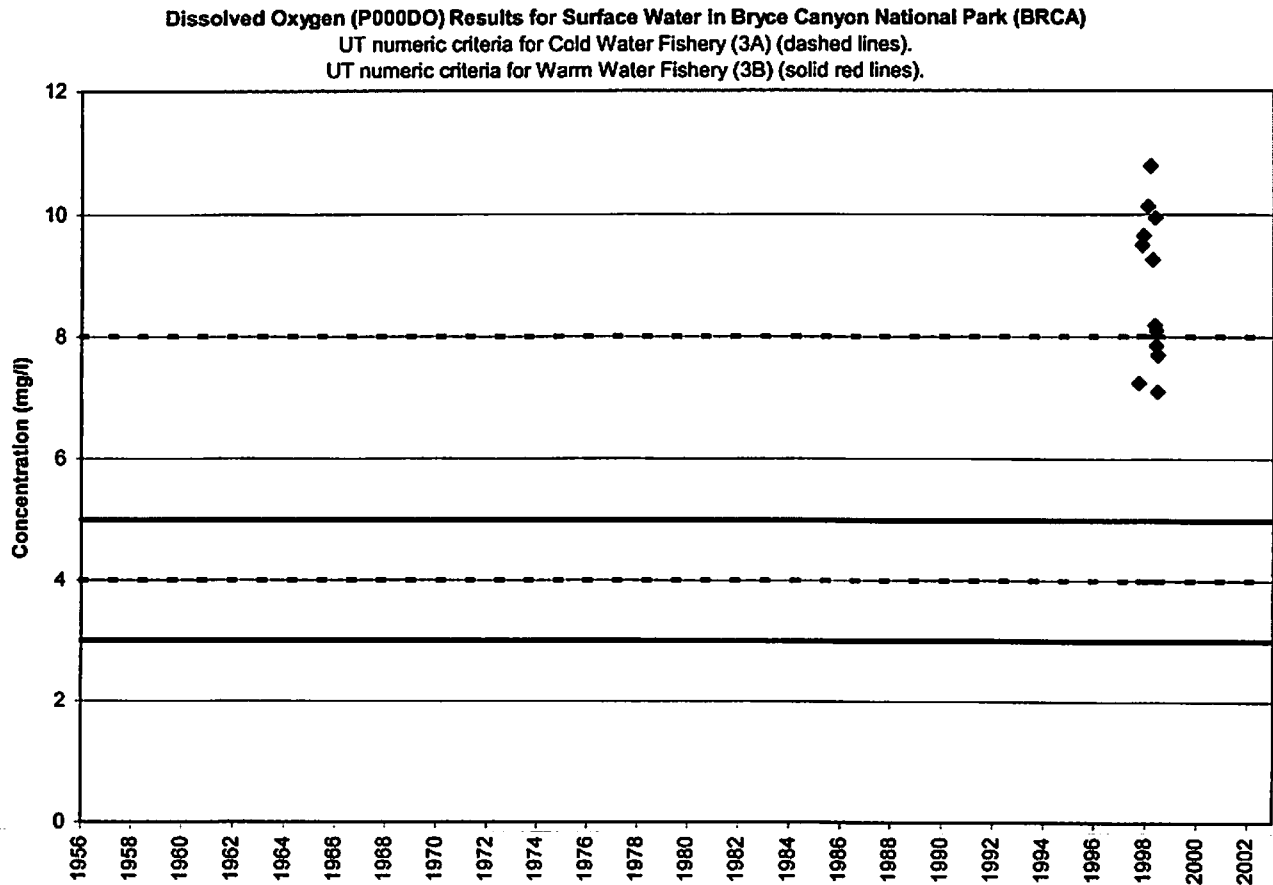
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	66	106	09/29/1956	06/09/1998
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	54	66	09/29/1956	06/09/1998
Microorganisms	15	34	06/23/1981	08/18/1981
Major Ions	45	58	09/29/1956	06/09/1998
Total and Dissolved Selenium	3	5	02/27/1986	04/30/1998
Total Dissolved Solids	12	14	10/05/1956	02/27/1986
Total Suspended Solids	2	10	09/17/1997	06/09/1998
Trace Elements	32	37	09/29/1956	04/30/1998
Pesticides	0	n/a	n/a	n/a
Nutrients	24	36	09/29/1956	06/09/1998
Unionized Ammonia	2	12	09/17/1997	06/09/1998
Ammonia	2	2	03/09/1974	02/27/1986
Nitrite	7	7	06/18/1996	07/12/1996
Nitrate	21	33	09/29/1956	06/09/1998
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	2	10	11/18/1997	06/09/1998
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

Water Sample Density by Category in Bryce Canyon National Park (BRCA)



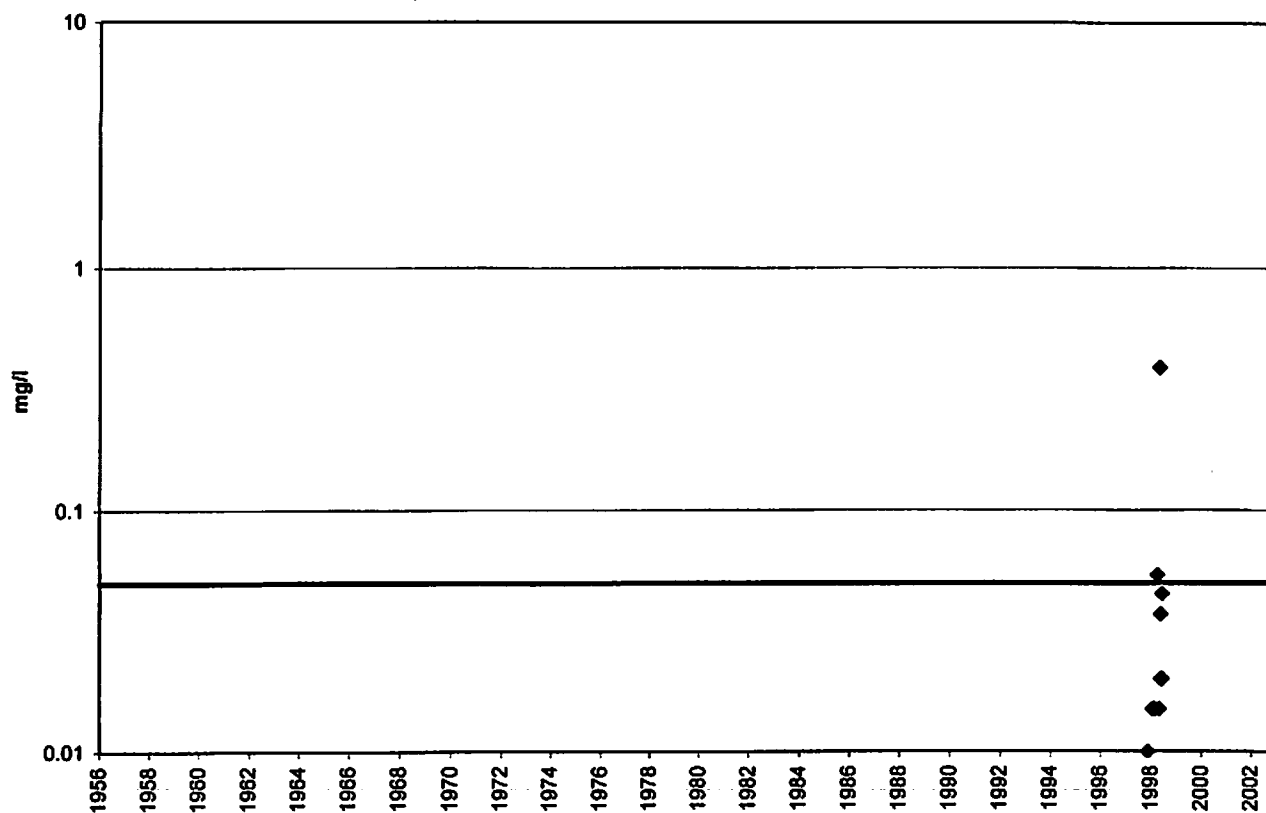
[illegible][illegible]



Total Phosphorus (PtotalP) Results for Surface Water in Bryce Canyon National Park (BRCA)

Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

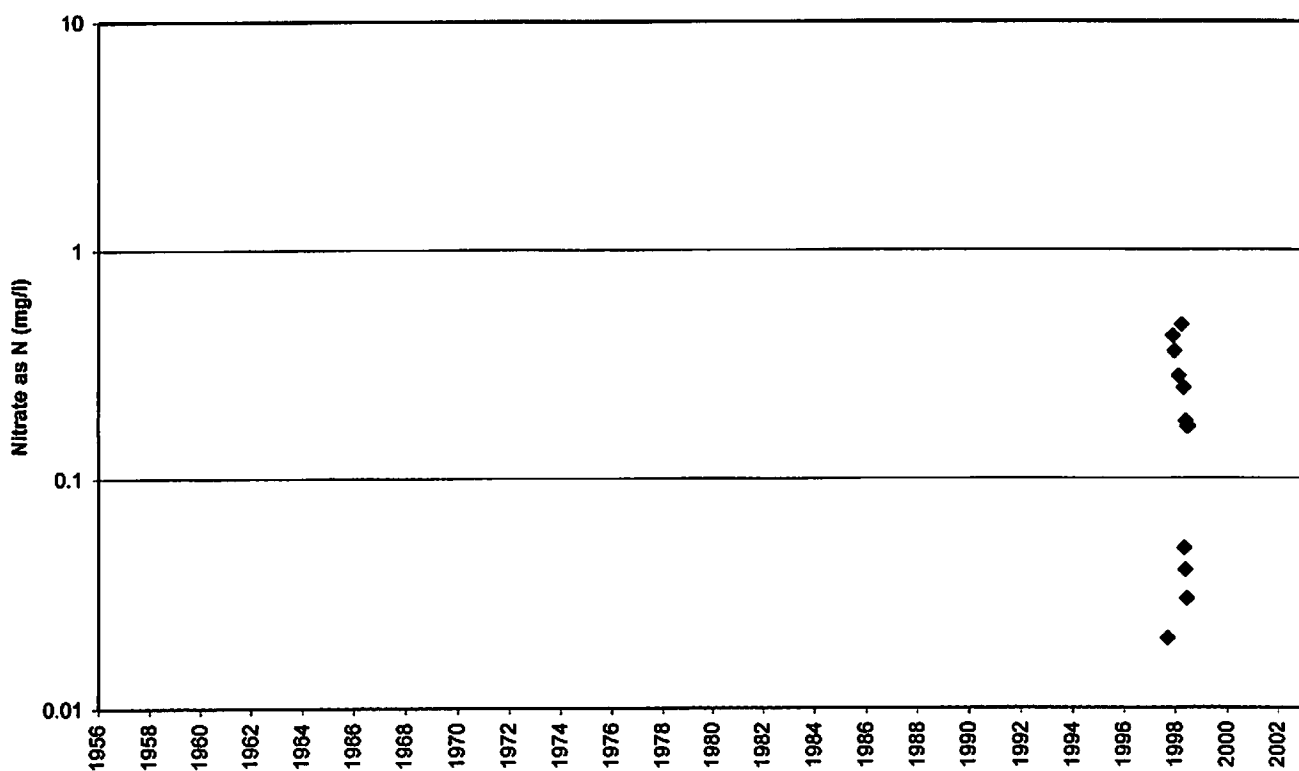
Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.



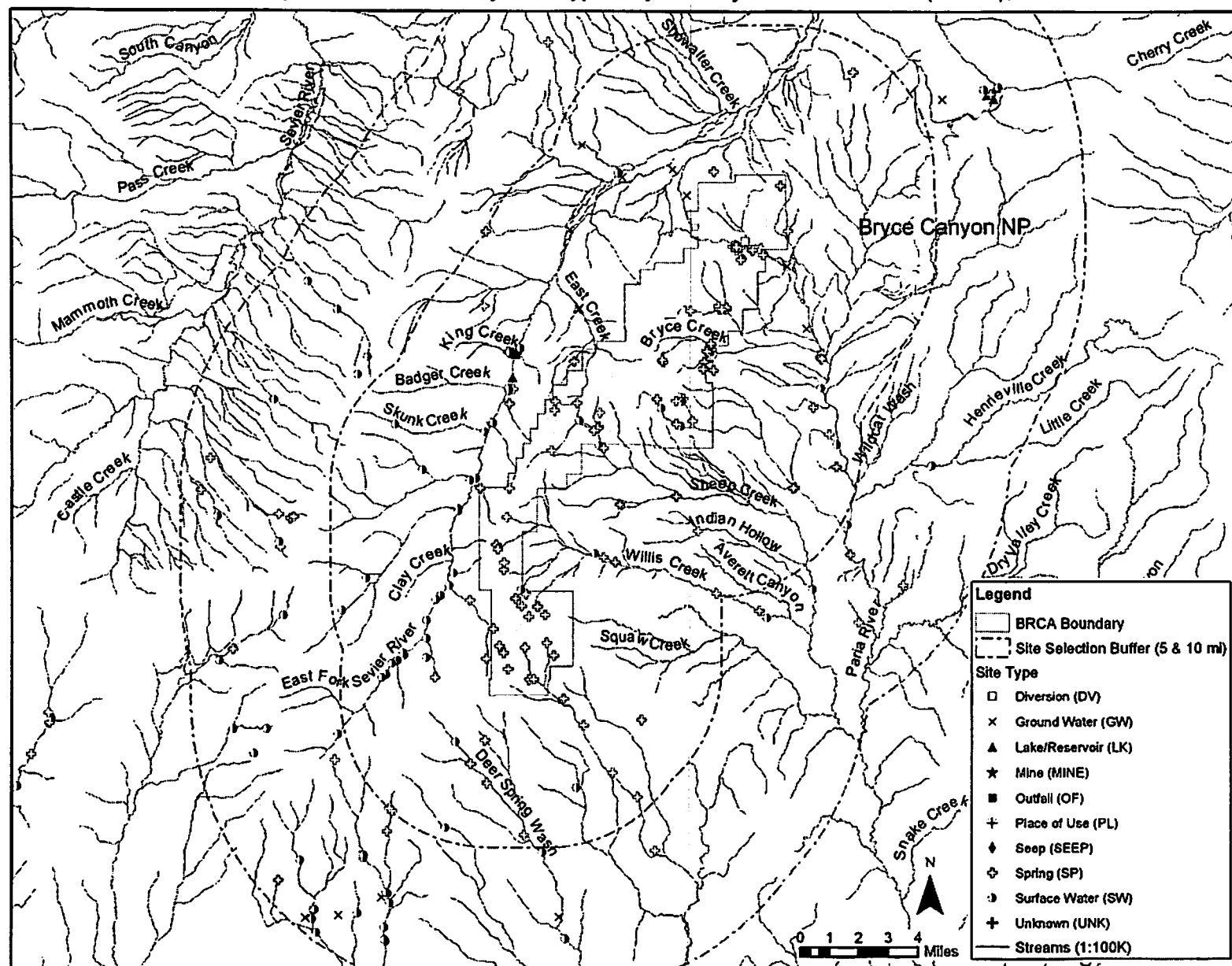
Nitrate (Pnitrate) Results for Surface Water in Bryce Canyon National Park (BRCA)

Numeric Criteria for Domestic Source (UT) is 10 mg/l.

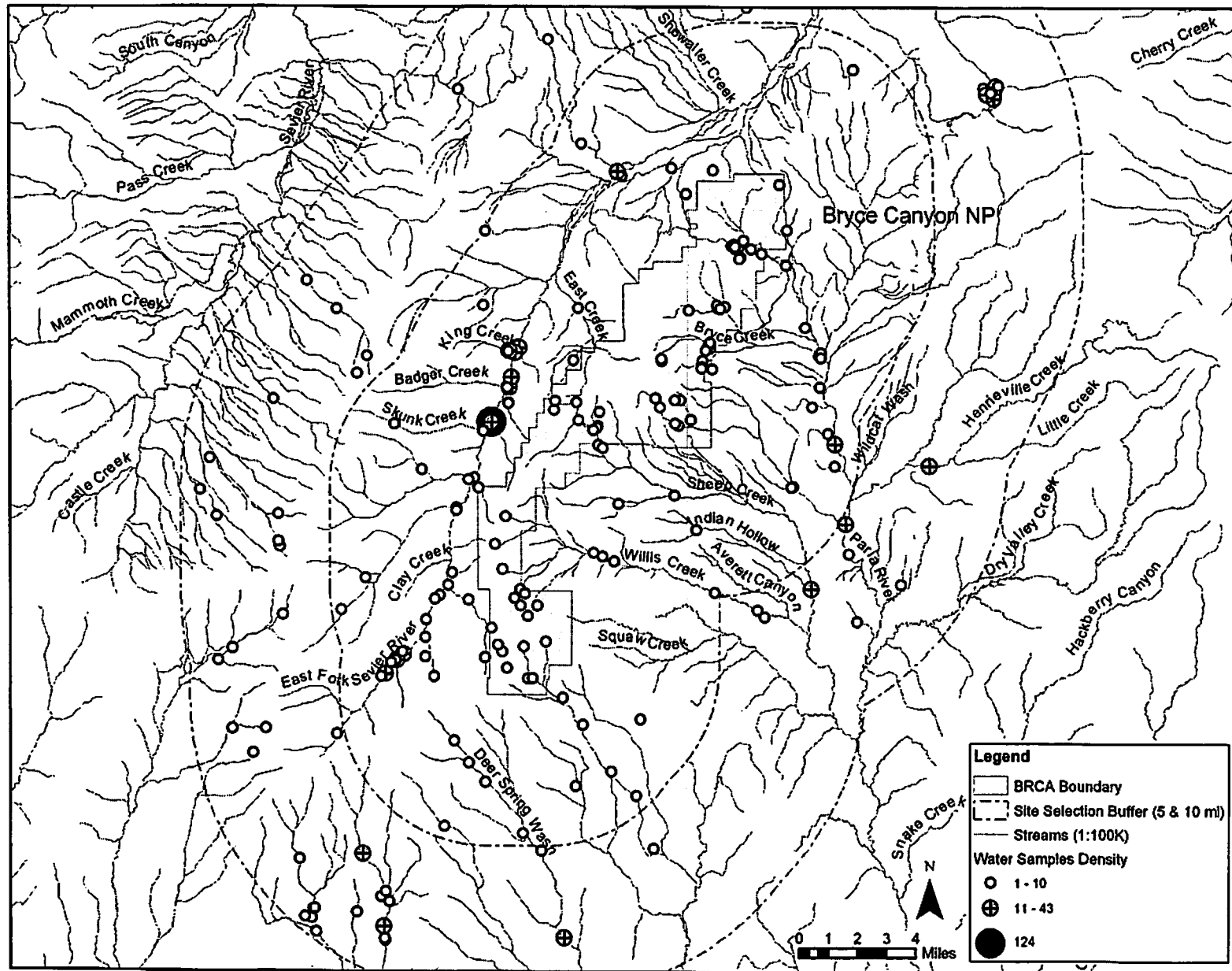
Note: Pnitrate optimized from P00631, P00618, P71851, P00630, P00620, P71850.



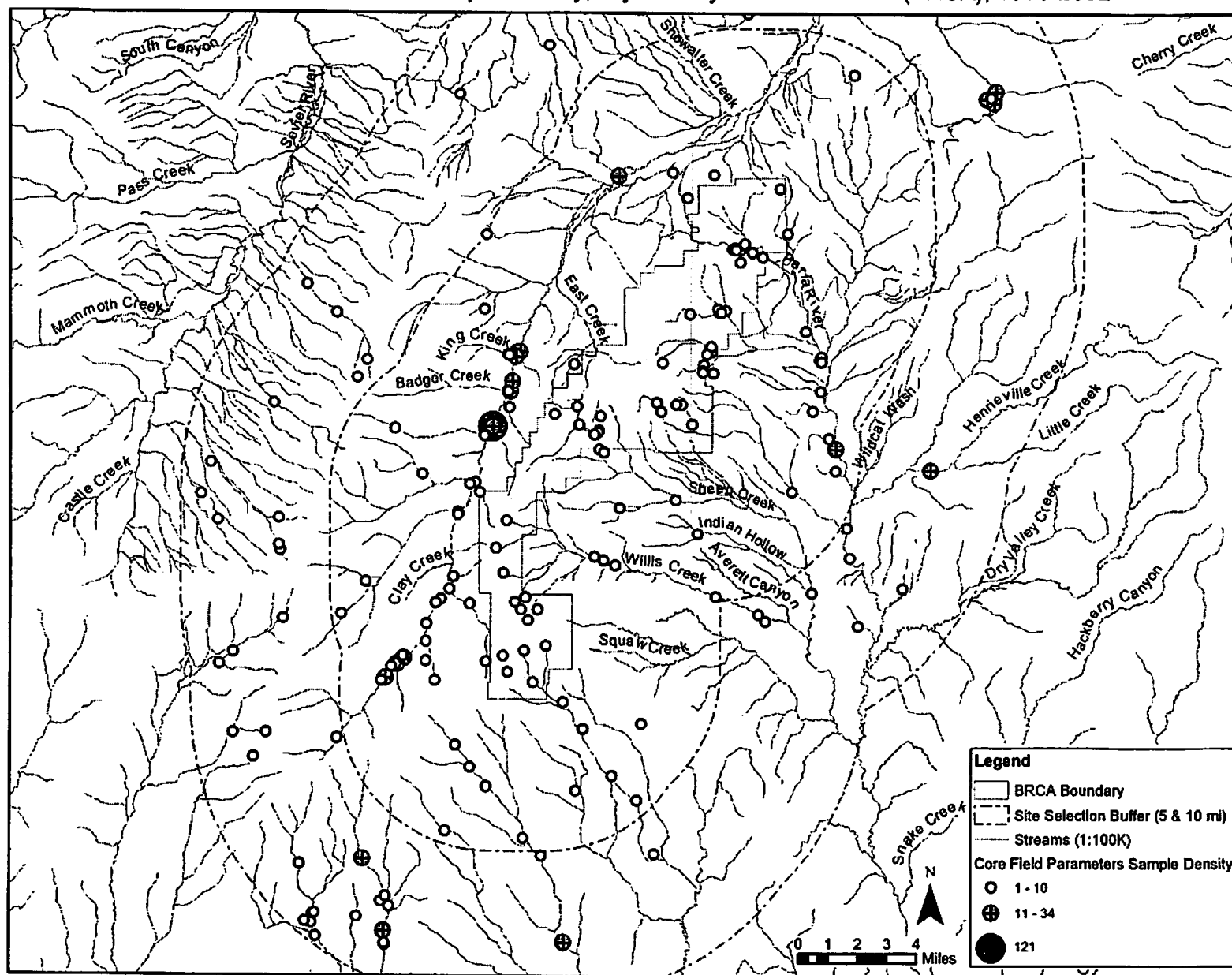
Historic Sample Site Locations by Site Type, Bryce Canyon National Park (BRCA), 1956-2002



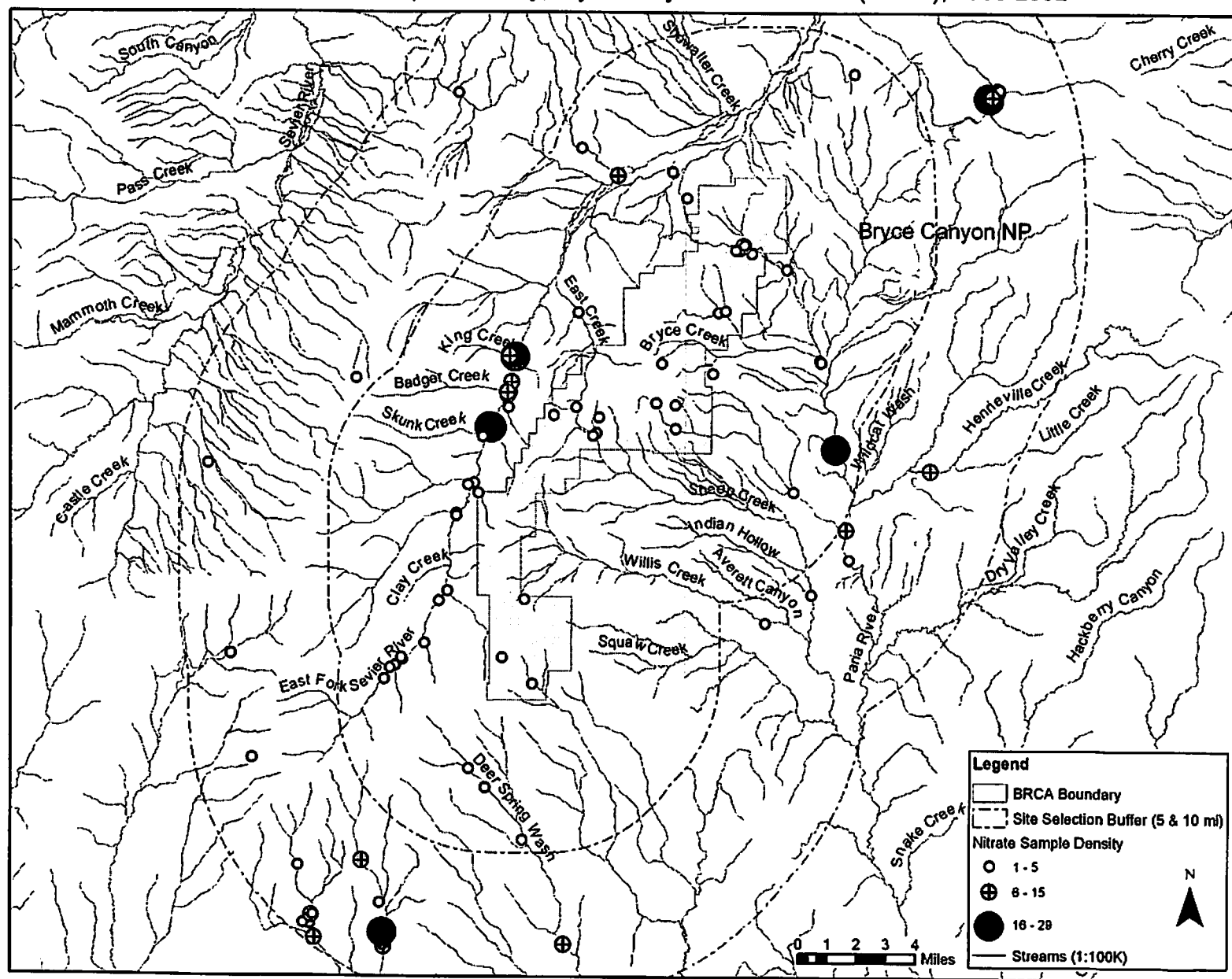
Water Sample Density, Bryce Canyon National Park (BRCA), 1956-2002



Core Field Parameters Sample Density, Bryce Canyon National Park (BRCA), 1956-2002



Nitrate Water Samples Density, Bryce Canyon National Park (BRCA), 1956-2002



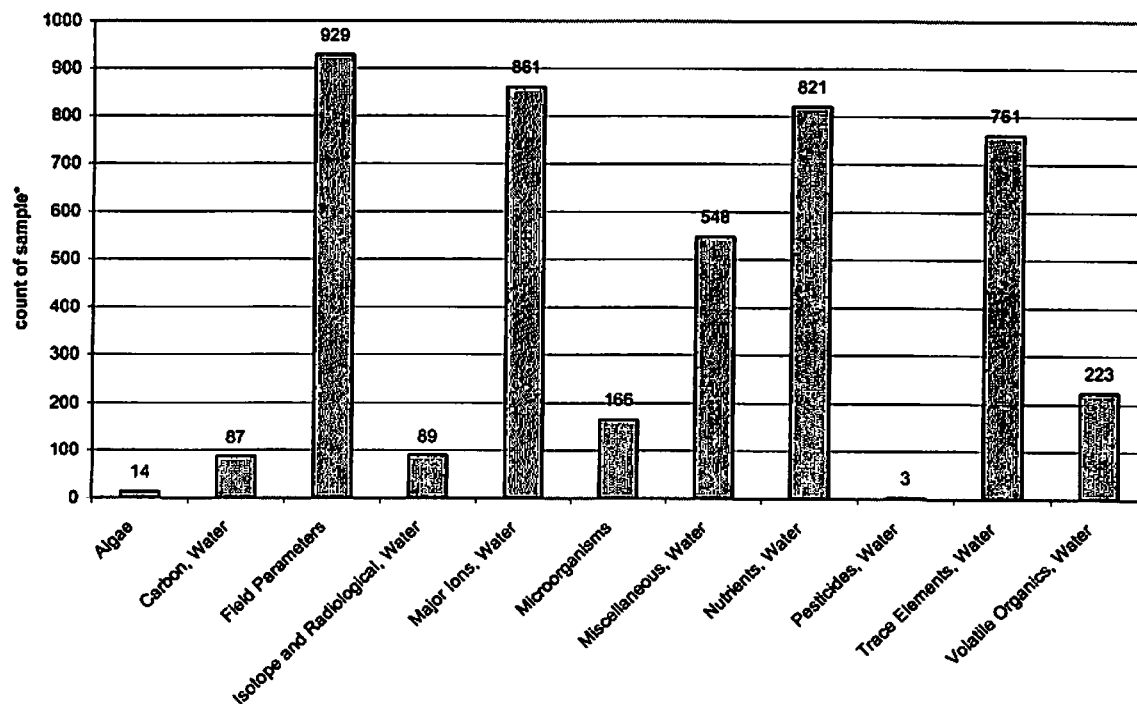
Canyonlands National Park (CANY) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

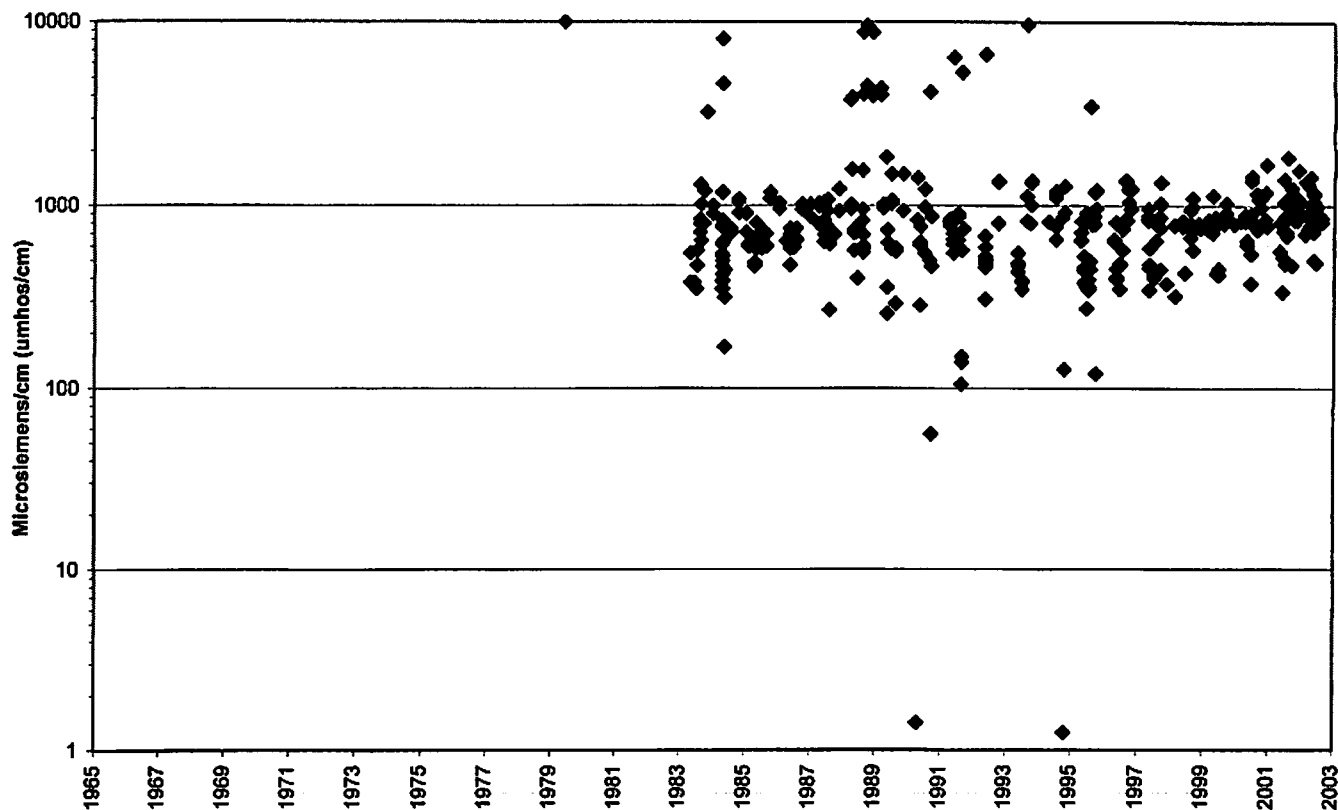
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	158	30000	05/18/1965	08/15/2002
Streamflow	47	60	08/24/1983	08/24/1988
Core Field Parameters ⁽³⁾	154	853	05/18/1965	08/15/2002
Microorganisms	43	166	06/17/1980	05/22/1990
Major Ions	129	861	05/18/1965	06/10/2002
Total and Dissolved Selenium	57	435	06/17/1980	04/09/2002
Total Dissolved Solids	52	78	05/18/1965	07/27/1995
Total Suspended Solids	45	399	06/15/1983	06/10/2002
Trace Elements	98	761	06/18/1965	04/09/2002
Pesticides	3	3	07/09/1990	07/10/1990
Nutrients	117	821	05/18/1965	06/10/2002
Unionized Ammonia	64	407	05/04/1983	05/29/1999
Ammonia	30	30	04/24/1984	10/27/1990
Nitrite	49	105	05/04/1983	10/27/1990
Nitrate	115	786	05/18/1965	06/10/2002
Total Nitrogen	35	213	05/04/1983	05/09/1997
Ortho-Phosphorus	28	88	07/22/1975	07/10/1990
Total Phosphorus	67	452	06/17/1980	06/10/2002
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

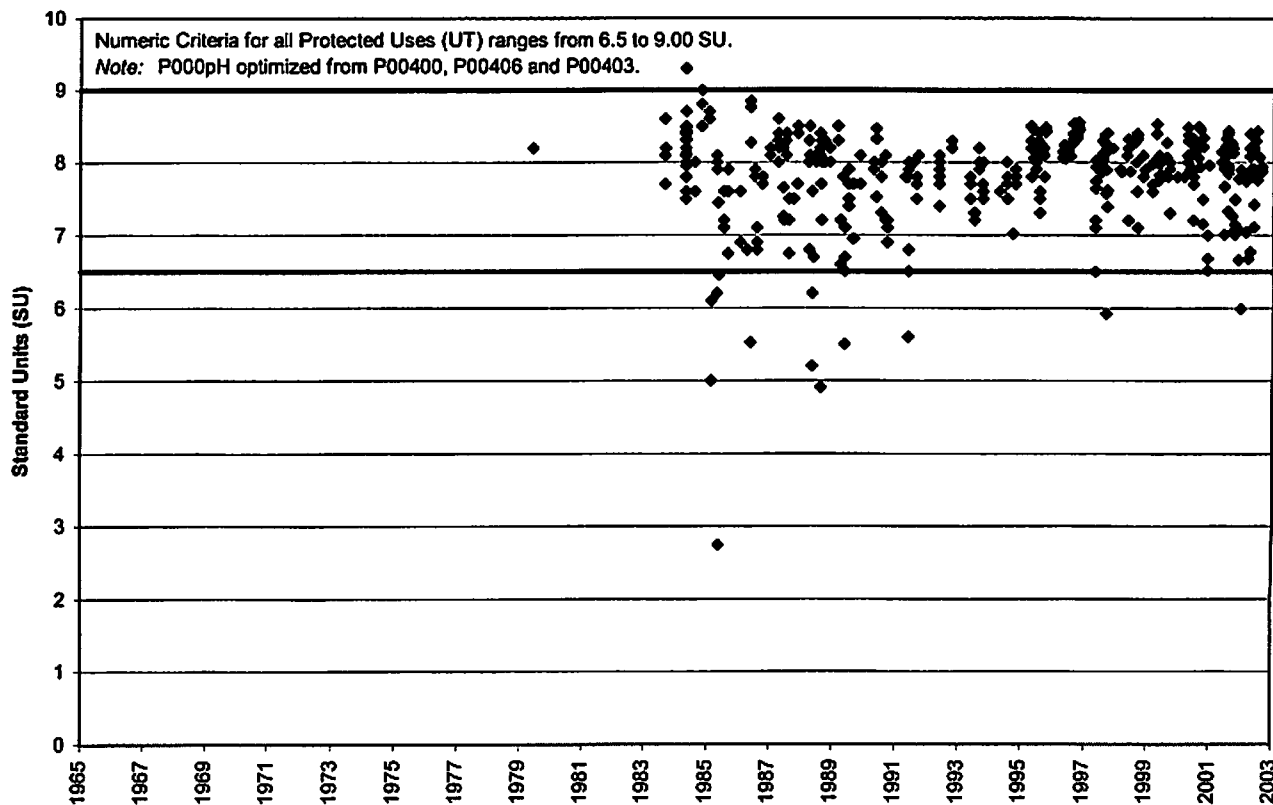
Water Sample Density by Category in Canyonlands National Park (CANY)

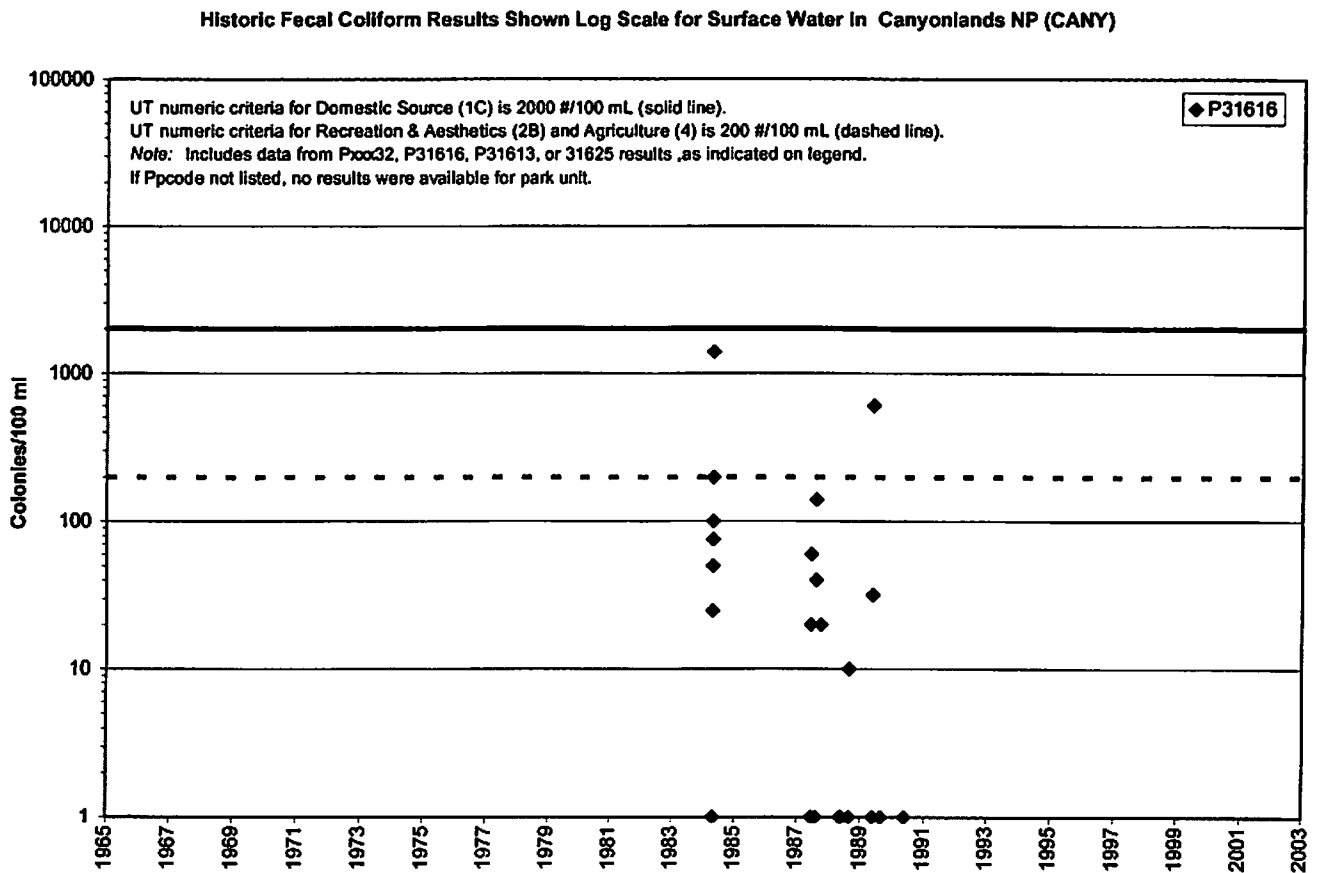
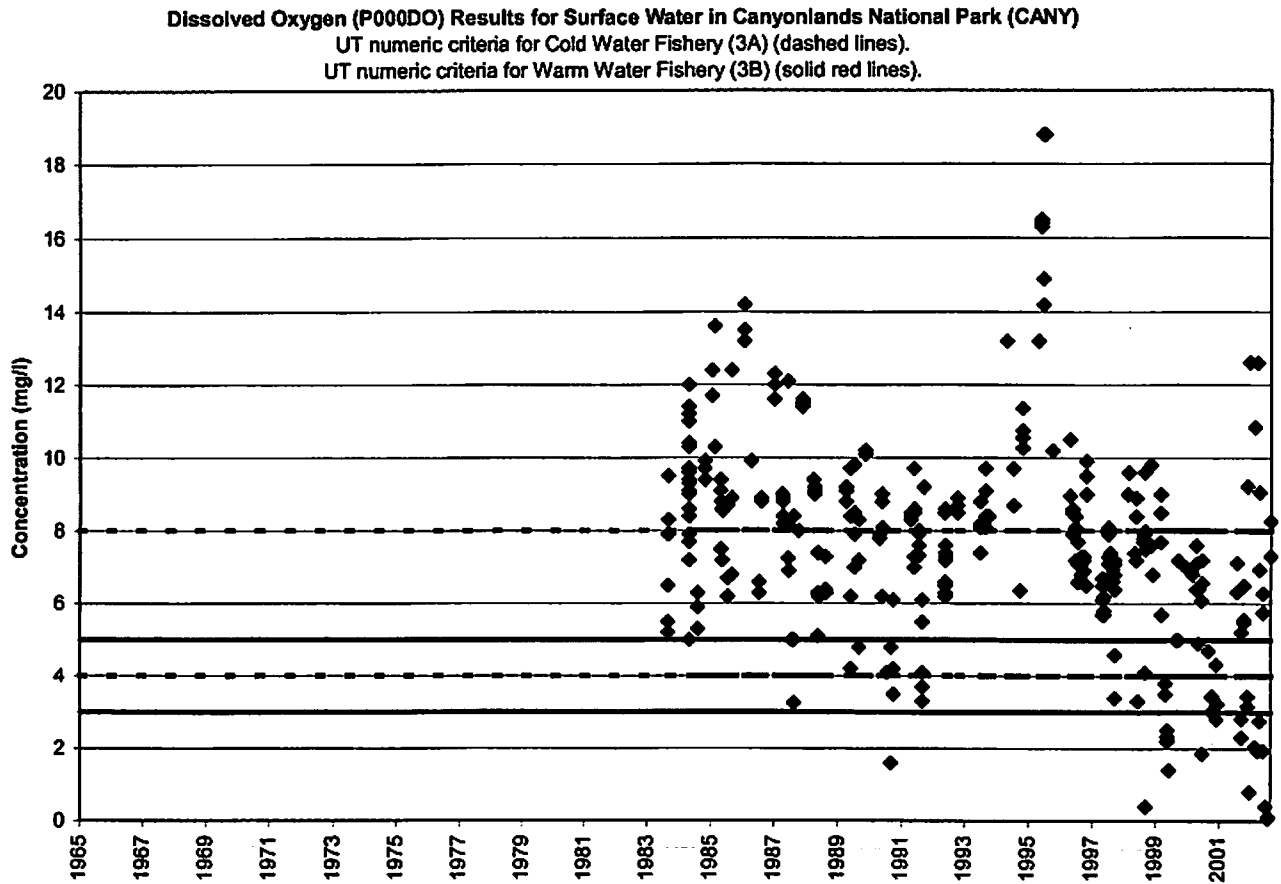


Specific Conductivity (PSPCnd) Results for Surface Water in Canyonlands National Park (CANY)
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

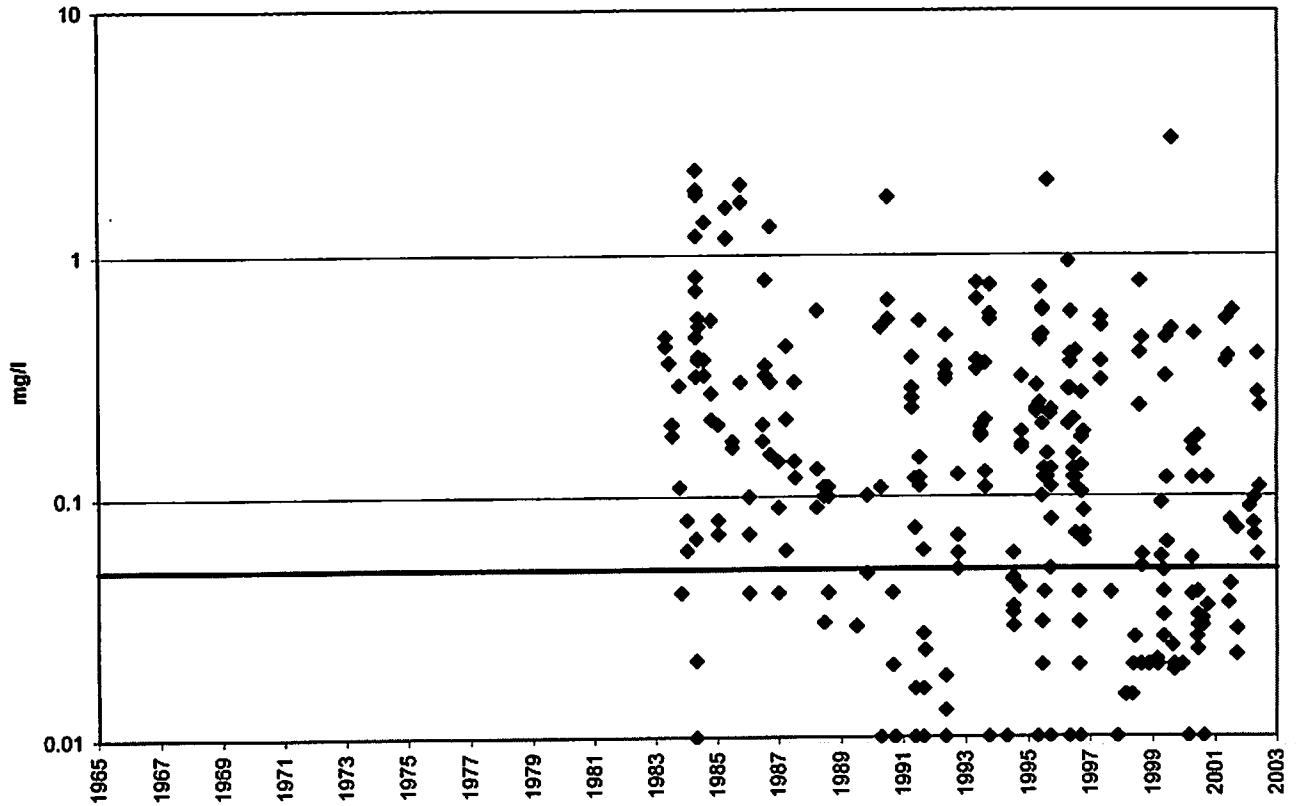


pH (P000pH) Results for Surface Water in Canyonlands National Park (CANY)

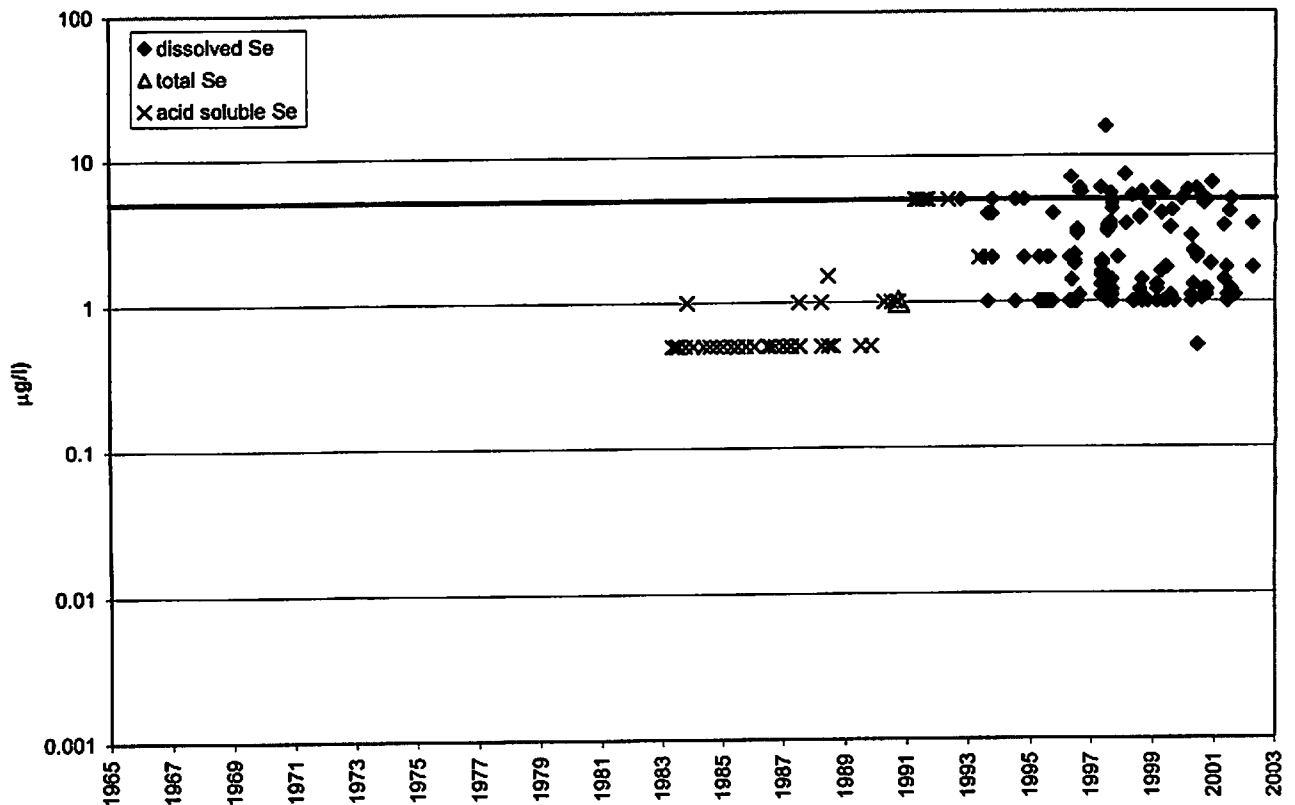




Total Phosphorus (PtotalP) Results for Surface Water in Canyonlands National Park (CANY)
 Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.
 Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.

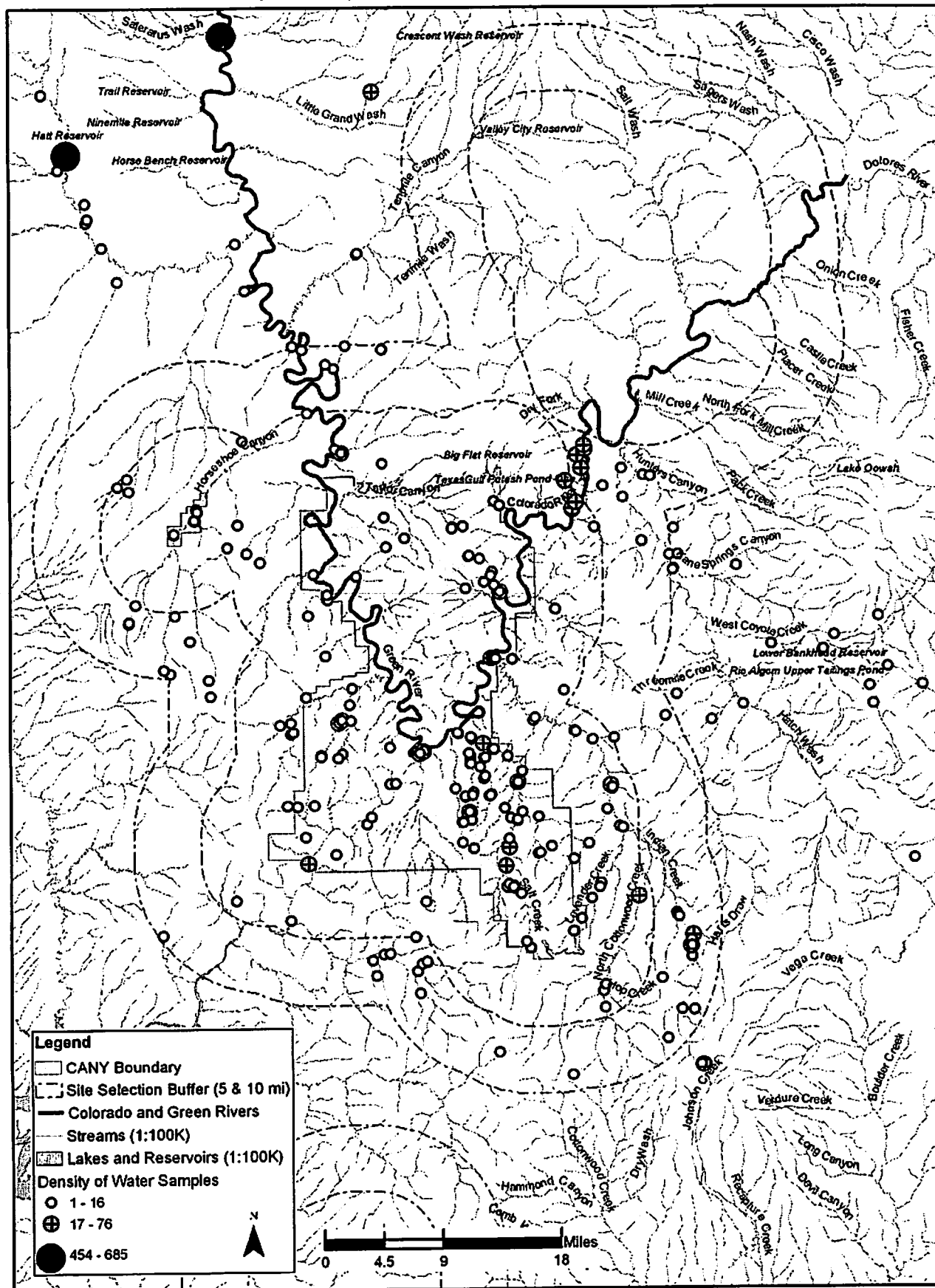


Selenium Results for Surface Water in Canyonlands National Park (CANY)
 USEPA Numeric Criteria for Aquatic Wildlife = 5 µg/l.

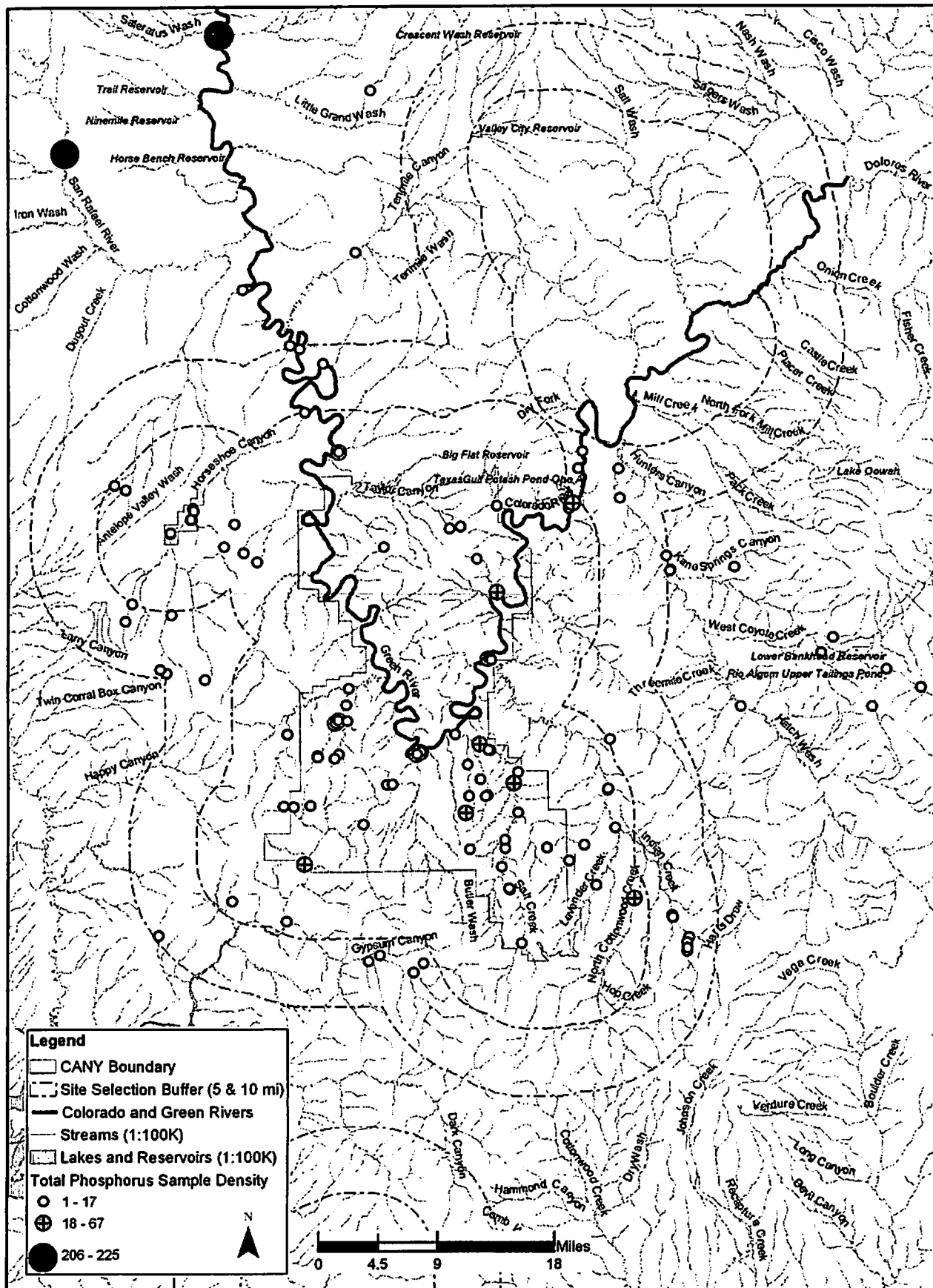




Water Sample Density, Canyonlands National Park (CANY), 1951-2002



Total Phosphorus Water Sample Density, Canyonlands National Park (CANY), 1974-2002



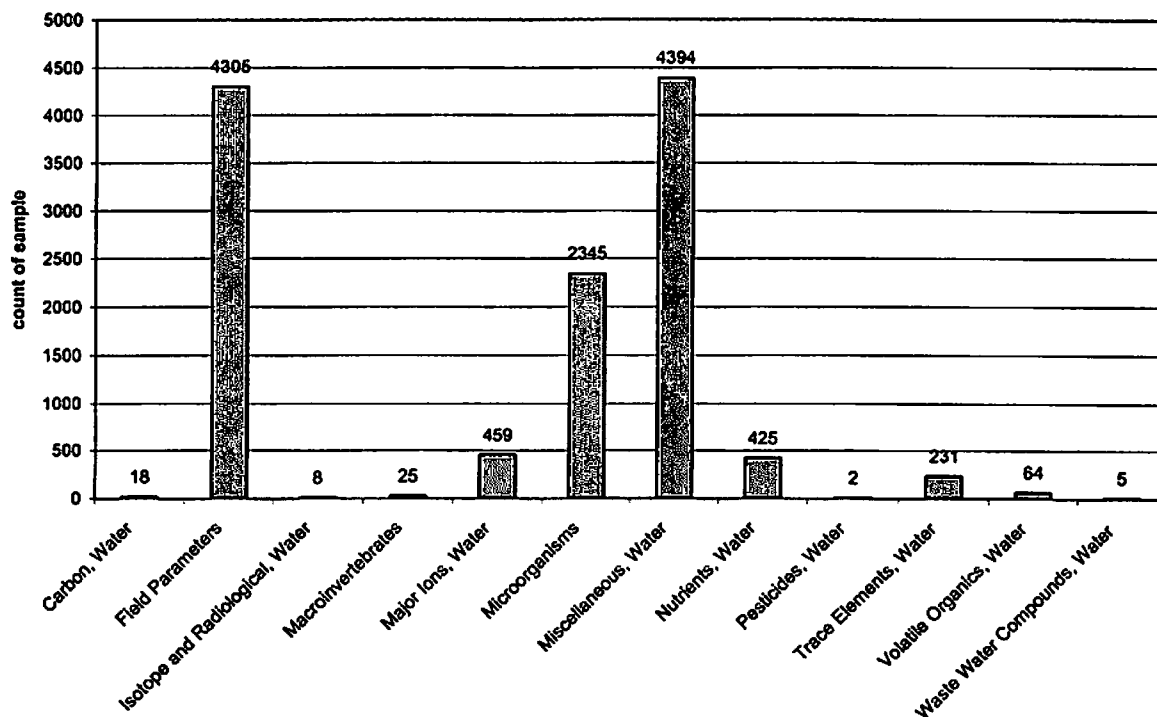
Capitol Reef NP (CARE) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

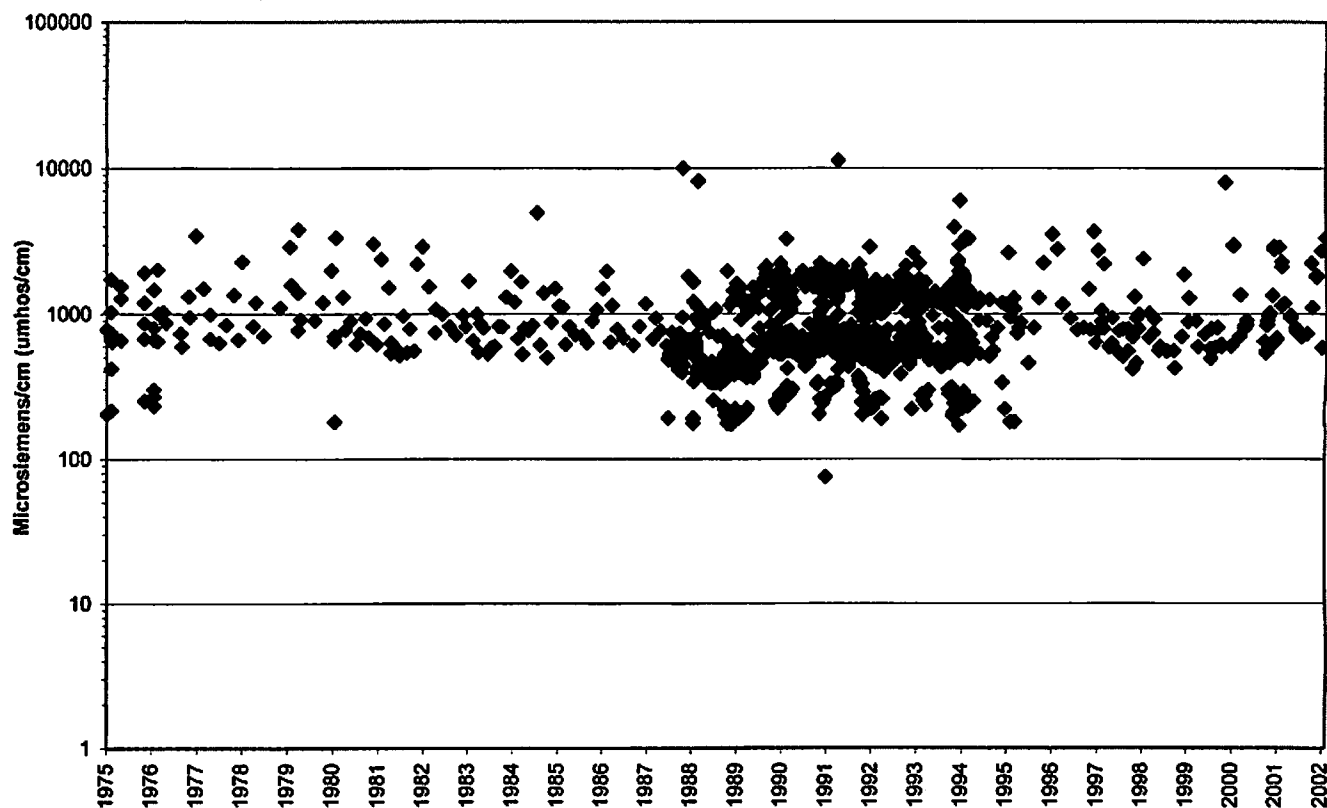
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	50	4457	07/24/1975	07/17/2002
Streamflow	12	28	07/24/1975	09/09/1976
Core Field Parameters ⁽³⁾	46	3779	07/24/1975	07/17/2002
Microorganisms	27	2345	09/09/1976	12/01/1994
Major Ions	41	459	07/24/1975	07/17/2002
Total and Dissolved Selenium	16	118	07/24/1975	09/12/2000
Total Dissolved Solids	16	34	07/24/1975	06/16/1983
Total Suspended Solids	9	118	01/20/1977	07/11/2001
Trace Elements	26	231	07/24/1975	07/11/2001
Pesticides	2	2	08/04/1980	08/04/1980
Nutrients	37	425	7/24/1975	07/11/2001
Unionized Ammonia	17	276	01/20/1977	04/07/1999
Ammonia	10	194	06/16/1983	03/17/1993
Nitrite	2	11	05/26/1977	11/02/1990
Nitrate	30	320	07/24/1975	10/25/2000
Total Nitrogen	6	59	01/20/1977	10/19/1995
Ortho-Phosphorus	29	161	07/24/1975	04/08/1994
Total Phosphorus	9	115	01/20/1977	07/11/2001
Macroinvertebrates	1	25	10/02/1985	02/25/1998

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

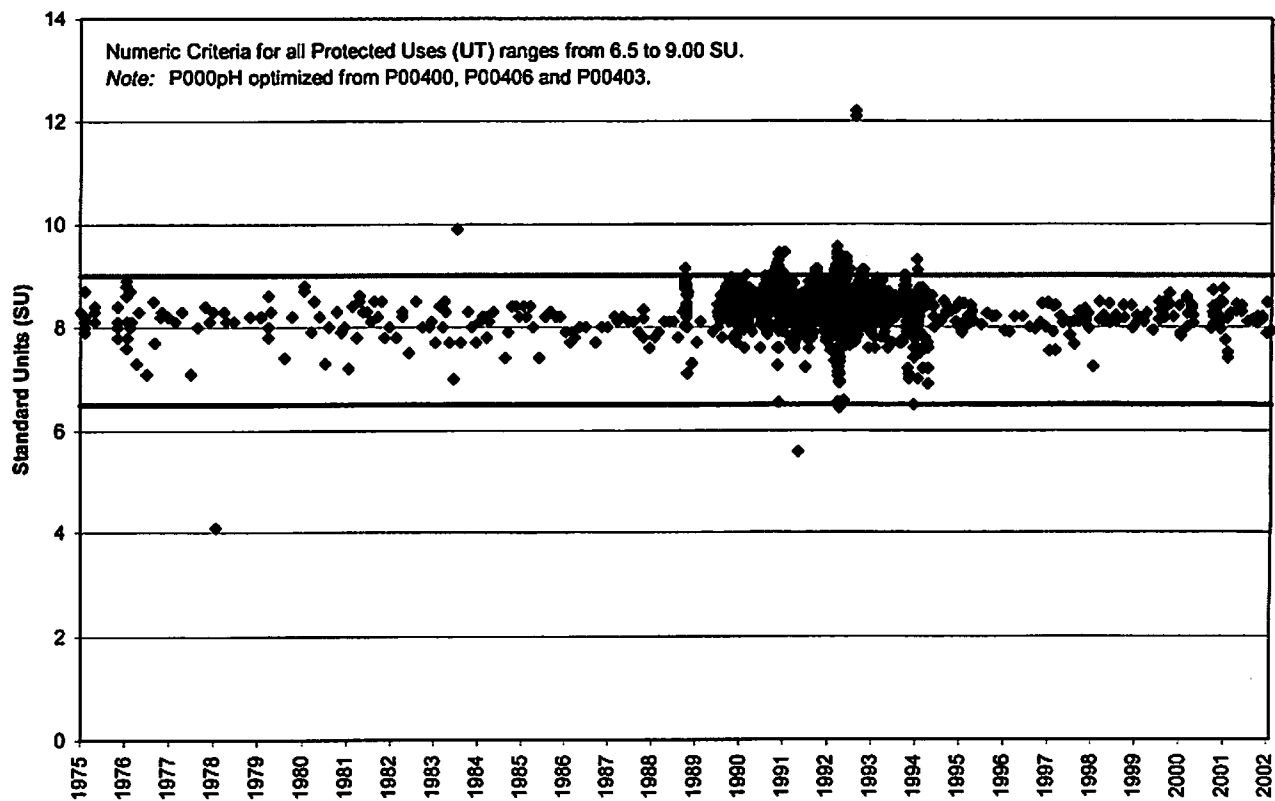
Water Sample Density by Category in Capitol Reef National Park (CARE)



Specific Conductivity (PSPCnd) Results for Surface Water in Capitol Reef National Park (CARE)
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



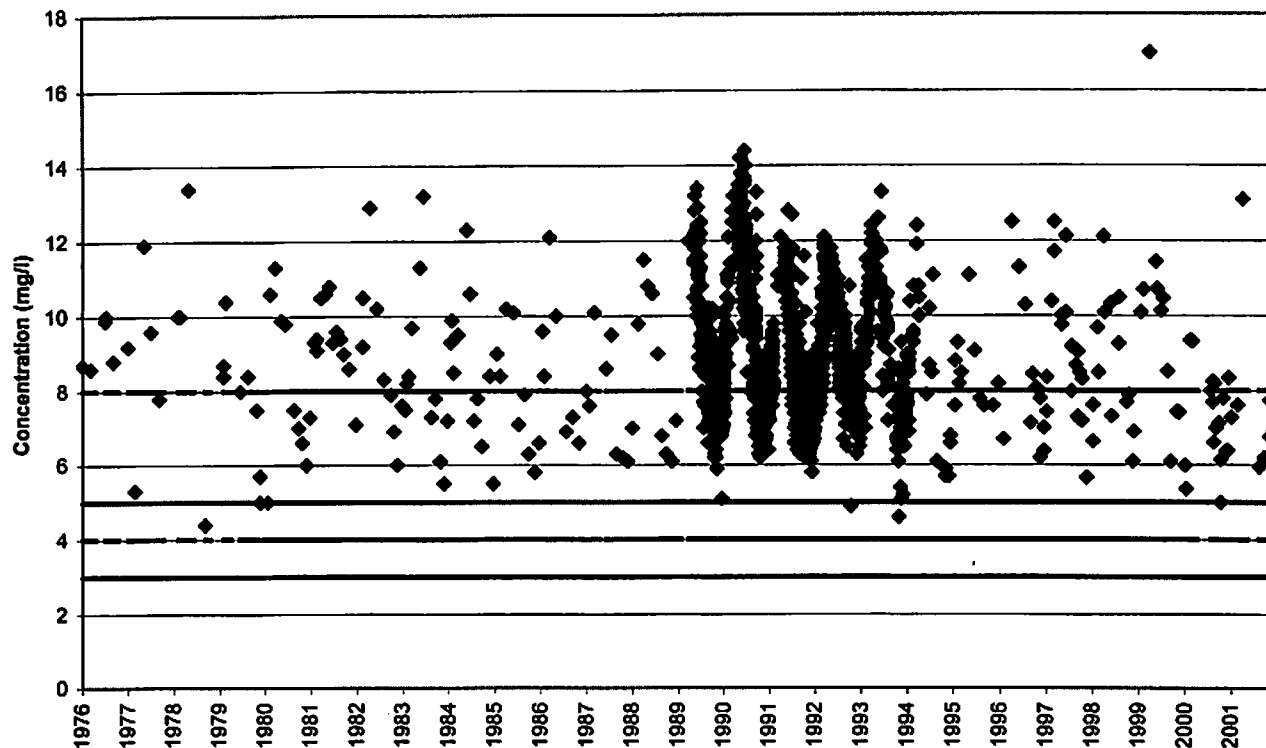
pH (P000pH) Results for Surface Water in Capitol Reef National Park (CARE)



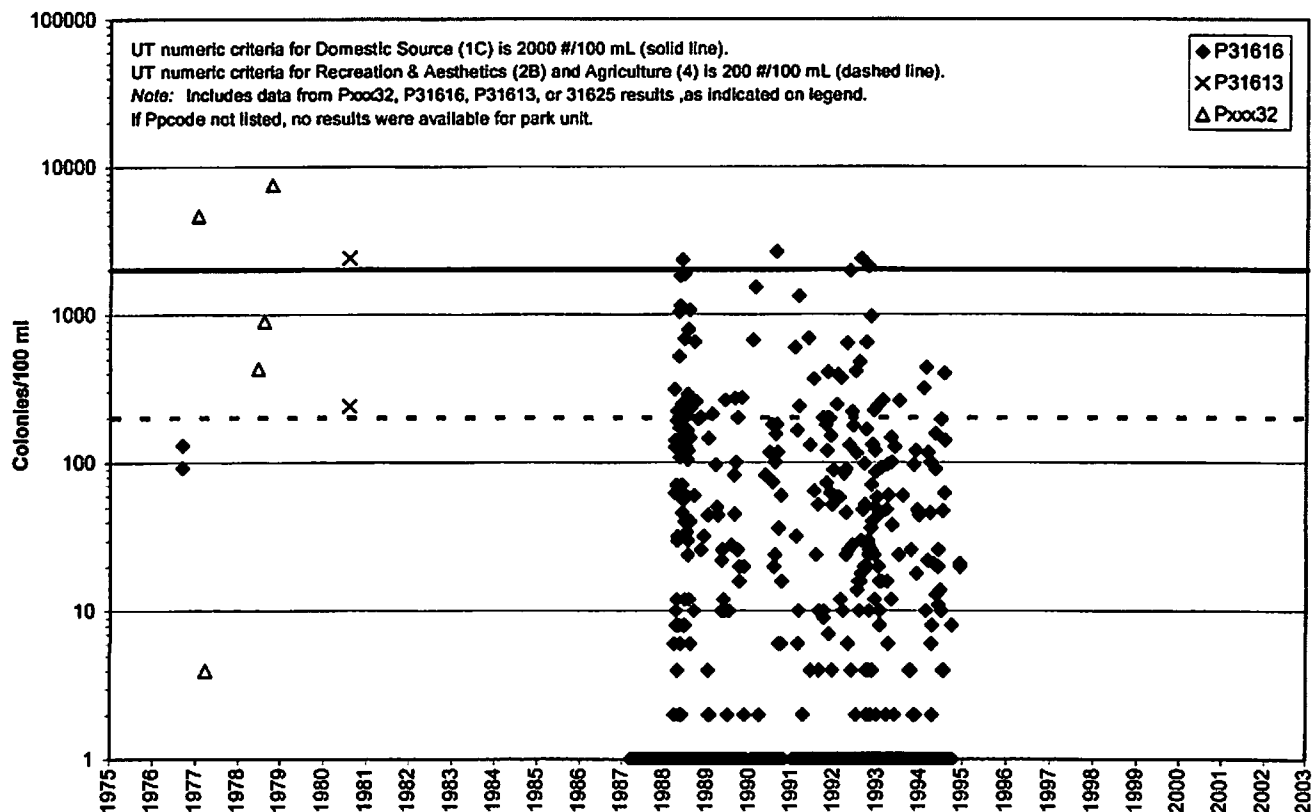
Dissolved Oxygen (P000DO) Results for Surface Water In Capitol Reef National Park (CARE)

UT numeric criteria for Cold Water Fishery (3A) (dashed lines).

UT numeric criteria for Warm Water Fishery (3B) (solid red lines).



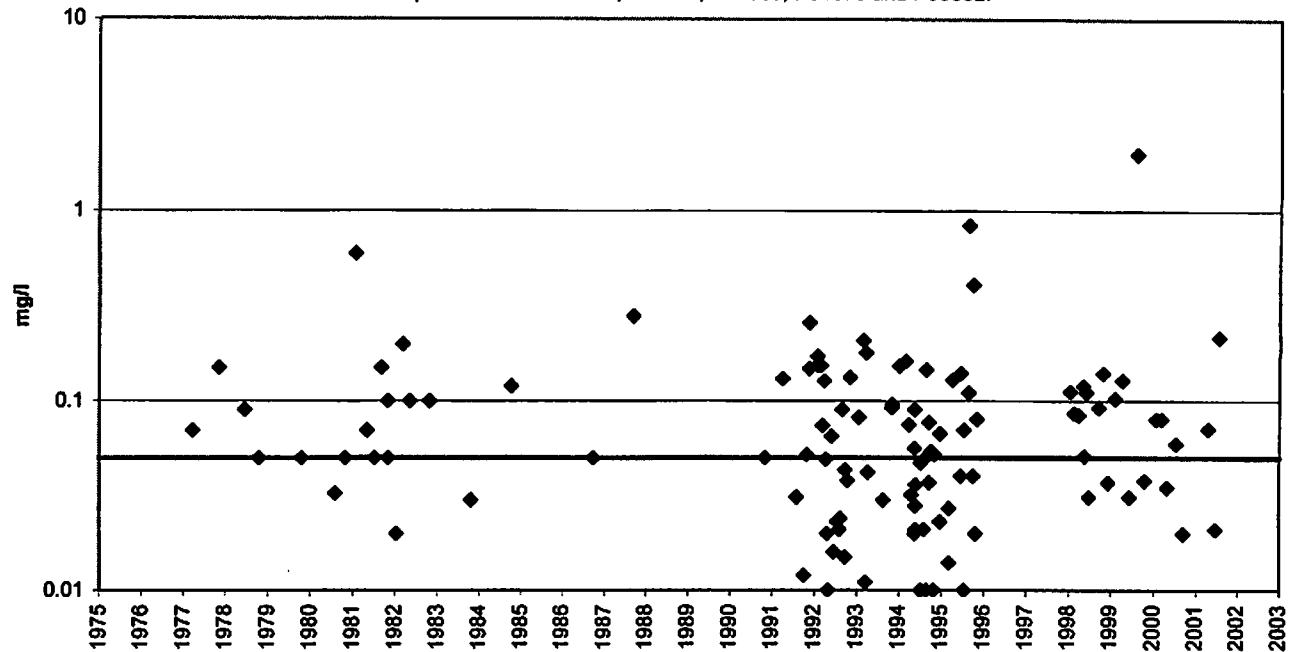
Historic Fecal Coliform Results Shown Log Scale for Surface Water In Capitol Reef NP (CARE)



Total Phosphorus (PtotalP) Results for Surface Water in Capitol Reef National Park (CARE)

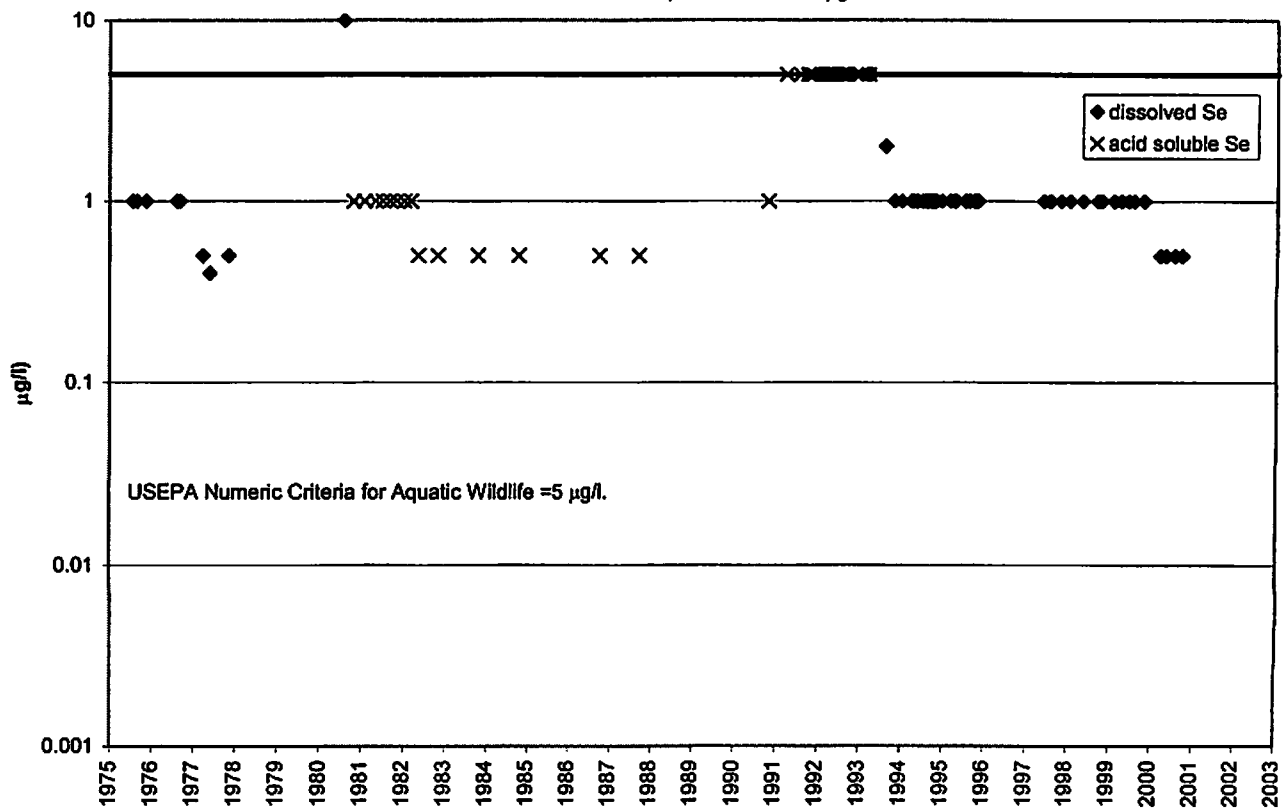
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.

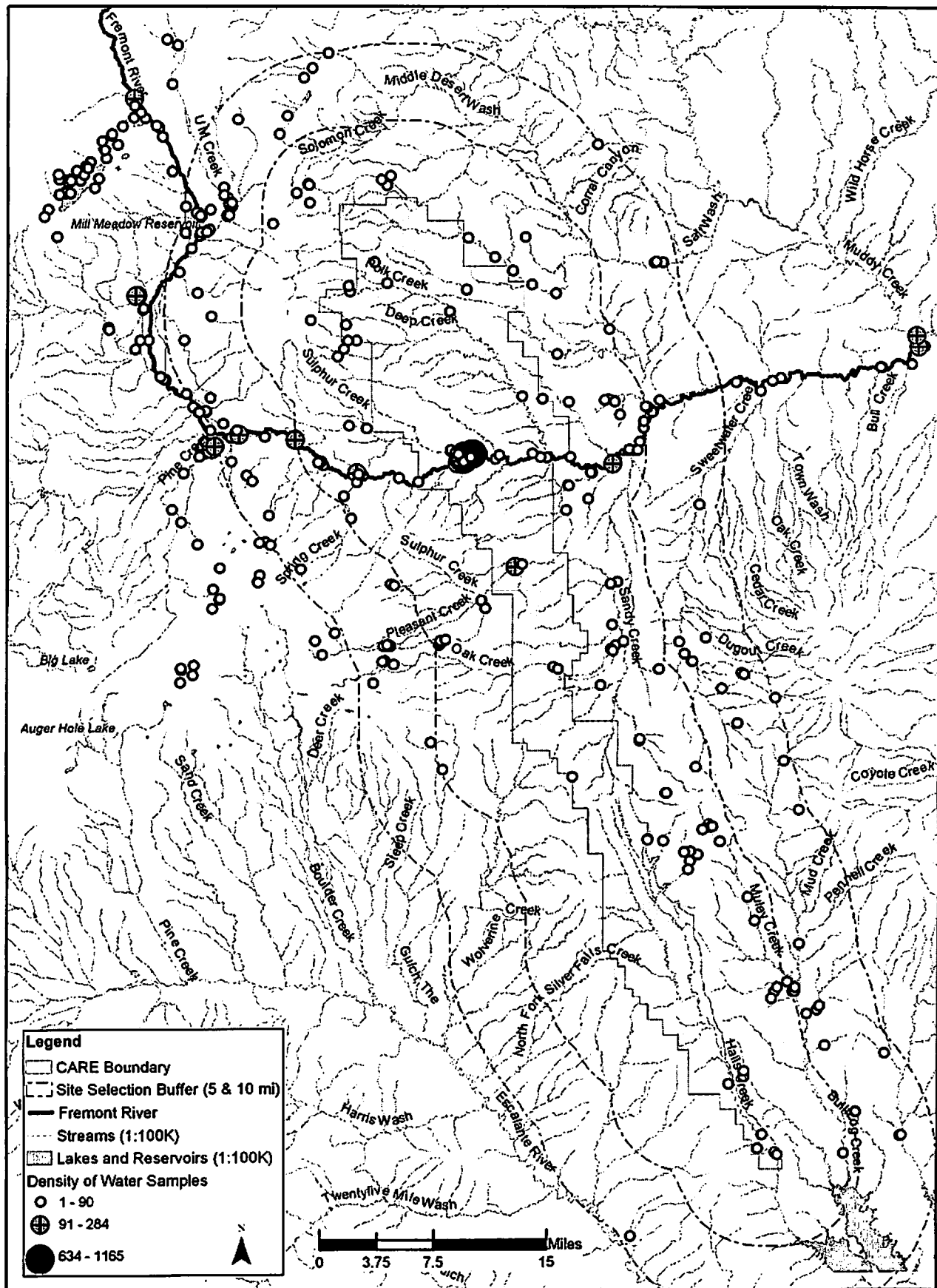


Selenium Results for Surface Water in Capitol Reef National Park (CARE)

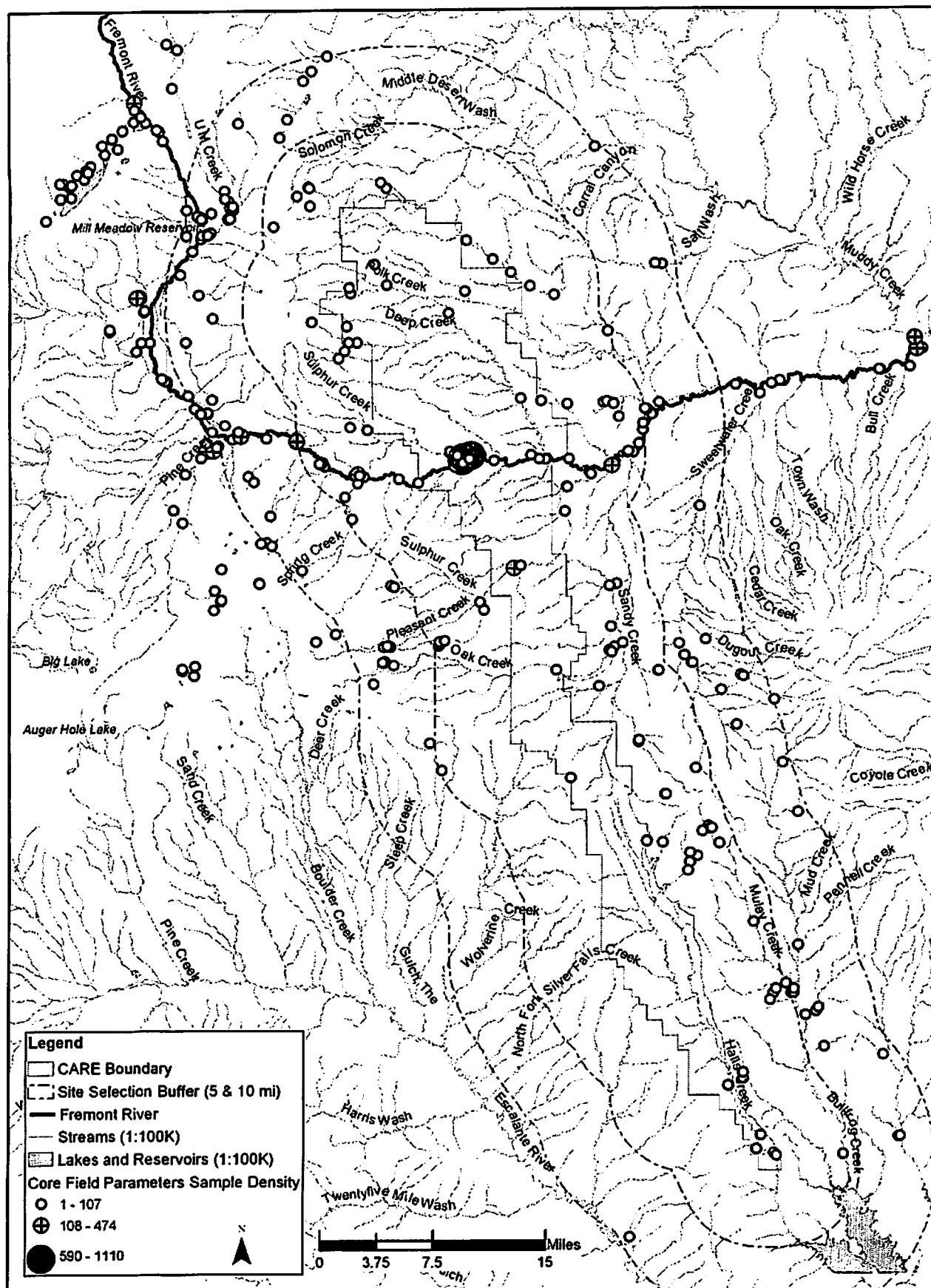
USEPA Numeric Criteria for Aquatic Wildlife =5 µg/l.



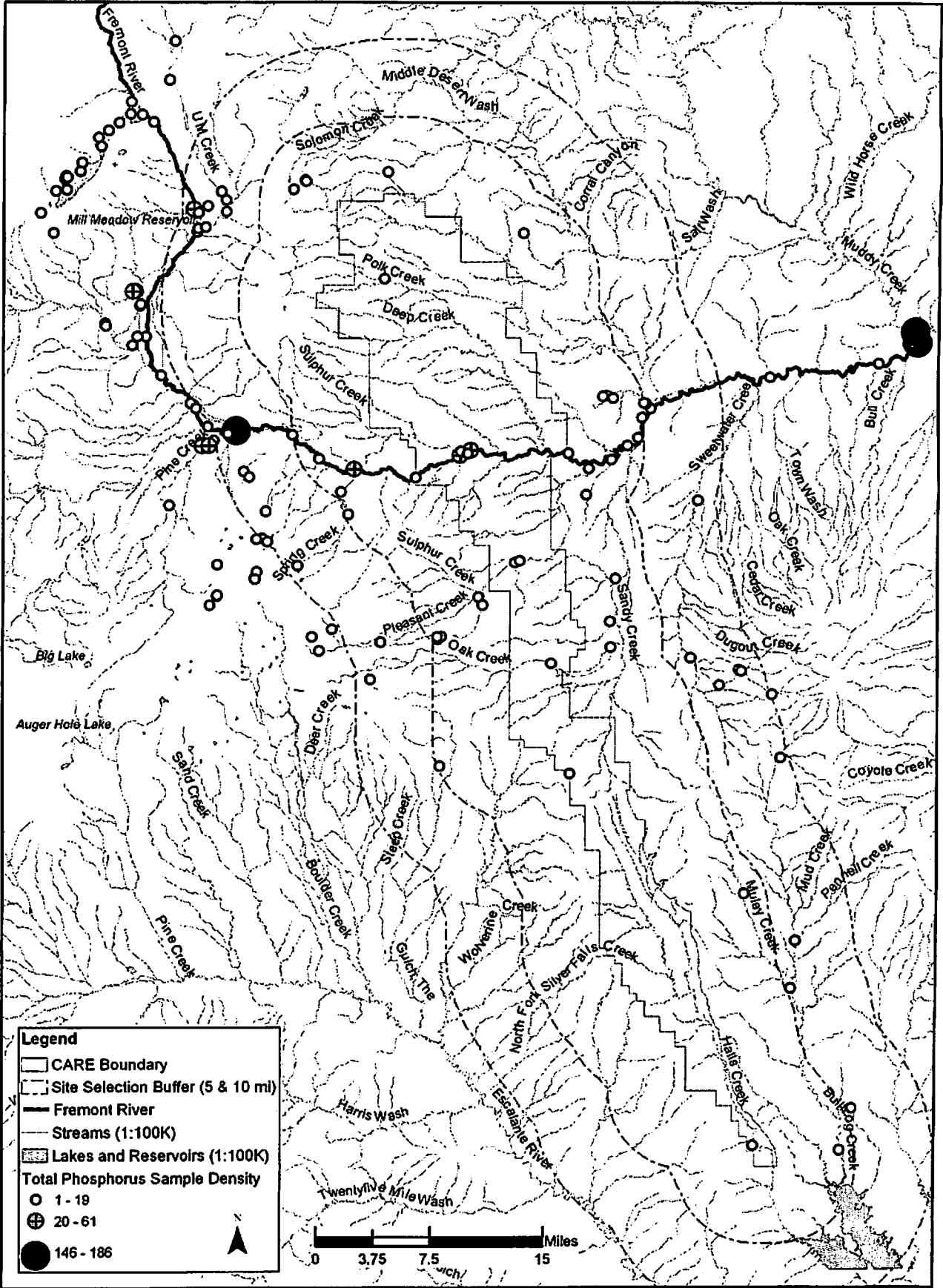
Water Sample Density, Capitol Reef National Park (CARE), 1966-2002



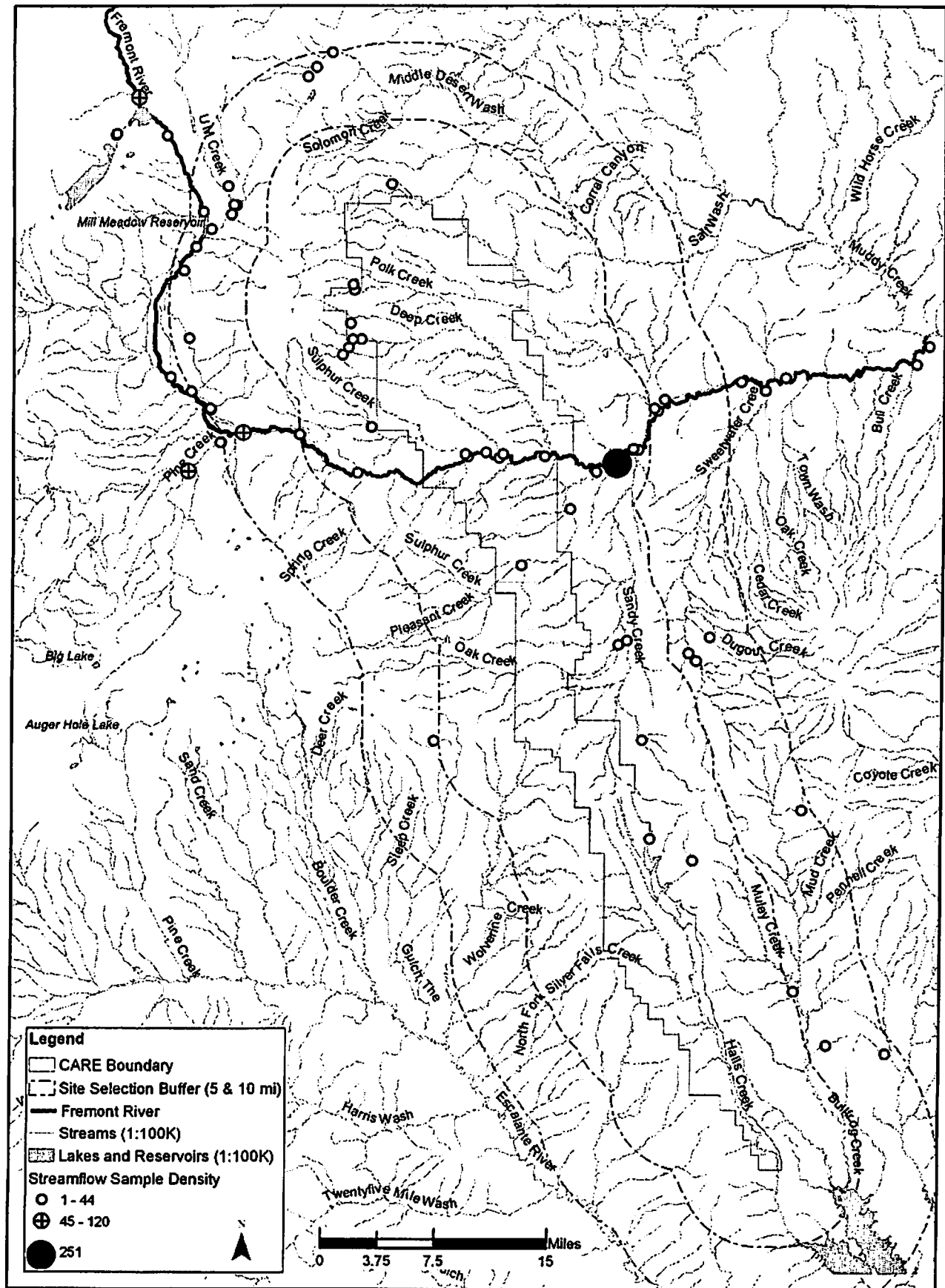
Core Field Parameters Sample Density, Capitol Reef National Park (CARE), 1966-2002



Total Phosphorus Water Samples Density, Capitol Reef National Park (CARE), 1971-2002



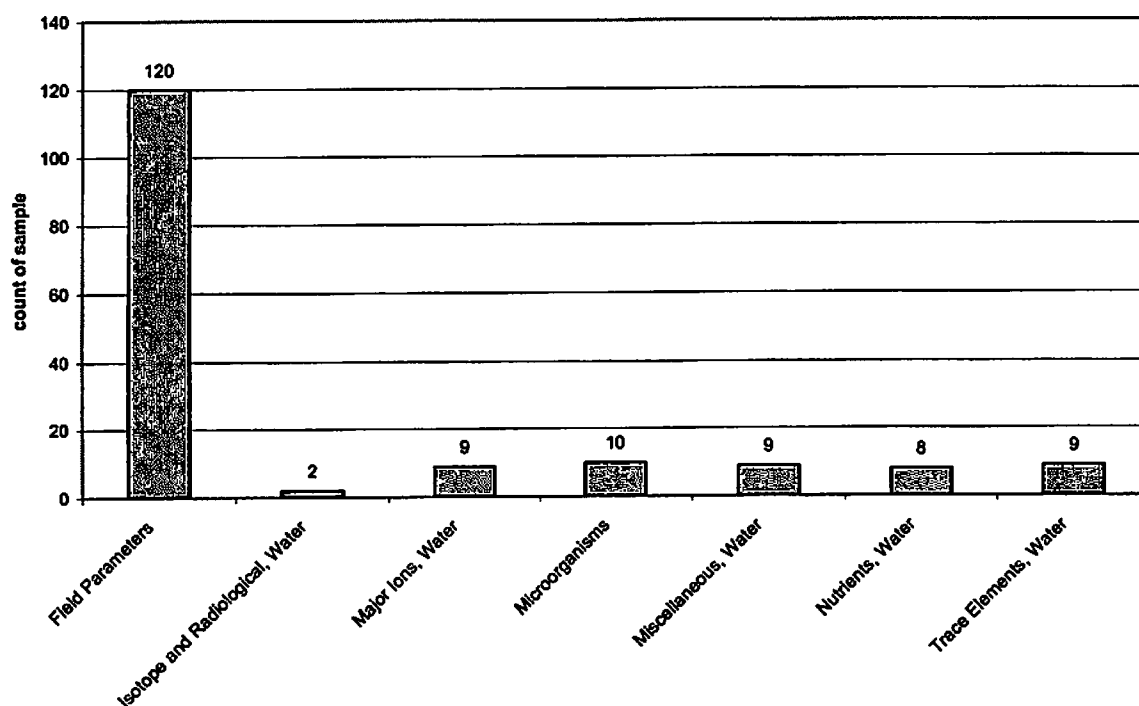
Streamflow Sample Density, Capitol Reef National Park (CARE), 1967-2002



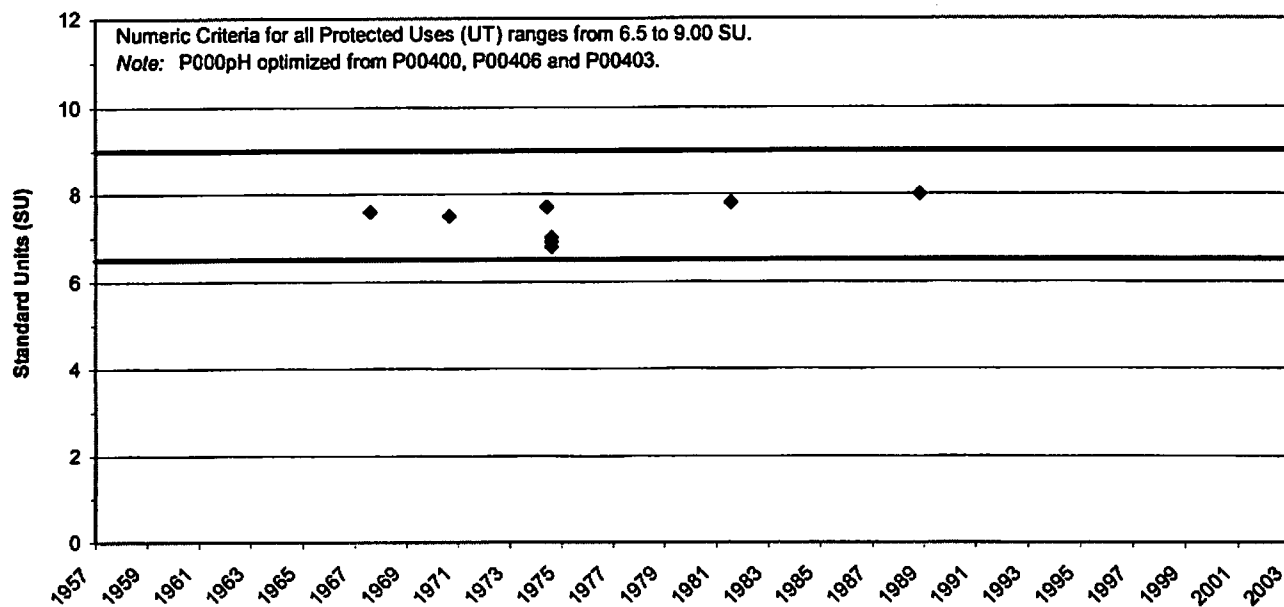
Cedar Breaks NM (CEBR) SummarySite and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	16	130	07/03/1957	05/18/1993
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	6	23	08/02/1967	11/01/1988
Microorganisms	2	10	07/10/1984	05/18/1993
Major Ions	7	9	08/02/1967	11/01/1988
Total and Dissolved Selenium	1	1	11/01/1988	11/01/1988
Total Dissolved Solids	7	9	08/02/1967	11/01/1988
Total Suspended Solids	1	1	11/01/1988	11/01/1988
Trace Elements	7	9	08/02/1967	11/01/1988
Pesticides	0	n/a	n/a	n/a
Nutrients	6	8	08/02/1967	11/01/1988
Unionized Ammonia	0	n/a	n/a	n/a
Ammonia	1	1	11/01/1988	11/01/1988
Nitrite	1	1	11/01/1988	11/01/1988
Nitrate	5	7	08/02/1967	11/01/1988
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	4	4	05/22/1974	11/01/1988
Total Phosphorus	0	n/a	n/a	n/a
Macroinvertebrates	0	n/a	n/a	n/a

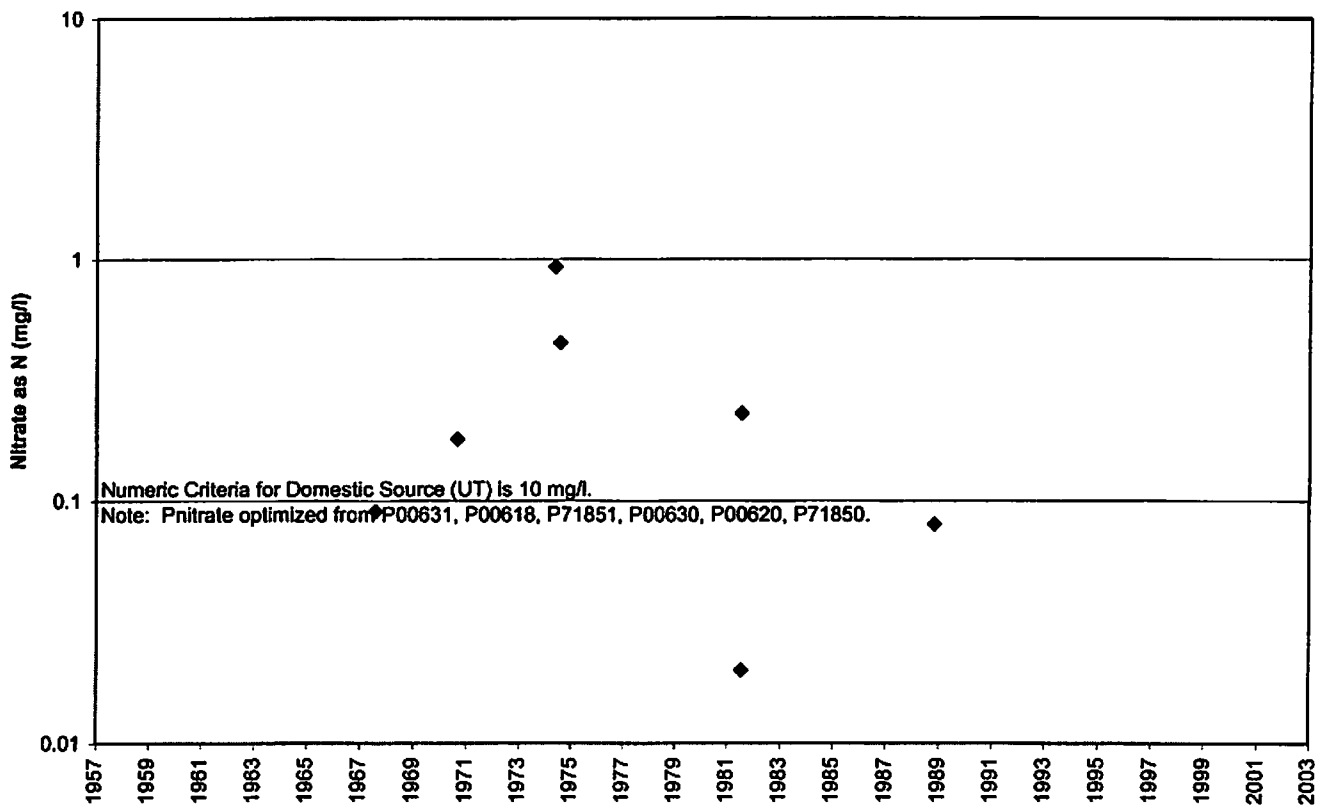
⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

Water Sample Density by Category in Cedar Breaks National Monument (CEBR)

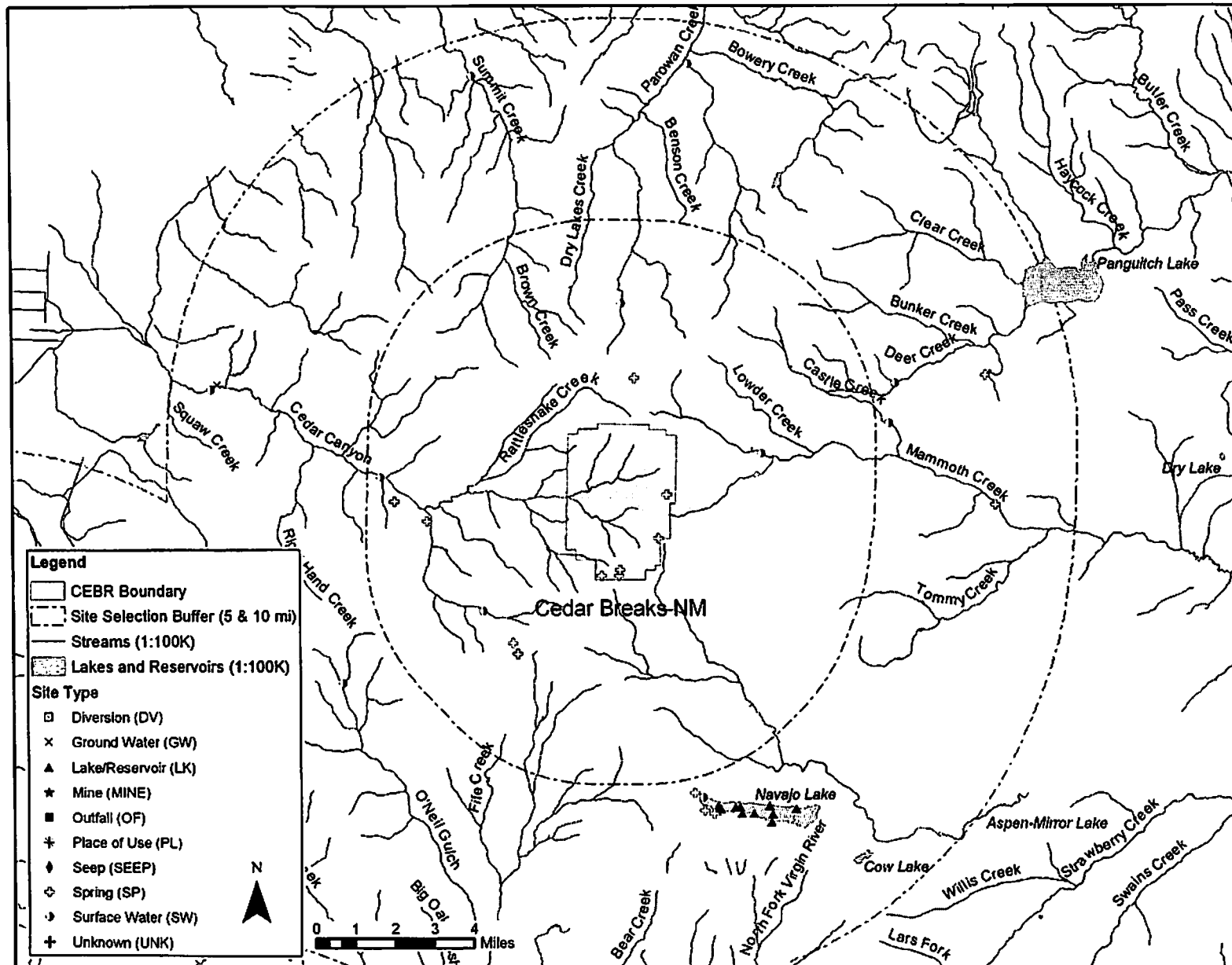
pH (P000pH) Results for Spring Water in Cedar Breaks National Monument (CEBR)



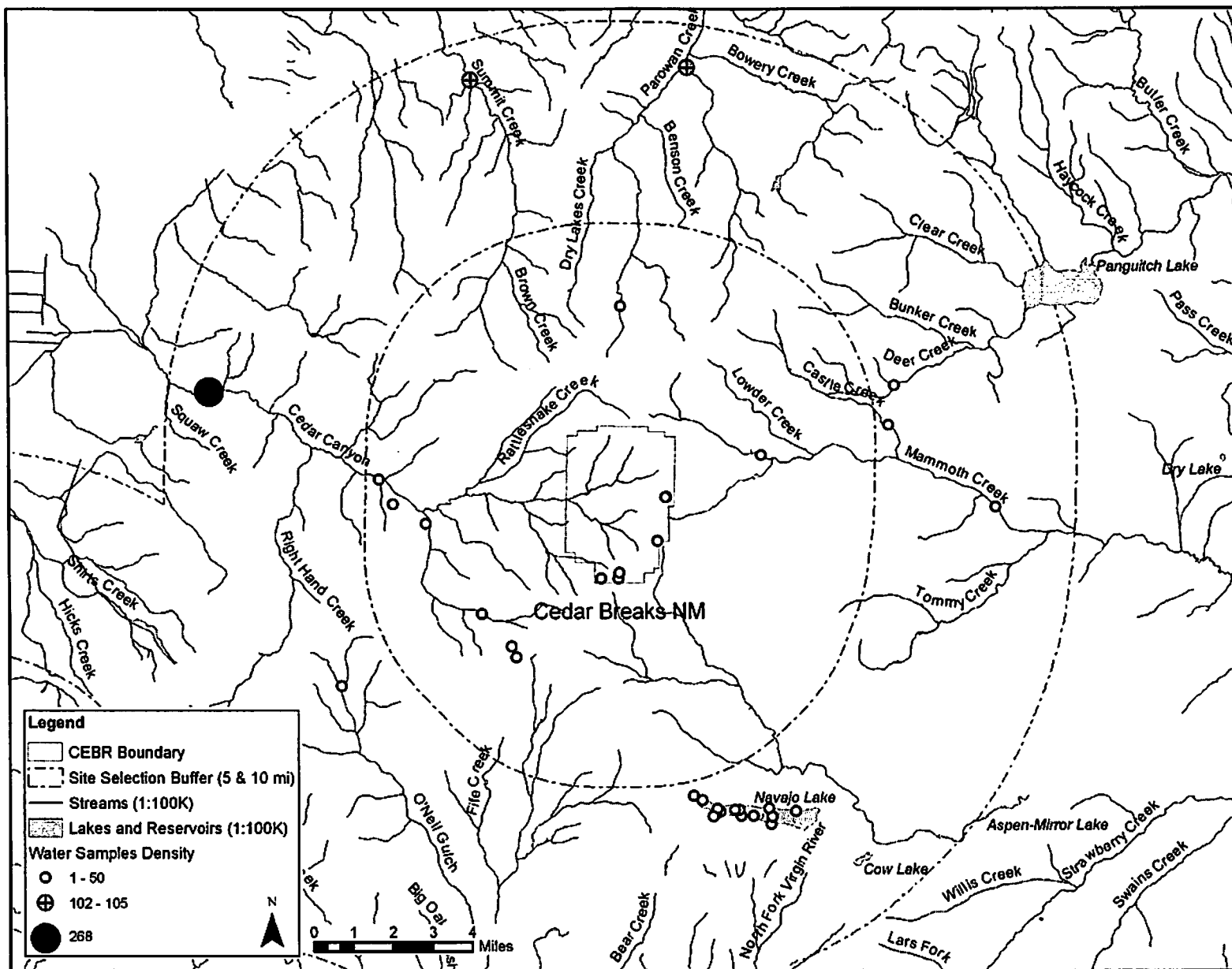
Nitrate Results for Surface Water in Cedar Breaks National Monument (CEBR)



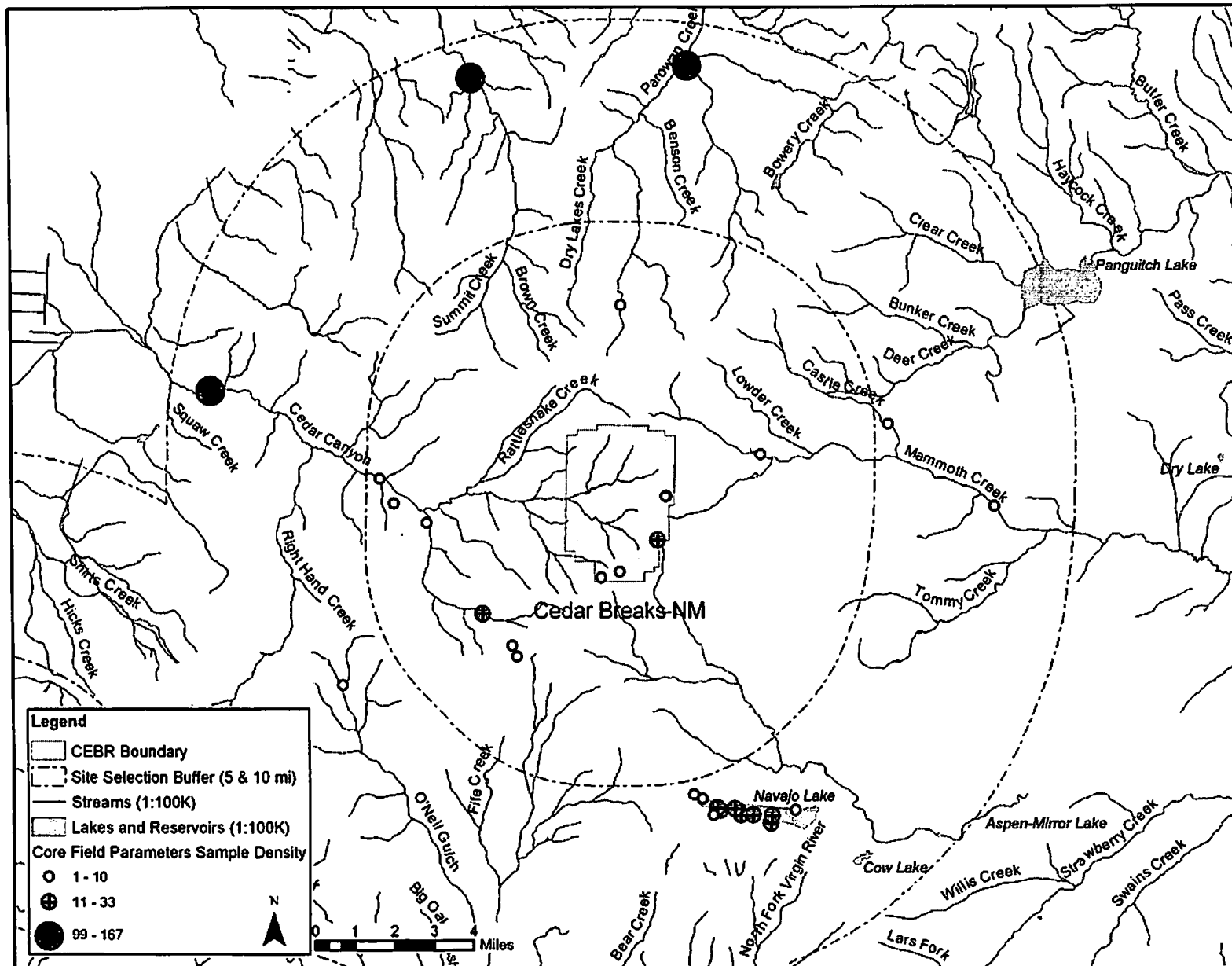
Historic Sample Site Locations by Site Type, Cedar Breaks National Monument (CEBR), 1957-2002



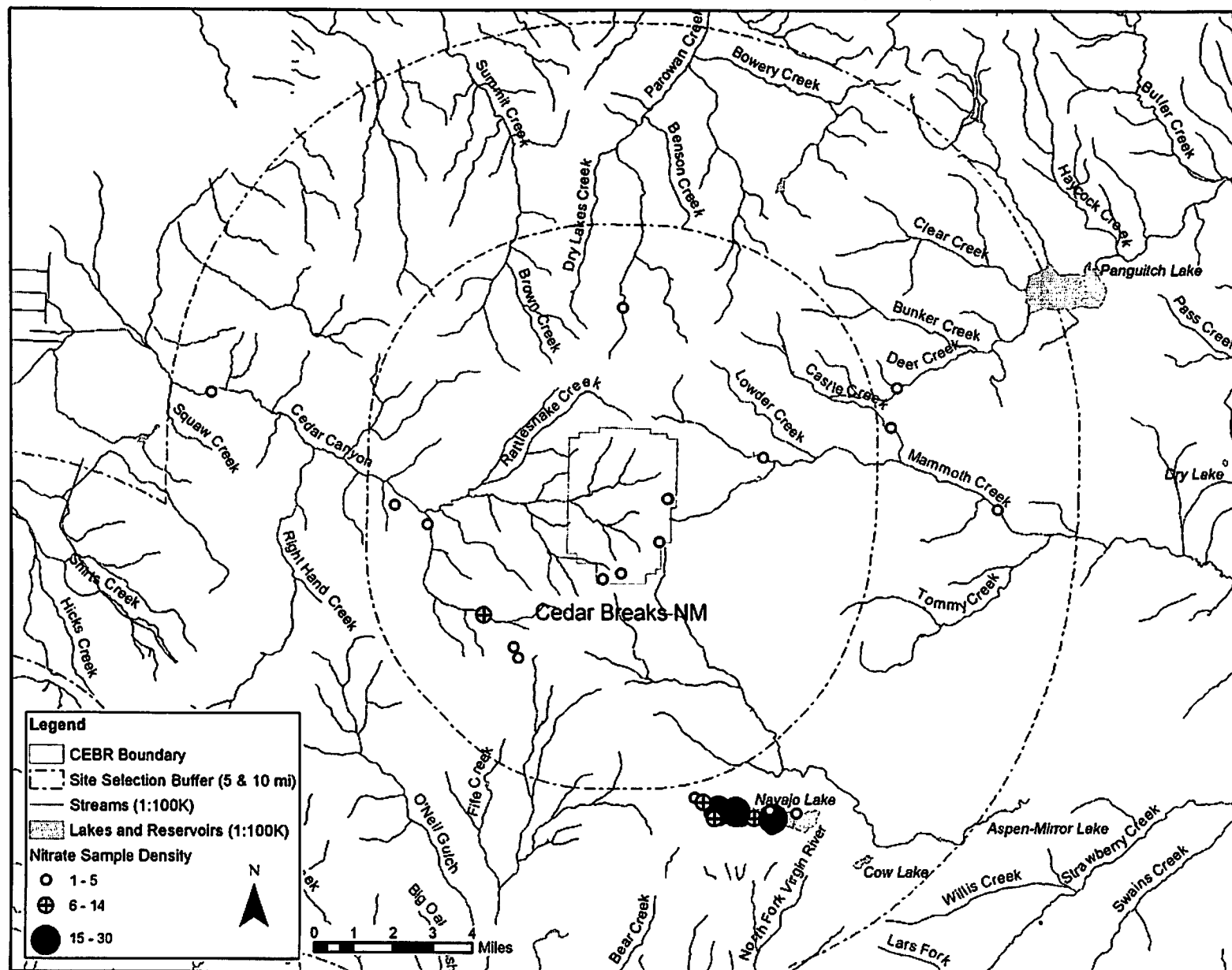
Water Sample Density, Cedar Breaks National Monument (CEBR), 1957-2002



Core Field Parameters Sample Density, Cedar Breaks National Monument (CEBR), 1967-2002



Nitrate Water Sample Density, Cedar Breaks National Monument (CEBR), 1967-2002



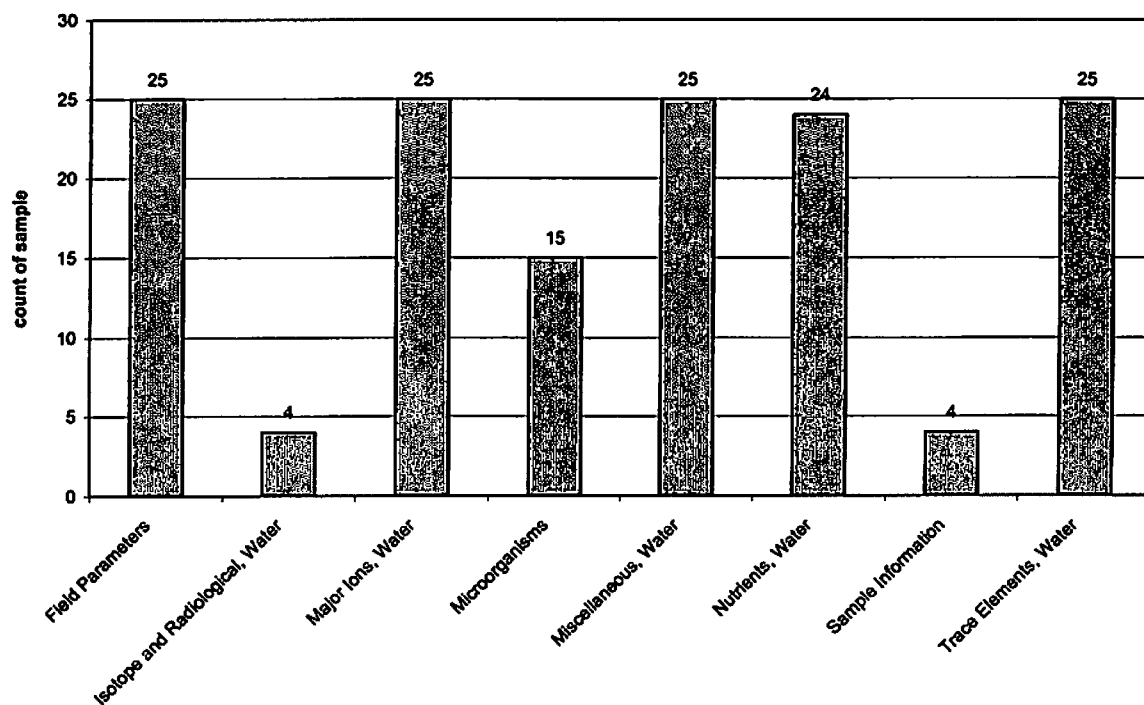
Colorado NM (COLM) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

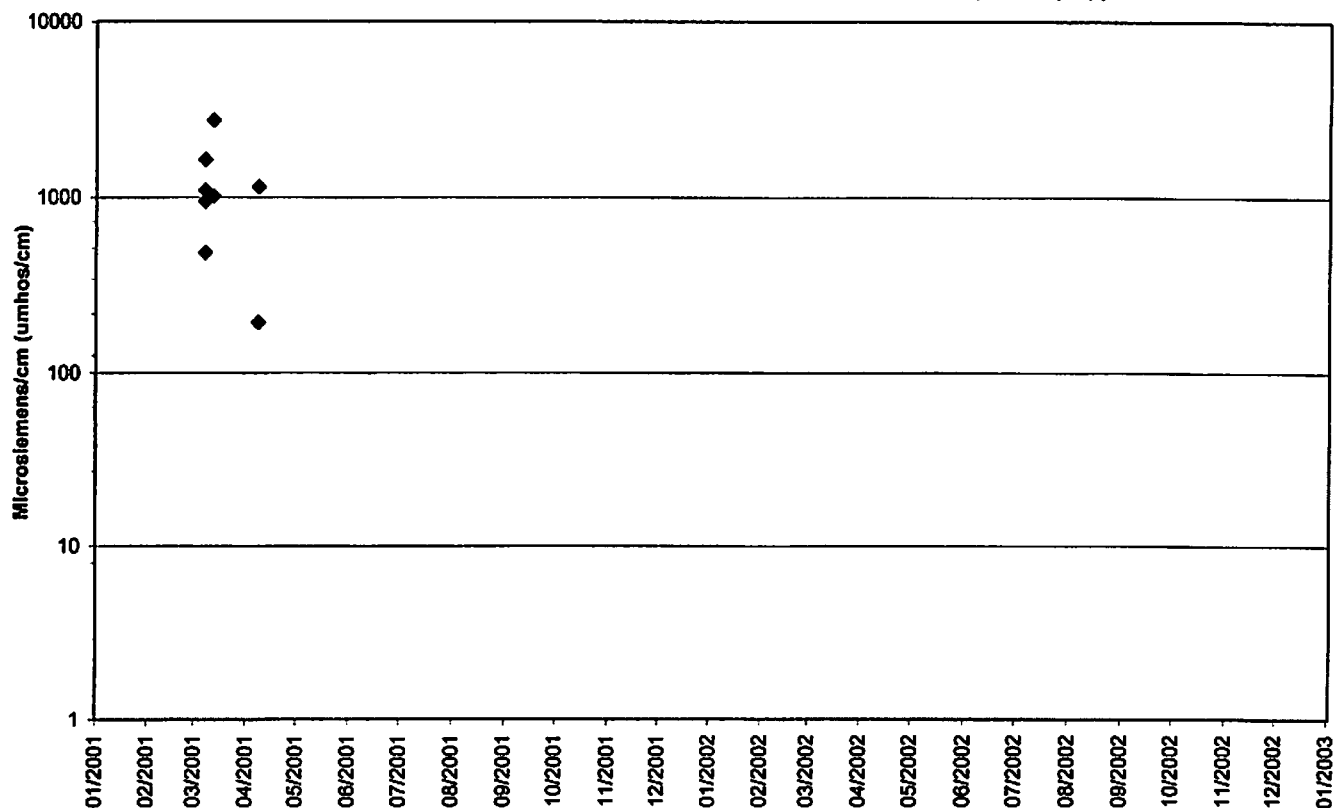
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	17	25	03/07/2001	11/08/2001
Streamflow	5	6	03/07/2001	04/08/2001
Core Field Parameters ⁽³⁾	14	21	03/07/2001	11/08/2001
Microorganisms	14	15	03/07/2001	05/15/2001
Major Ions	17	25	03/07/2001	11/08/2001
Total and Dissolved Selenium	17	25	03/07/2001	11/08/2001
Total Dissolved Solids	17	25	03/07/2001	11/08/2001
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	17	25	03/07/2001	11/08/2001
Pesticides	0	n/a	n/a	n/a
Nutrients	17	24	03/07/2001	11/08/2001
Unionized Ammonia	0	n/a	n/a	n/a
Ammonia	0	n/a	n/a	n/a
Nitrite	0	n/a	n/a	n/a
Nitrate	17	24	03/07/2001	11/08/2001
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	0	n/a	n/a	n/a
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

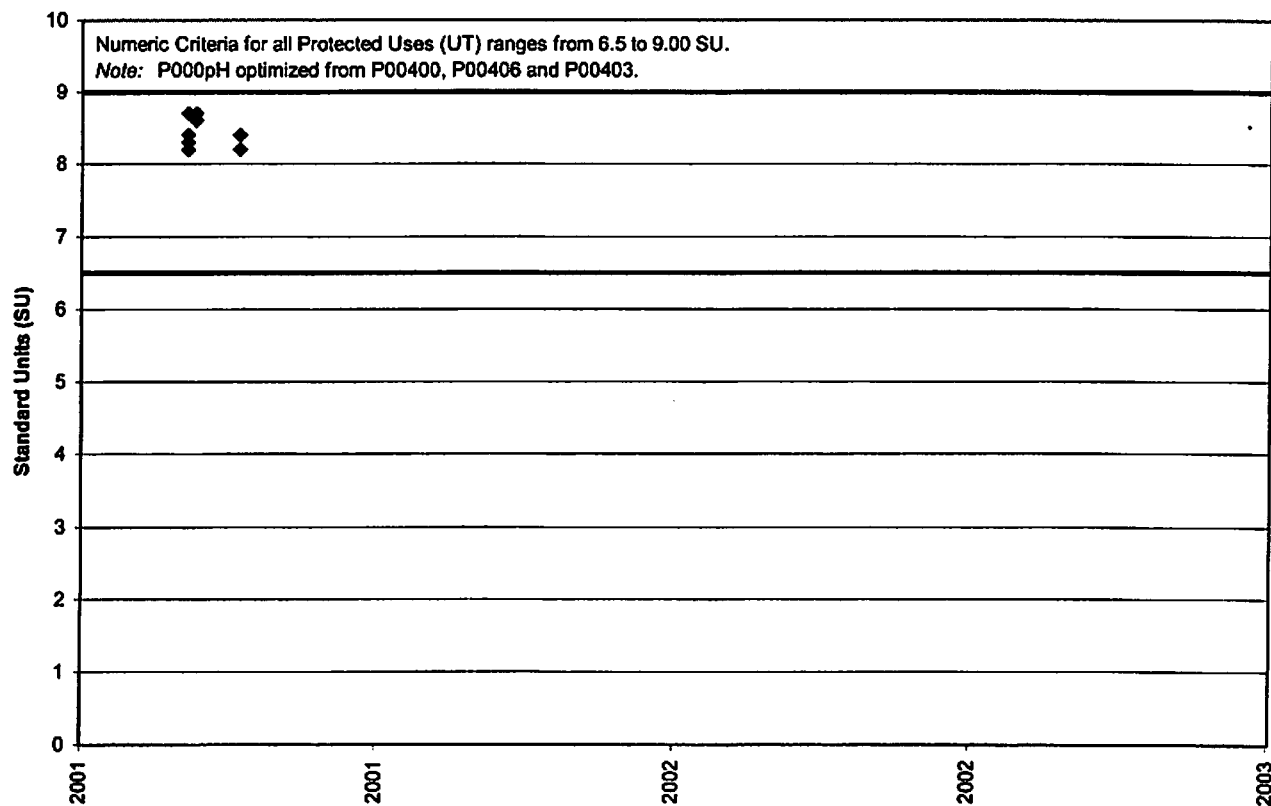
Water Sample Density by Category in Colorado National Monument (COLM)



Specific Conductivity (PSPCnd) Results for Surface Water in Colorado National Monument (COLM)
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

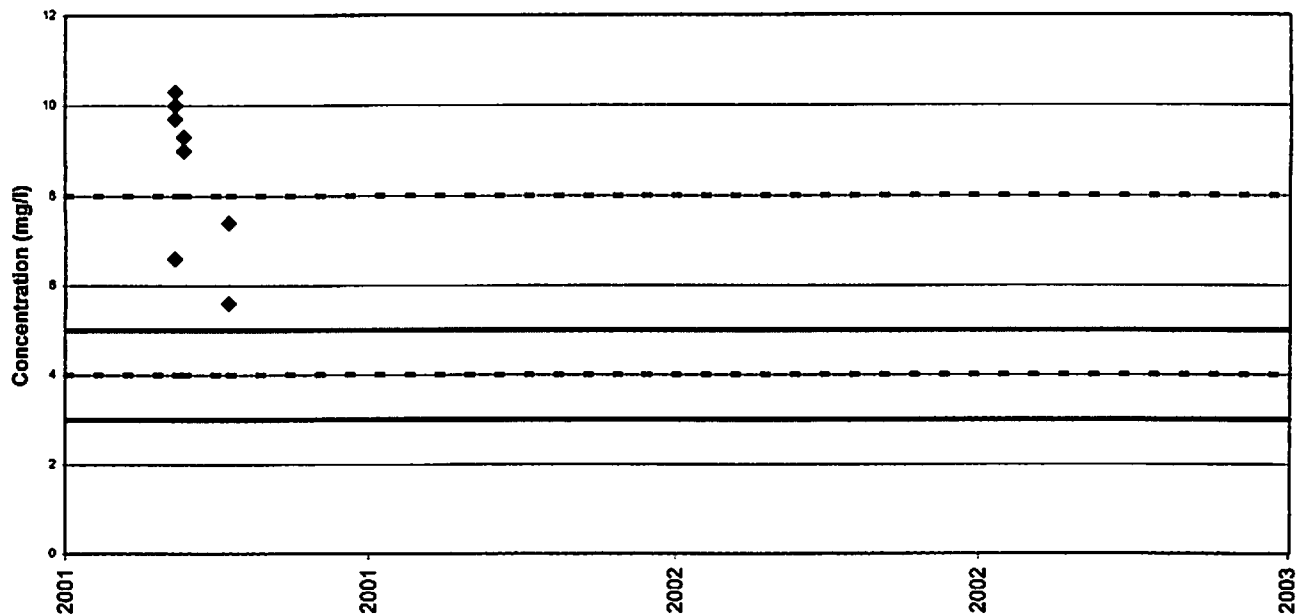


pH (P000pH) Results for Surface Water in Colorado National Monument (COLM)

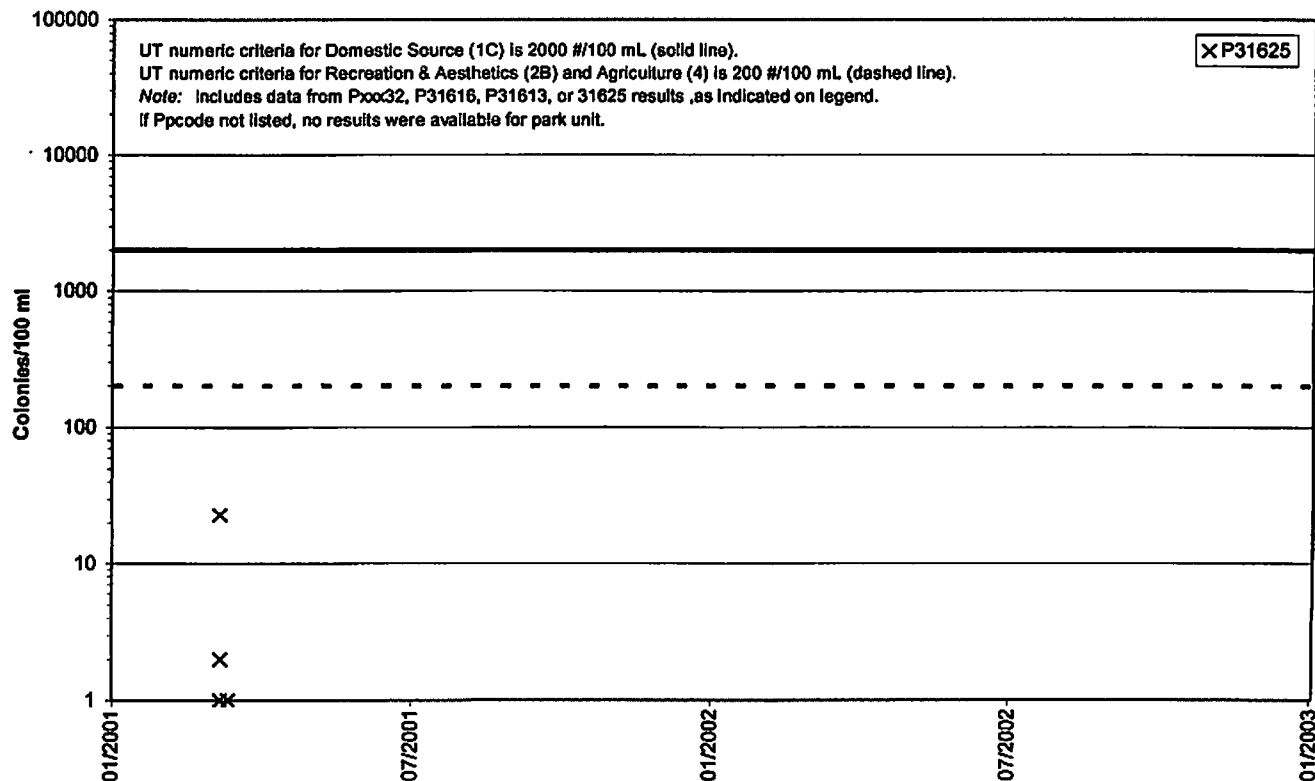


Dissolved Oxygen (P000DO) Results for Surface Water in Colorado National Monument (COLM)

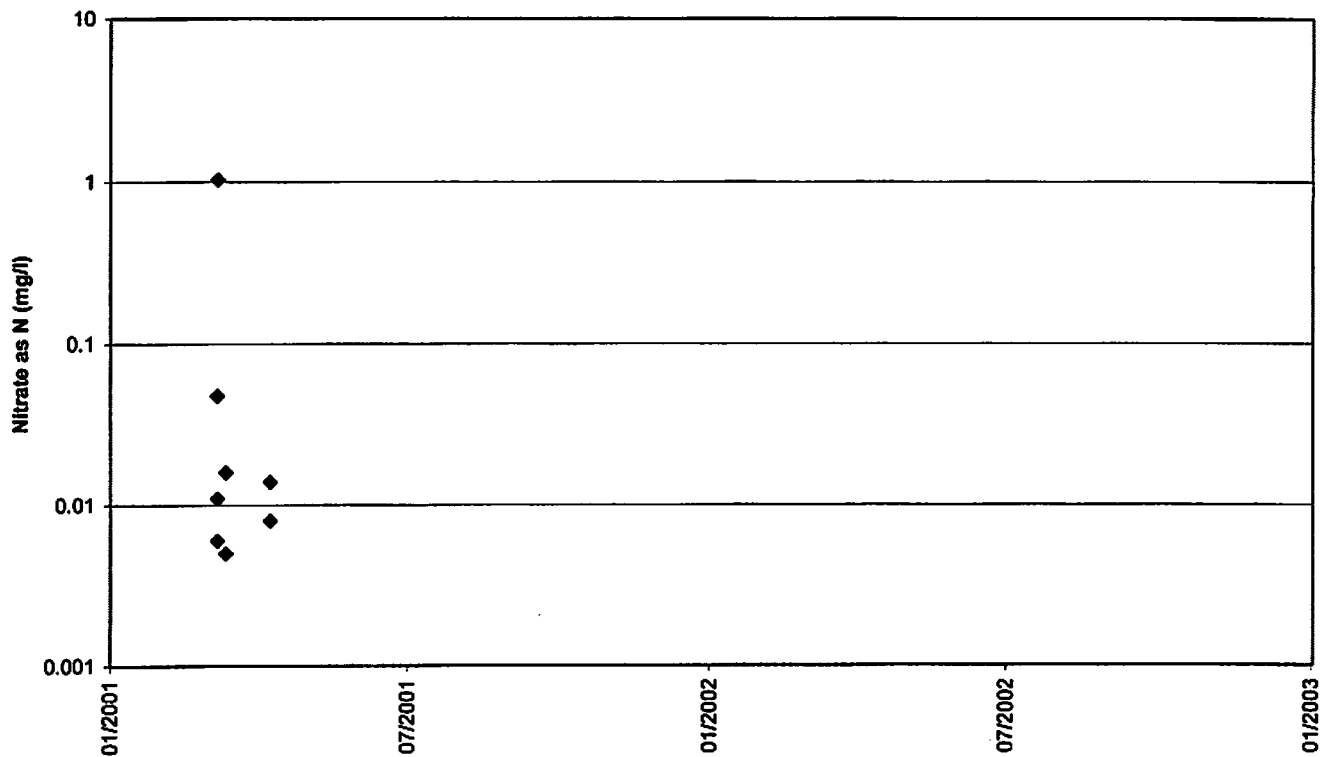
UT numeric criteria for Cold Water Fishery (3A) (dashed lines).
 UT numeric criteria for Warm Water Fishery (3B) (solid red lines).



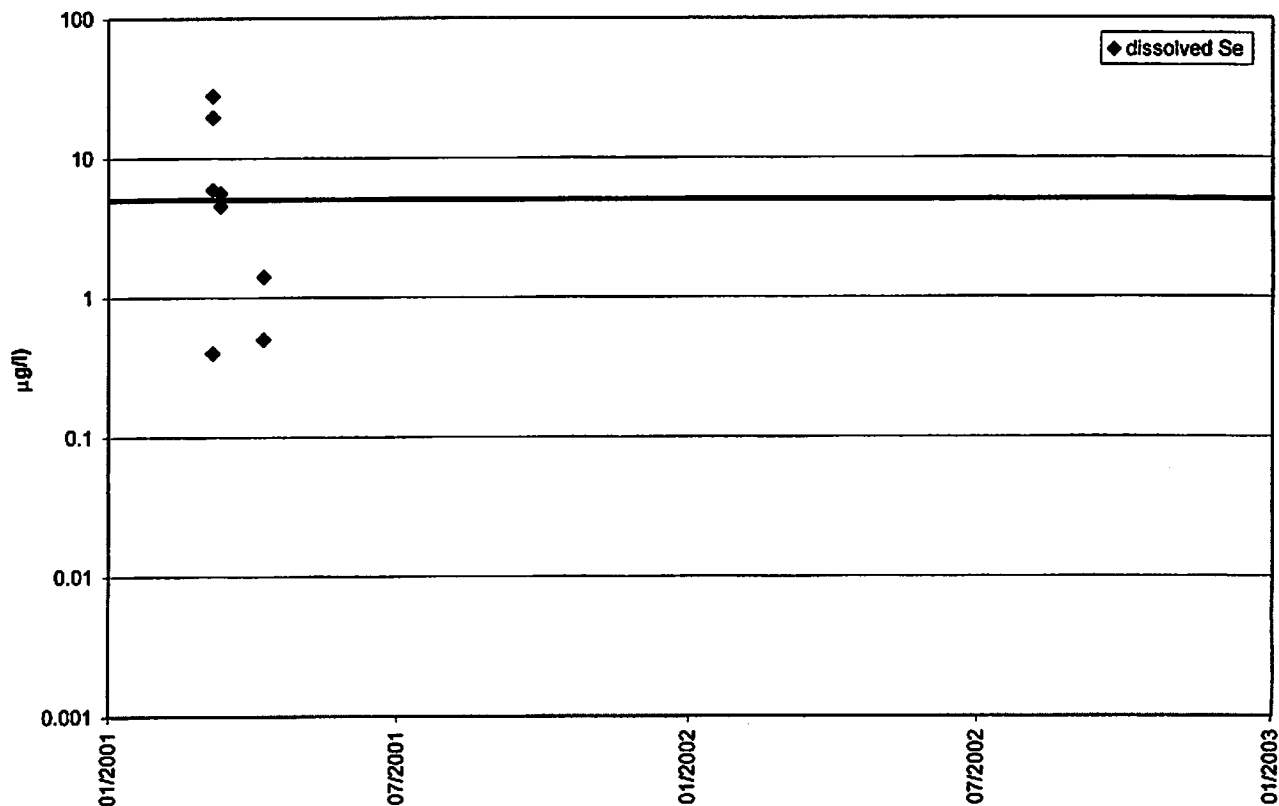
Historic Fecal Coliform Results Shown Log Scale for Surface Water in Colorado National Monument (COLM)



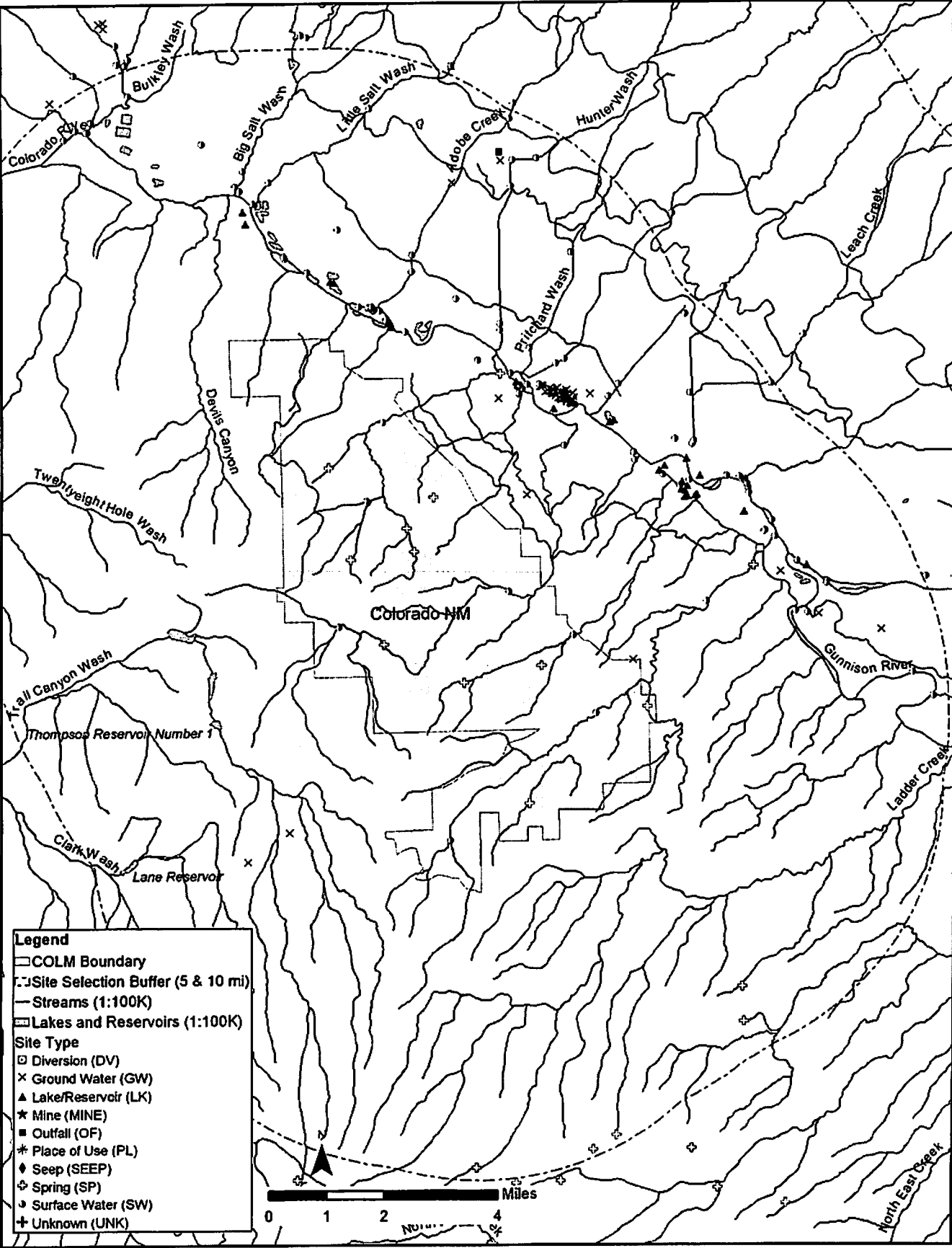
Nitrate Results for Surface Water in Colorado National Monument (COLM)
Numeric Criteria for Domestic Source (UT) is 10 mg/l.
Note: Pnitrate optimized from P00631, P00618, P71851, P00630, P00620, P71850.



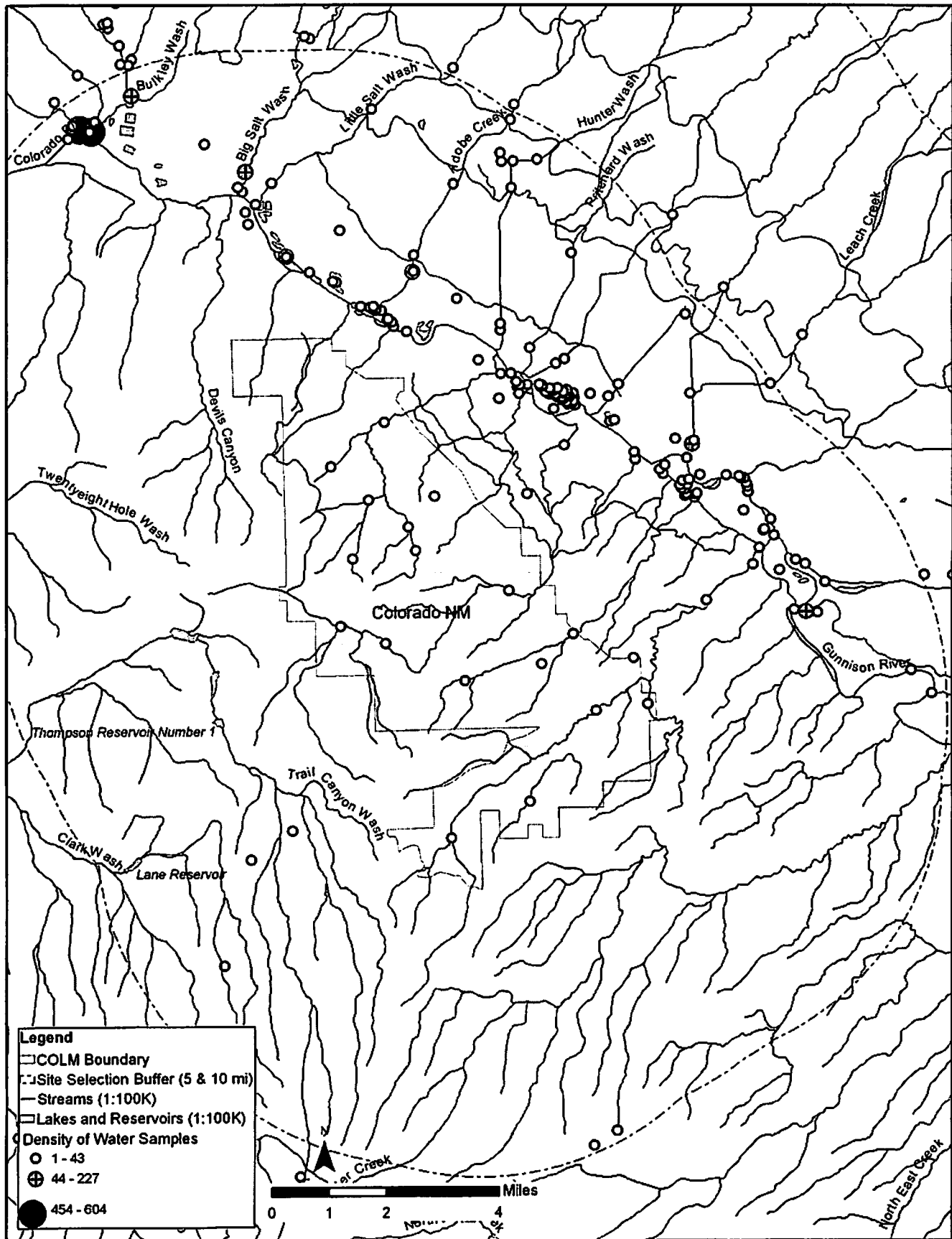
Selenium Results for Surface Water in Colorado National Monument (COLM)
USEPA Numeric Criteria for Aquatic Wildlife = 5 µg/l.



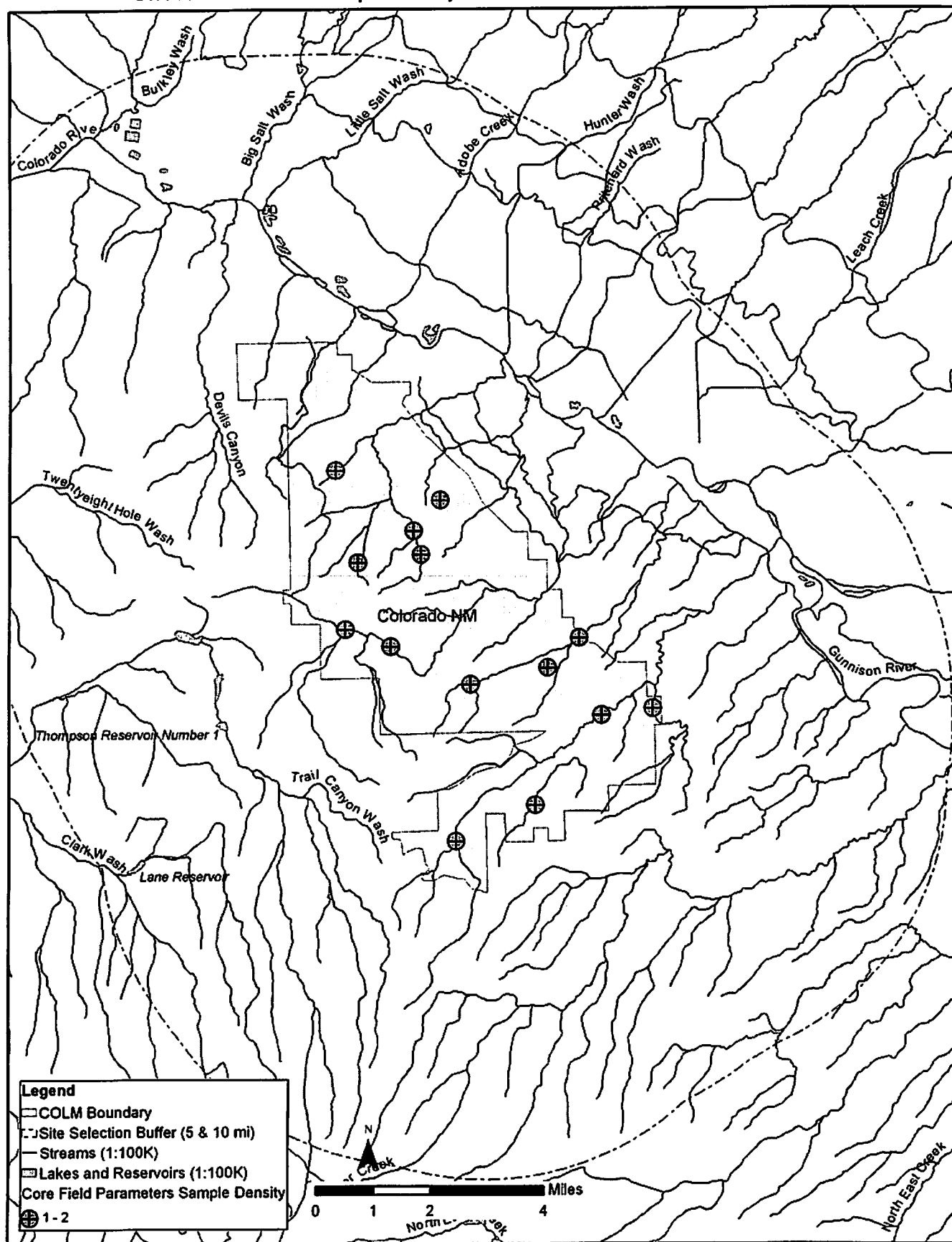
Historic Sample Site Locations by Site Type, Colorado National Monument (COLM), 1946-2002



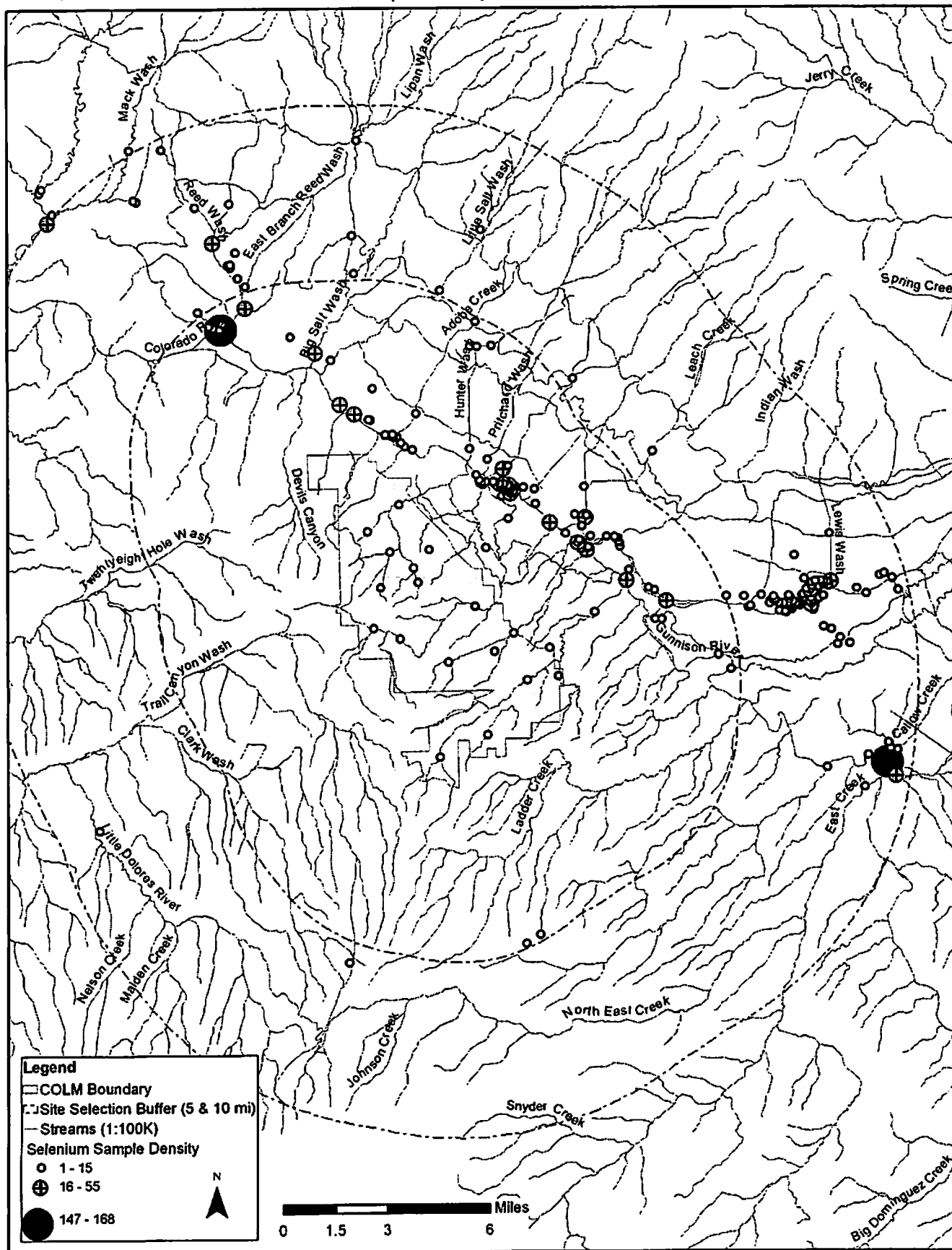
Water Sample Density, Colorado National Monument (COLM), 1946-2002



Core Field Parameters Samples Density in Colorado National Monument (COLM), 2001



Total and Dissolved Selenium Water Samples Density, Colorado National Monument (COLM), 1962-2002



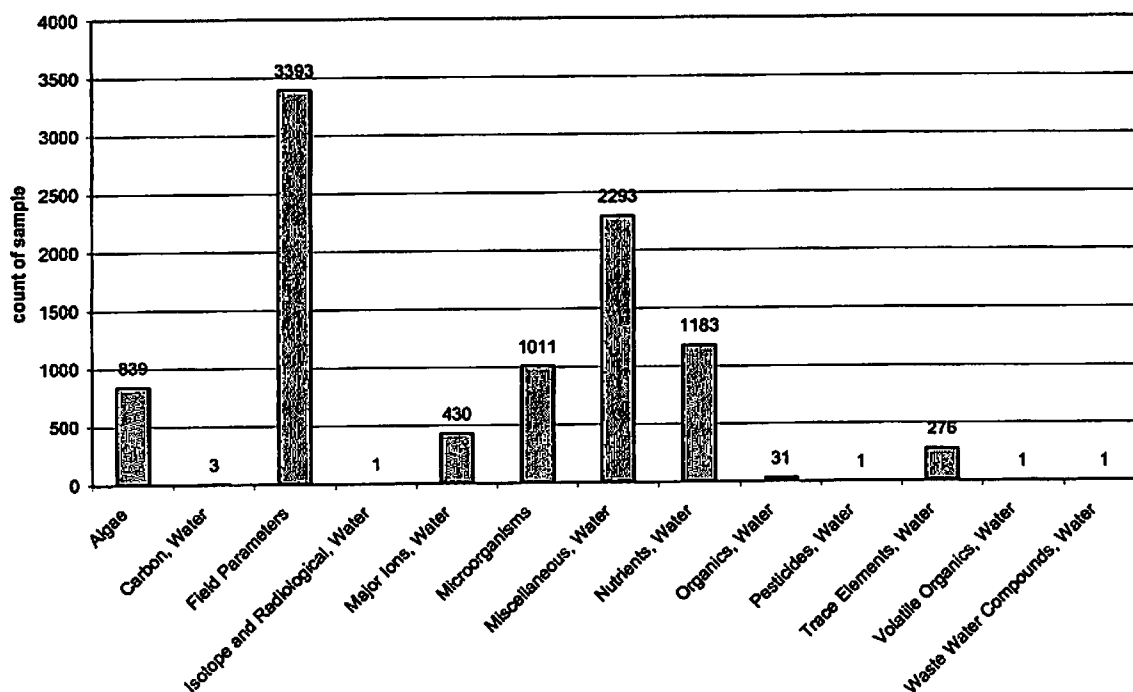
Curecanti National Recreation Area (CURE) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

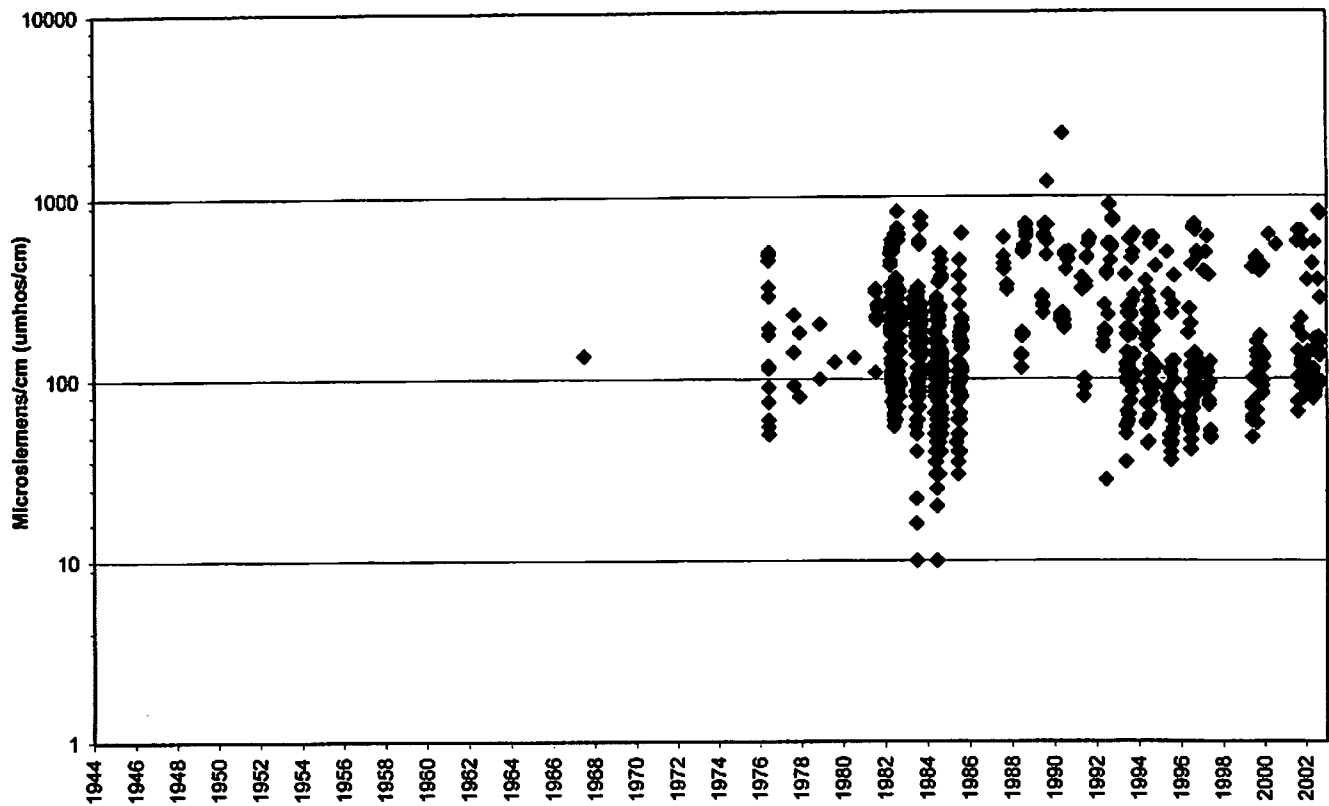
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	172	3554	07/24/1944	09/19/2002
Streamflow	27	309	09/01/1977	09/16/2002
Core Field Parameters ⁽³⁾	167	3206	04/04/1962	09/19/2002
Microorganisms	24	1011	07/07/1981	09/15/1997
Major Ions	85	430	04/01/1965	09/19/2002
Total and Dissolved Selenium	34	132	07/24/1944	09/19/2002
Total Dissolved Solids	20	126	05/28/1974	03/15/2000
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	88	276	07/24/1944	09/19/2002
Pesticides	1	1	09/15/1997	09/15/1997
Nutrients	78	1183	05/28/1974	09/19/2002
Unionized Ammonia	44	446	08/26/1975	09/19/2002
Ammonia	37	391	09/29/1974	09/19/2002
Nitrite	27	184	09/29/1974	09/19/2002
Nitrate	62	517	05/28/1974	09/19/2002
Total Nitrogen	39	263	09/29/1974	09/19/2002
Ortho-Phosphorus	75	1132	05/28/1974	09/19/2002
Total Phosphorus	66	1147	09/11/1974	09/19/2002
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

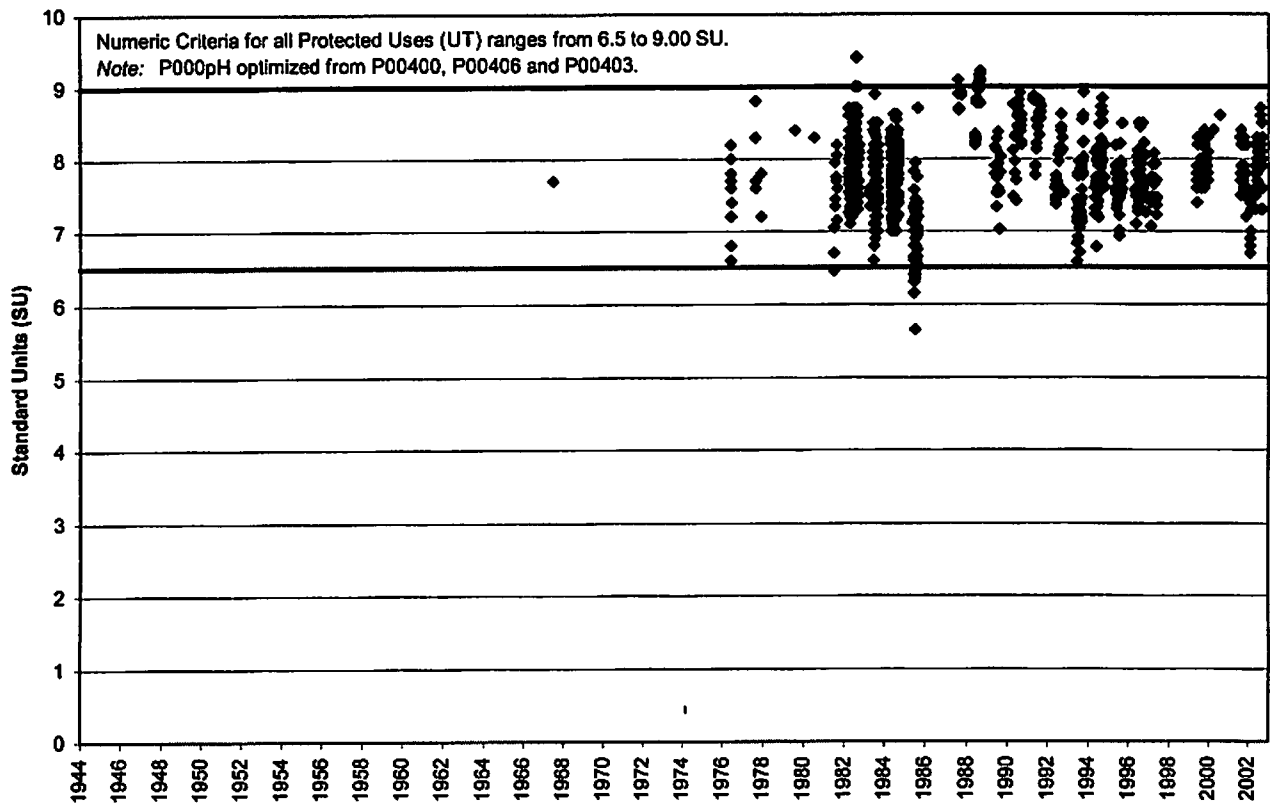
Water Sample Density by Category in Curecanti National Recreation Area (CURE)

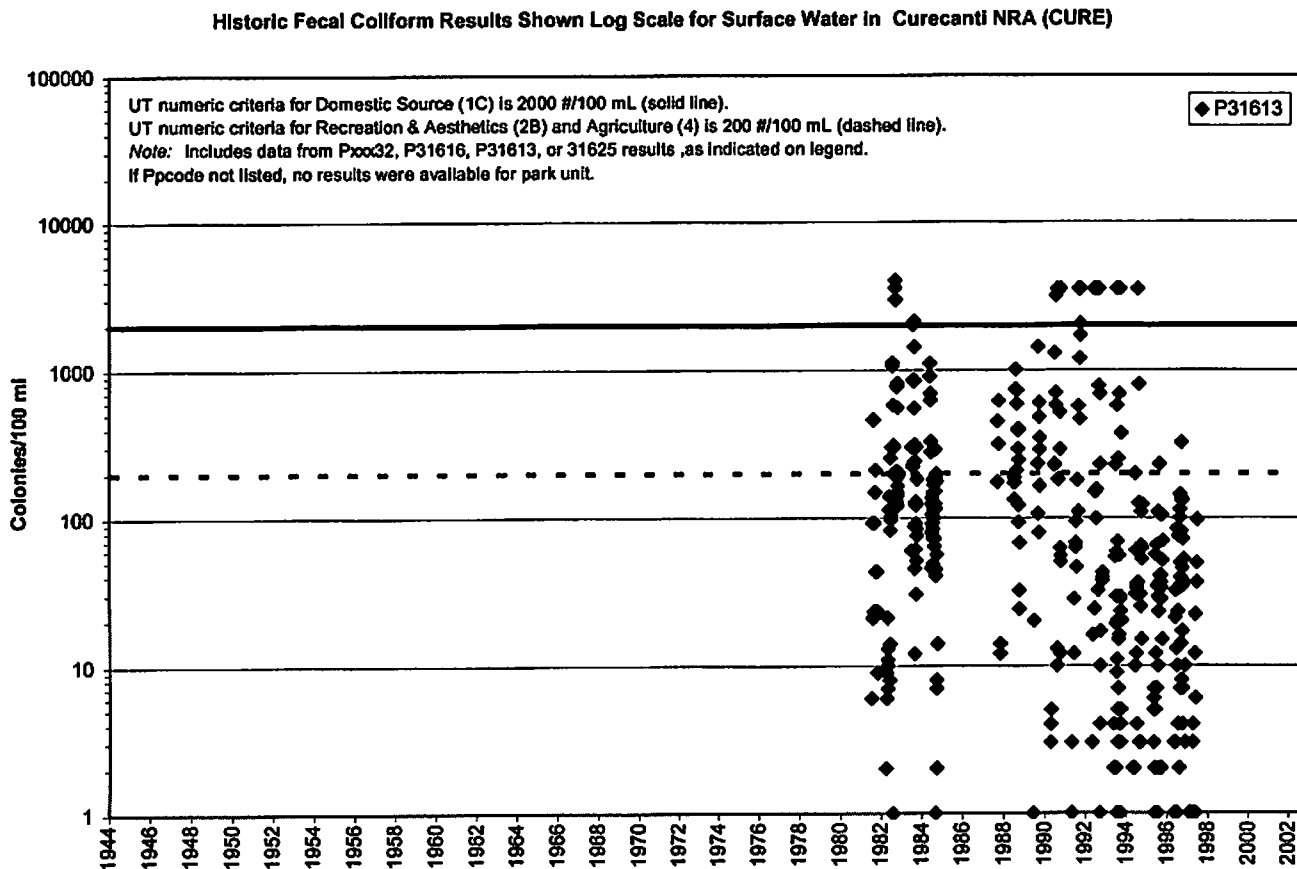
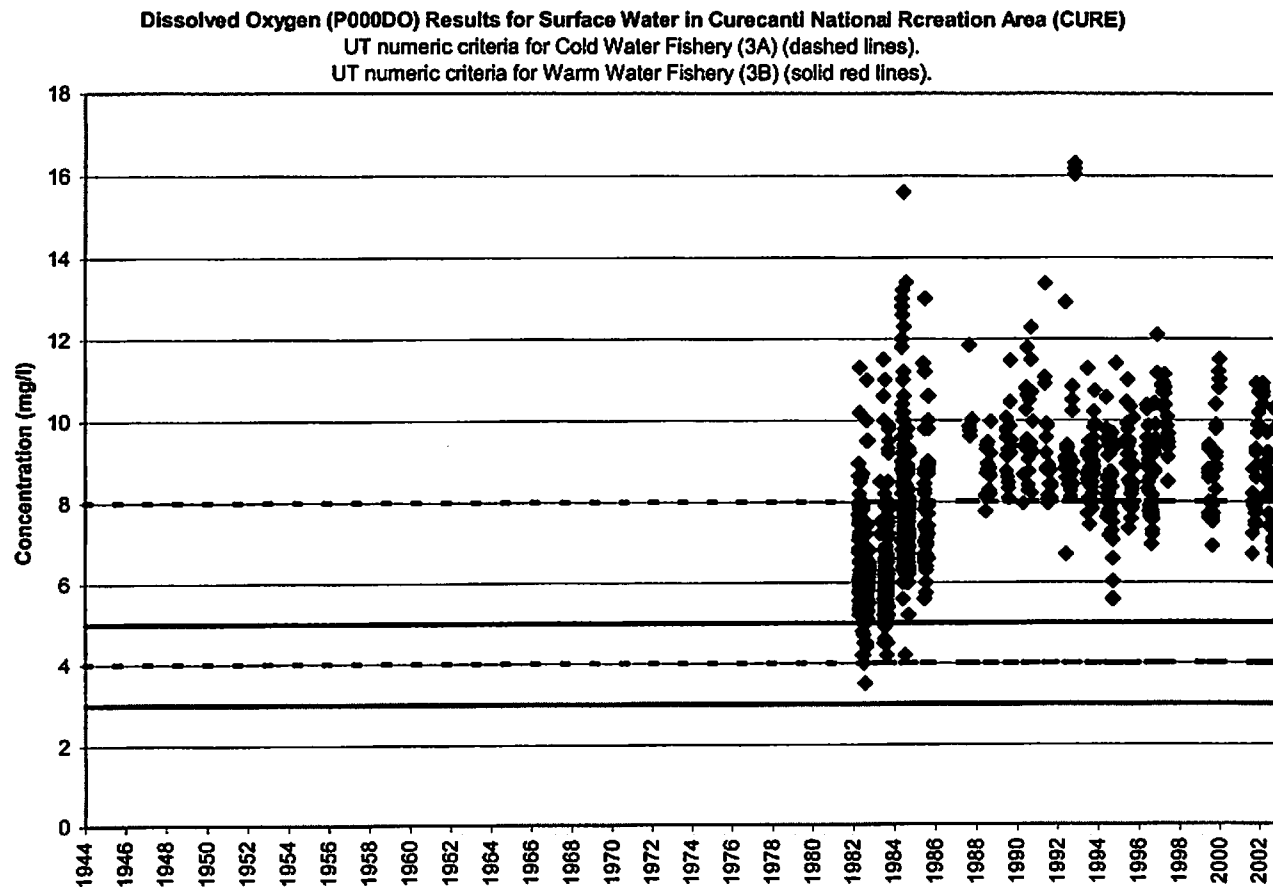


Specific Conductivity (PSPCnd) Results for Surface Water in Curecanti National Recreation Area (CURE)
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

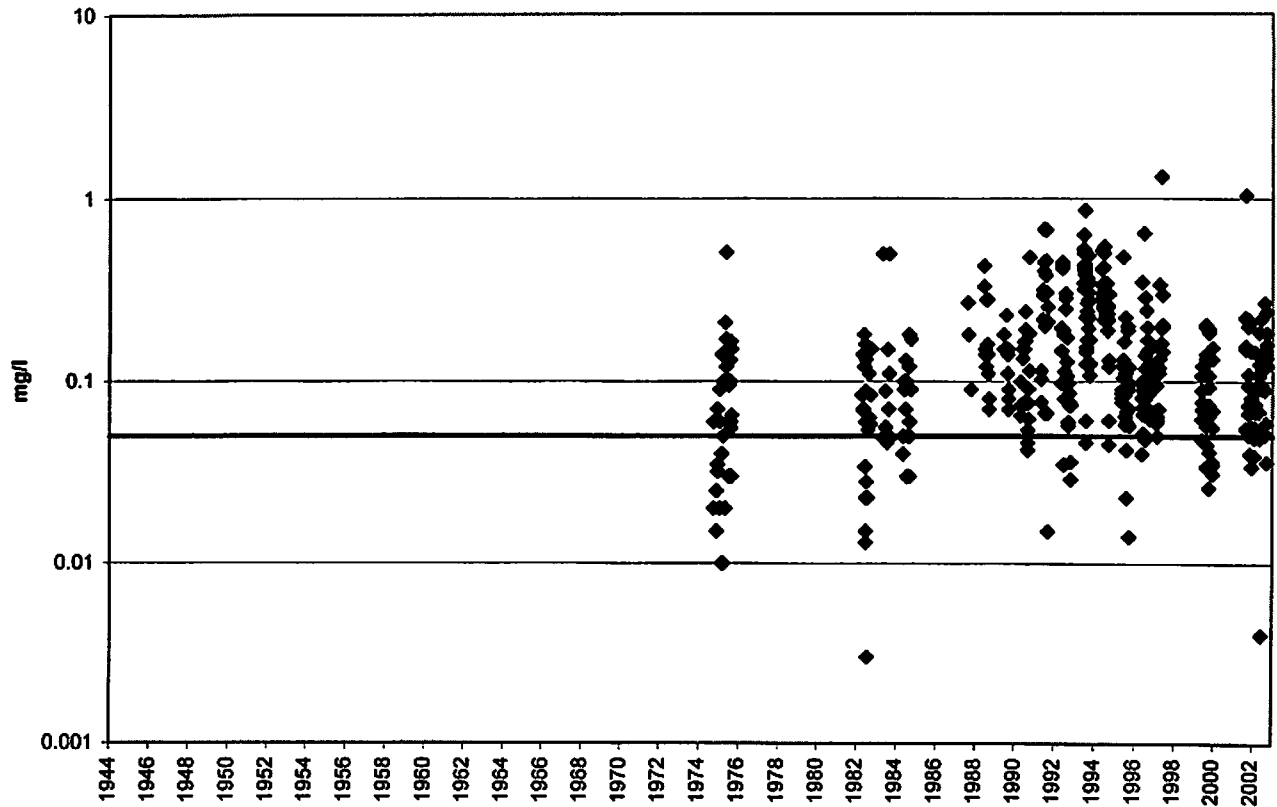


pH (P000pH) Results for Surface Water in Curecanti National Recreation Area (CURE)

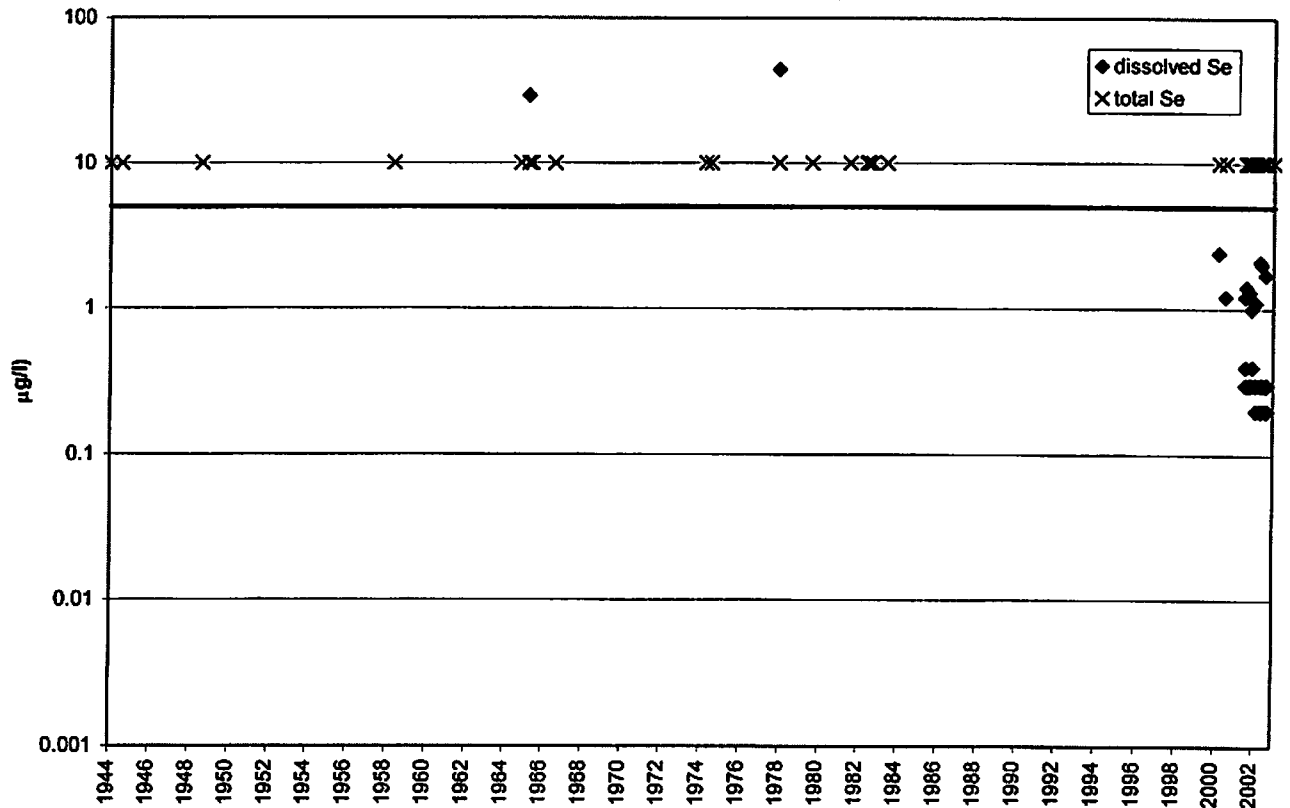




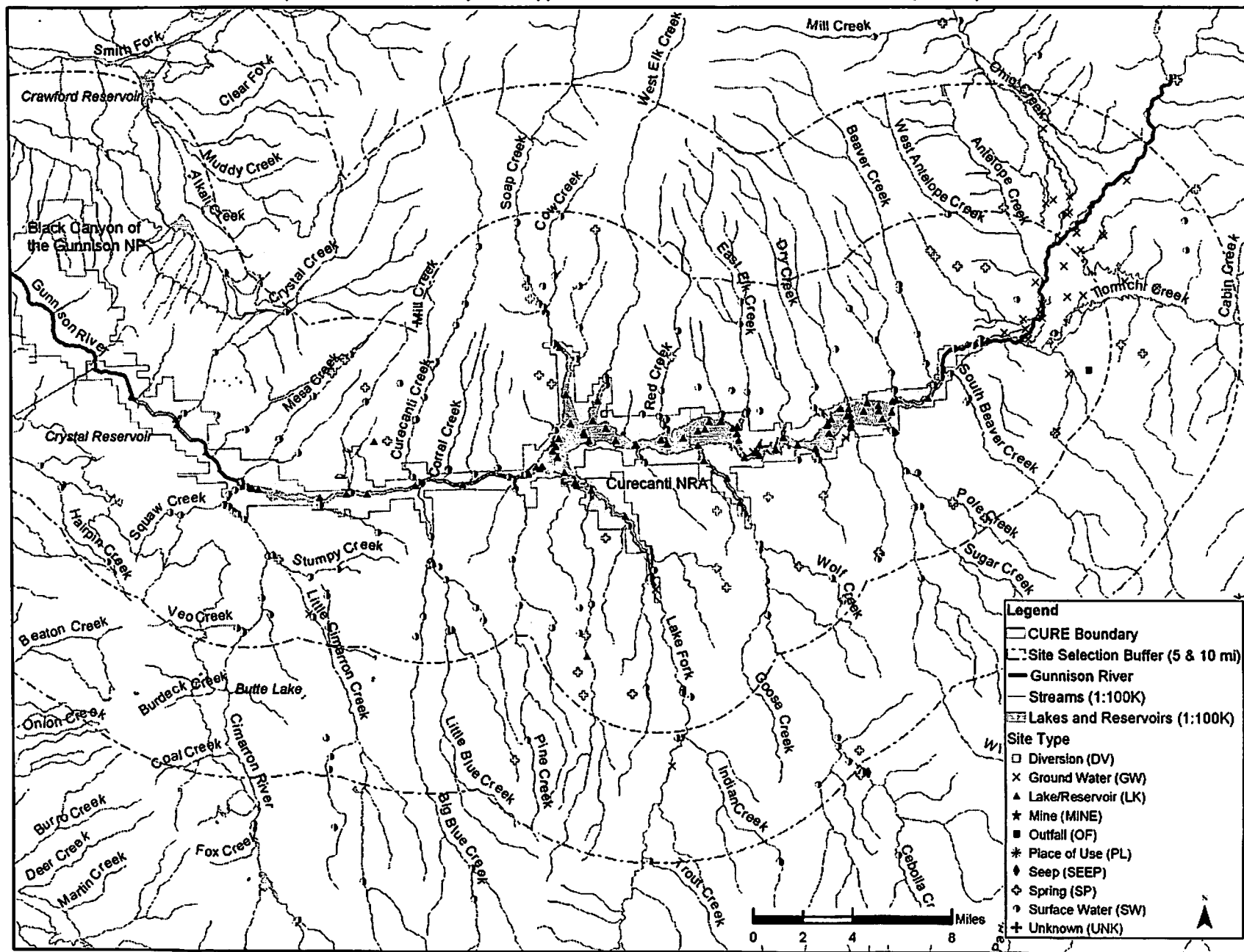
Total Phosphorus (PtotalP) Results for Surface Water in Curecanti National Recreation Area (CURE)
 Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.
 Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.



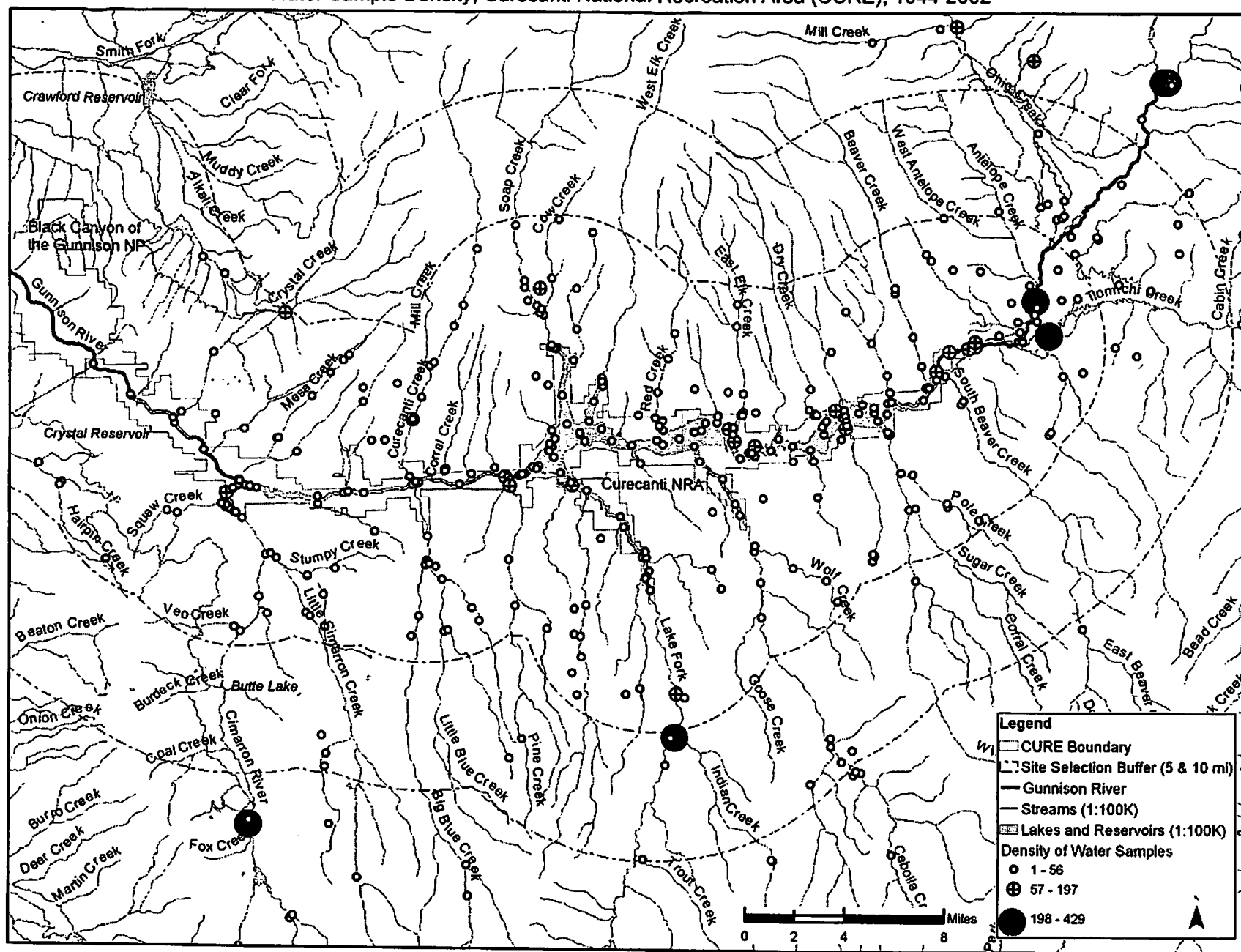
Selenium Results for Surface Water in Curecanti National Recreation Area (CURE)
 USEPA Numeric Criteria for Aquatic Wildlife = 5 µg/l.



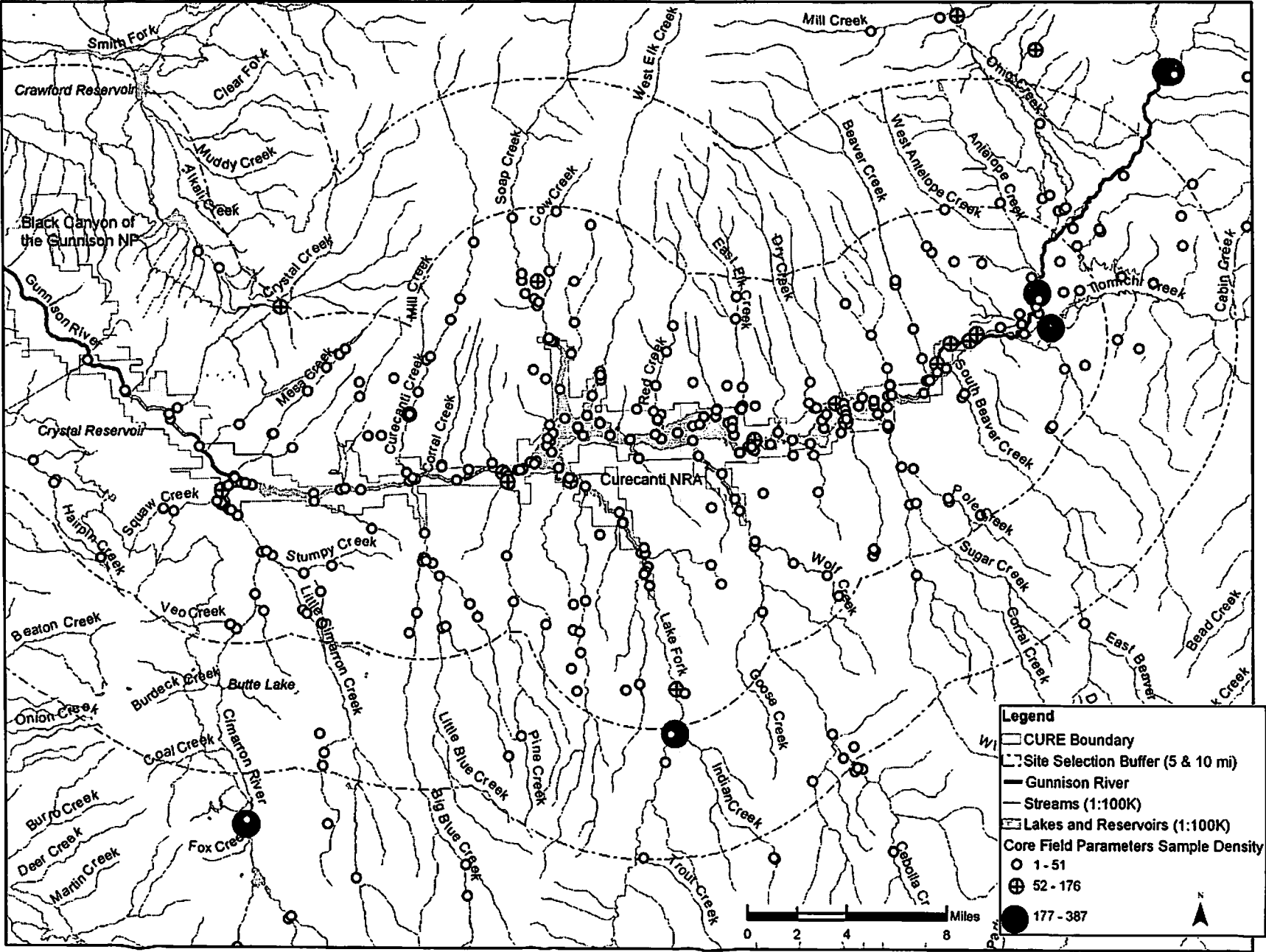
Historic Sample Site Locations by Site Type, Curecanti National Recreation Area (CURE), 1944-2002



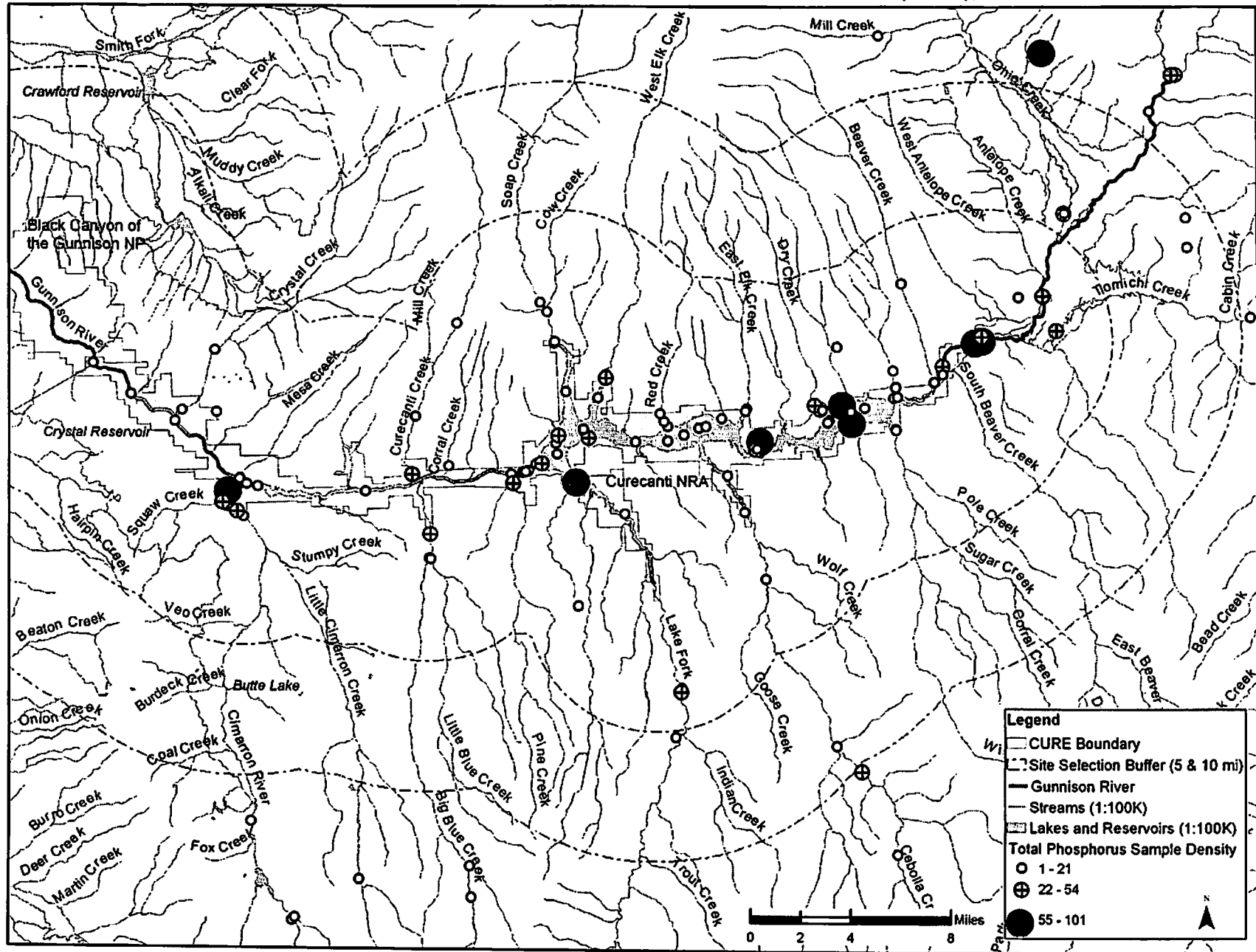
Water Sample Density, Curecanti National Recreation Area (CURE), 1944-2002



Core Field Parameters Sample Density, Curecanti National Recreation Area (CURE), 1959-2002



Total Phosphorus Water Sample Density, Curecanti National Recreation Area (CURE), 1974-2002



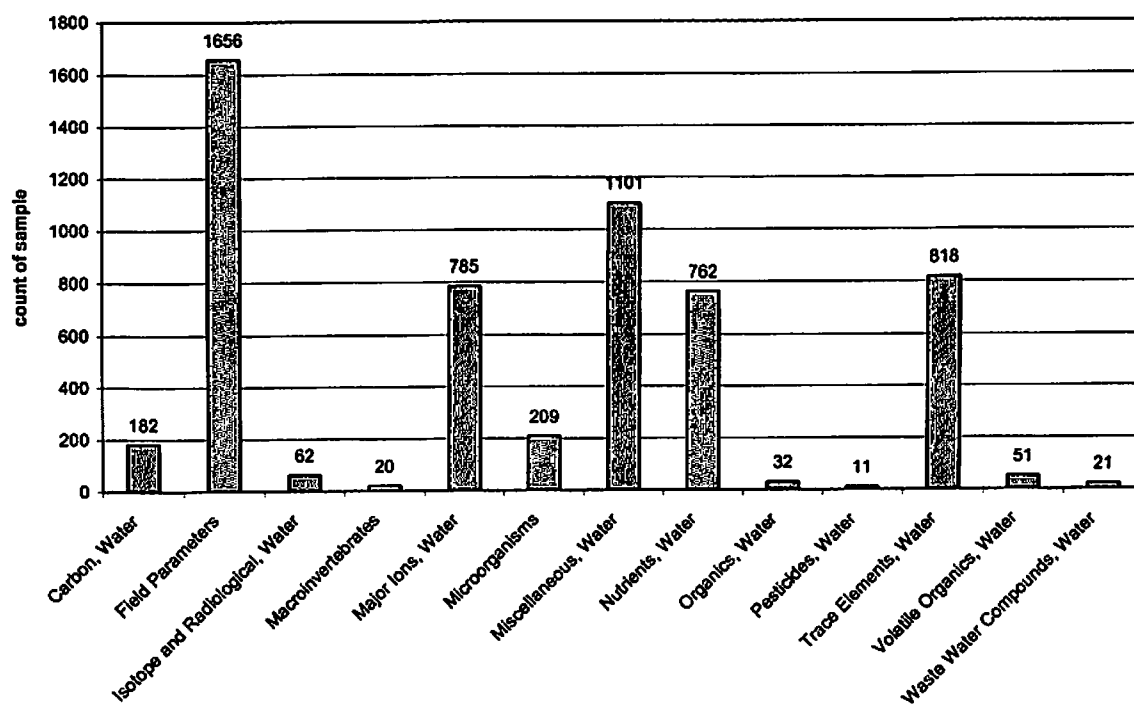
Dinosaur NM (DINO) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

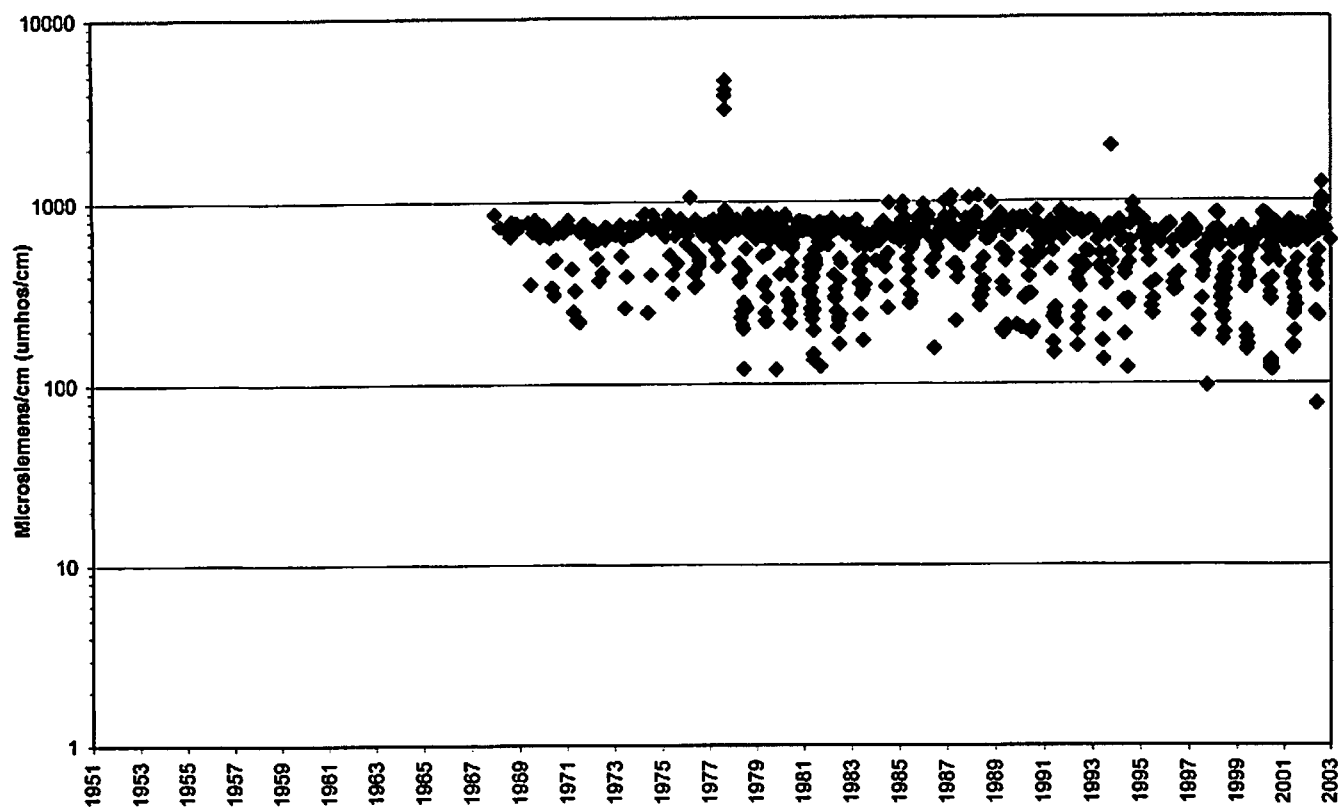
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁶⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	169	1406	10/15/1951	10/23/2002
Streamflow	10	635	10/15/1951	10/23/2002
Core Field Parameters ⁽³⁾	162	1191	11/18/1958	10/23/2002
Microorganisms	6	209	04/11/1972	10/23/2002
Major Ions	108	785	11/18/1958	10/23/2002
Total and Dissolved Selenium	11	418	03/13/1973	10/23/2002
Total Dissolved Solids	76	417	11/18/1958	10/03/2002
Total Suspended Solids	4	328	04/11/1972	04/30/2002
Trace Elements	129	818	11/18/1958	10/23/2002
Pesticides	3	11	07/31/1980	10/01/1991
Nutrients	108	762	11/18/1958	10/23/2002
Un-ionized Ammonia	11	452	01/25/1972	10/23/2002
Ammonia	10	179	01/25/1972	10/23/2002
Nitrite	11	232	05/09/1972	10/23/2002
Nitrate	107	752	11/18/1958	10/23/2002
Total Nitrogen	2	220	08/26/1975	04/02/2002
Ortho-Phosphorus	102	516	10/05/1967	10/23/2002
Total Phosphorus	6	352	08/13/1974	10/23/2002
Macroinvertebrates	1	20	10/08/1985	10/24/1995

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

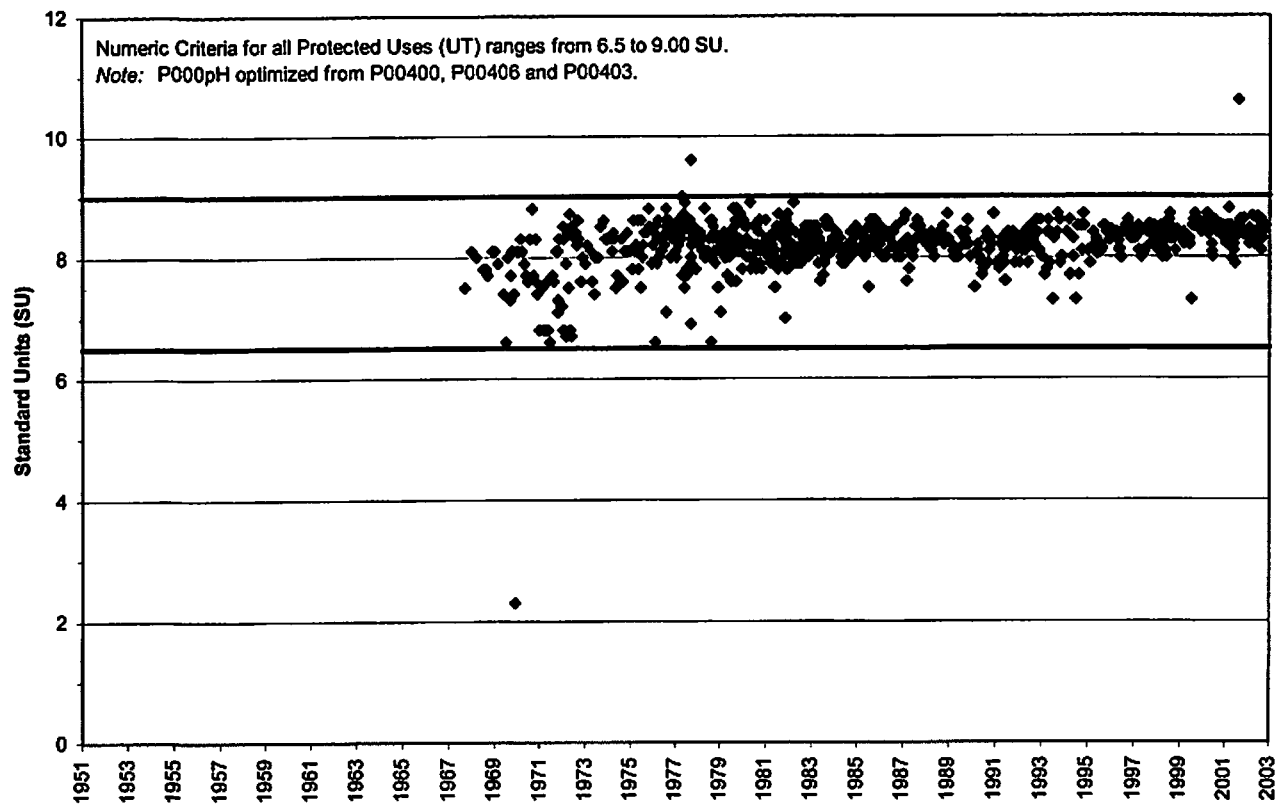
Water Sample Density by Category in Dinosaur National Monument (DINO)

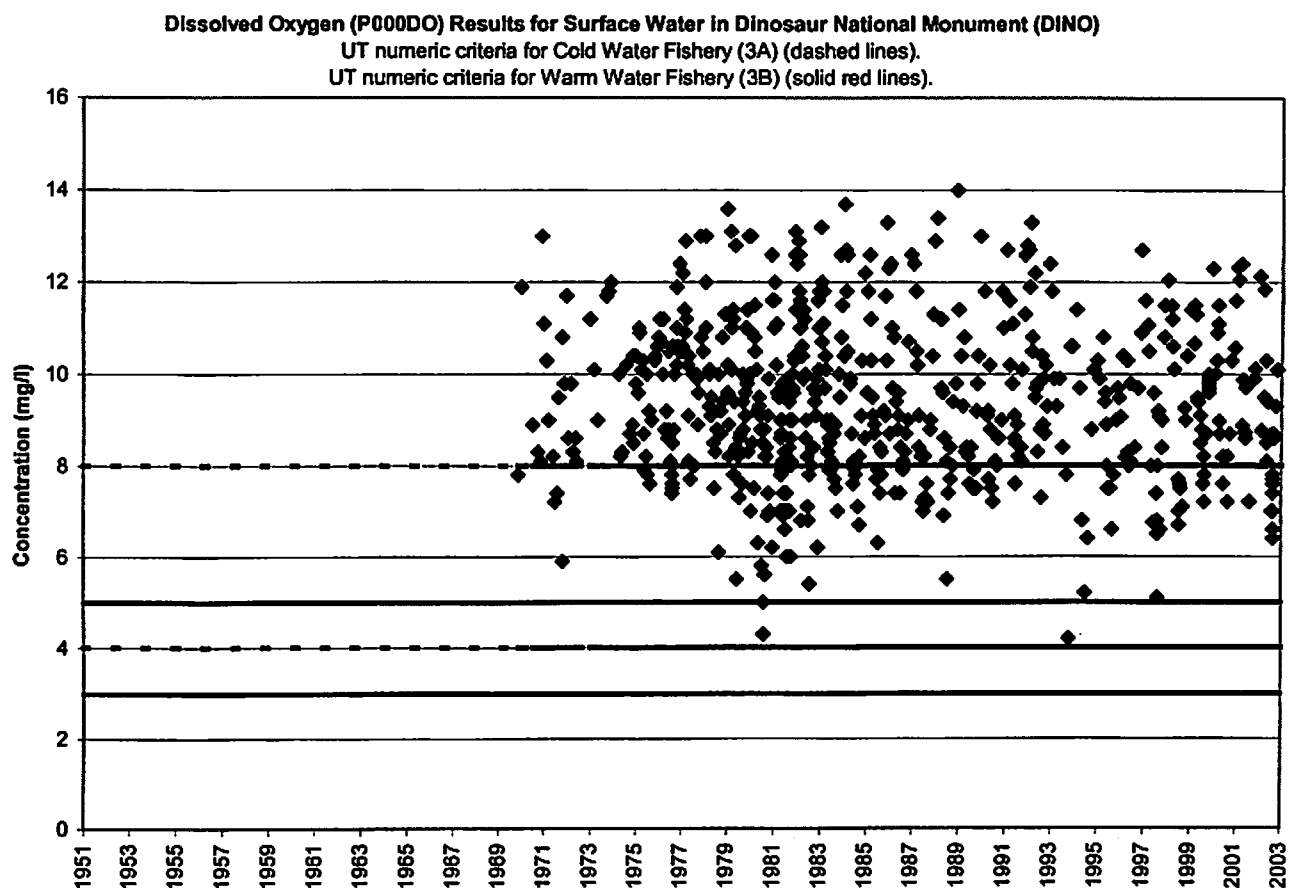


Specific Conductivity (PSPcnd) Results for Surface Water in Dinosaur National Monument (DINO)
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

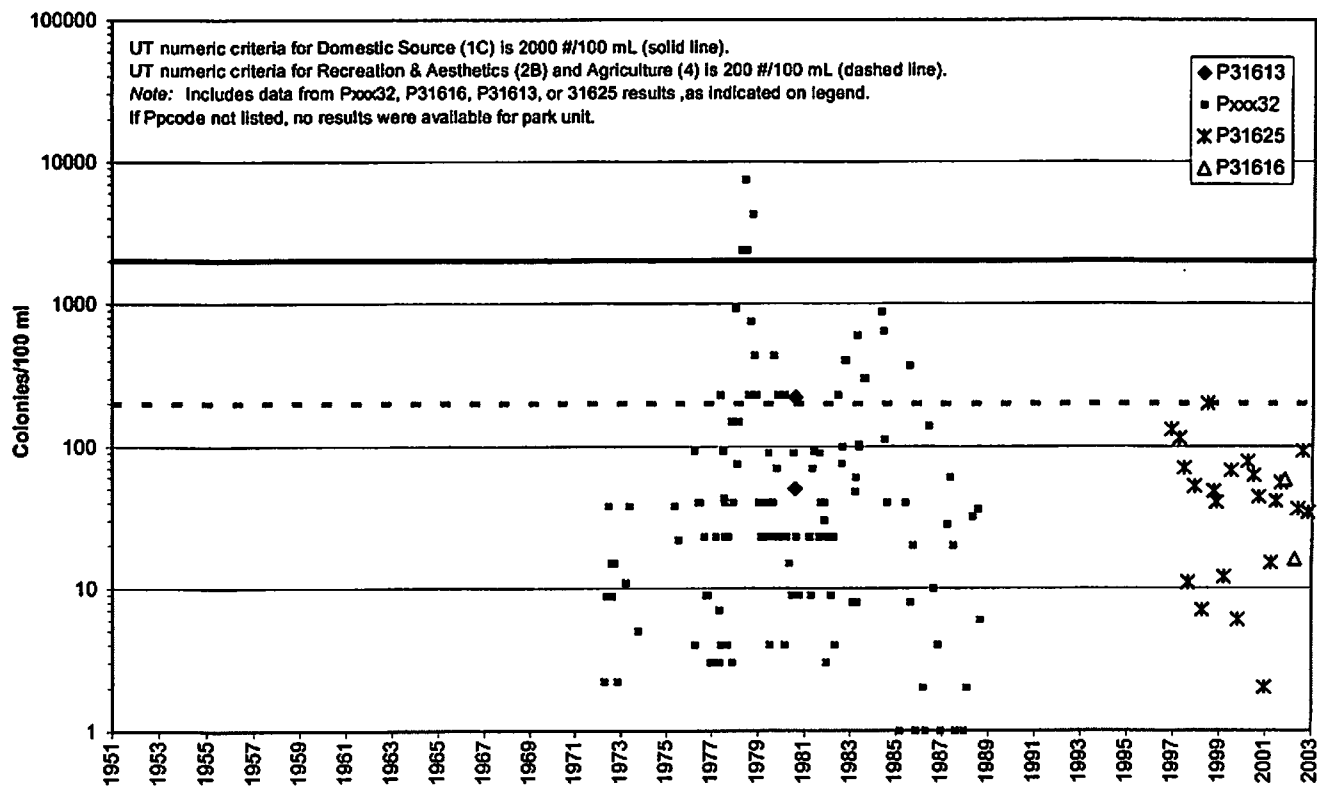


pH (P000pH) Results for Surface Water in Dinosaur National Monument (DINO)





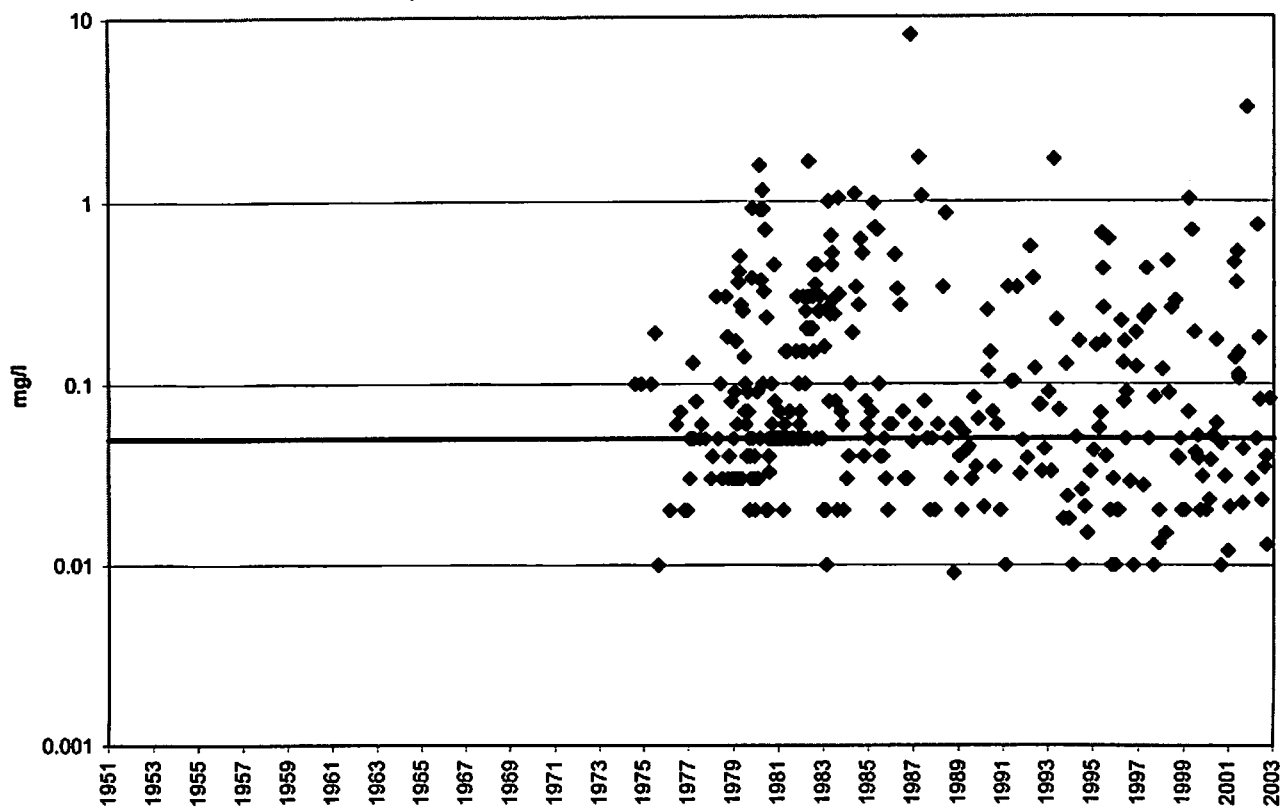
**Historic Fecal Coliform Results Shown Log Scale for Surface Water
 in Dinosaur National Monument (DINO)**



Total Phosphorus (PtotalP) Results for Surface Water in Dinosaur National Monument (DINO)

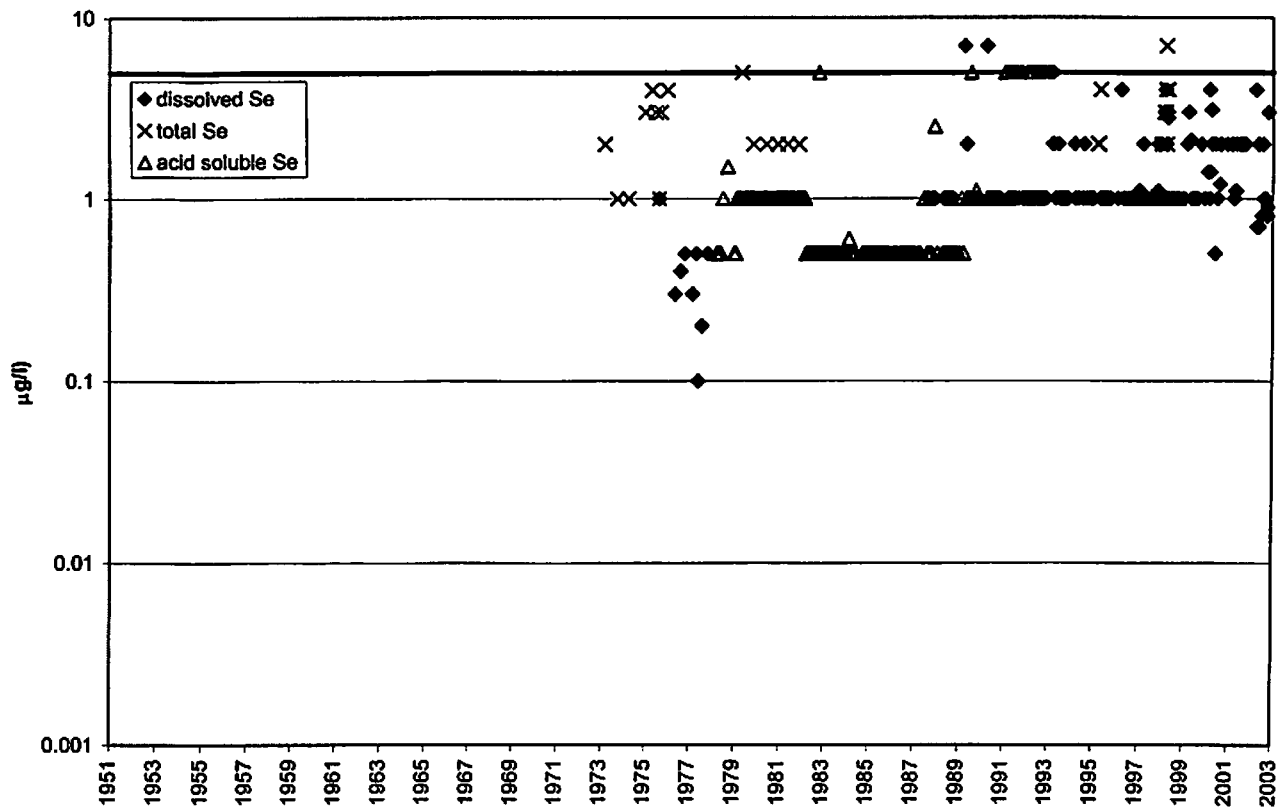
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.

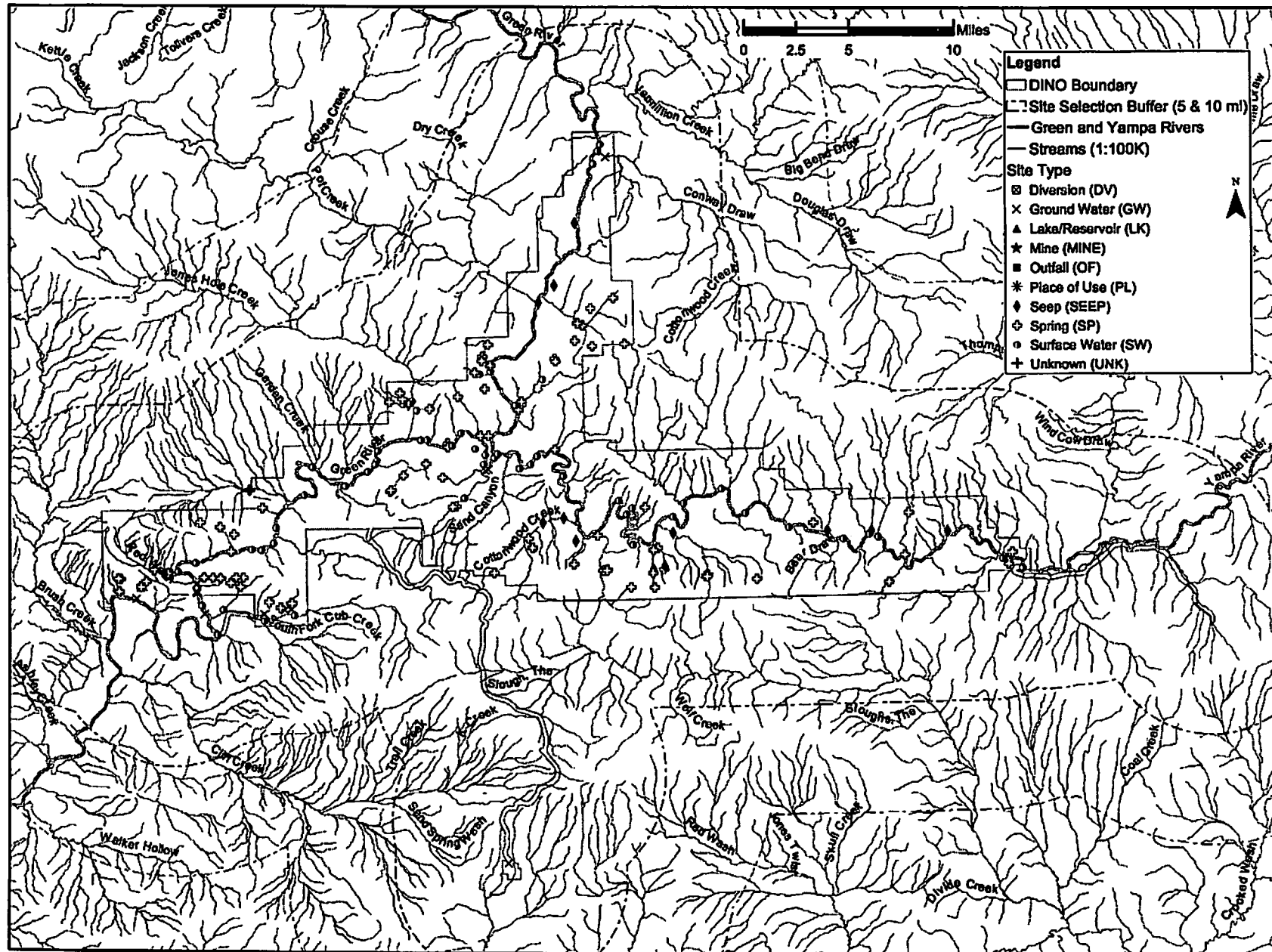


Selenium Results for Surface Water in Dinosaur National Monument (DINO)

USEPA Numeric Criteria for Aquatic Wildlife =5 µg/l.

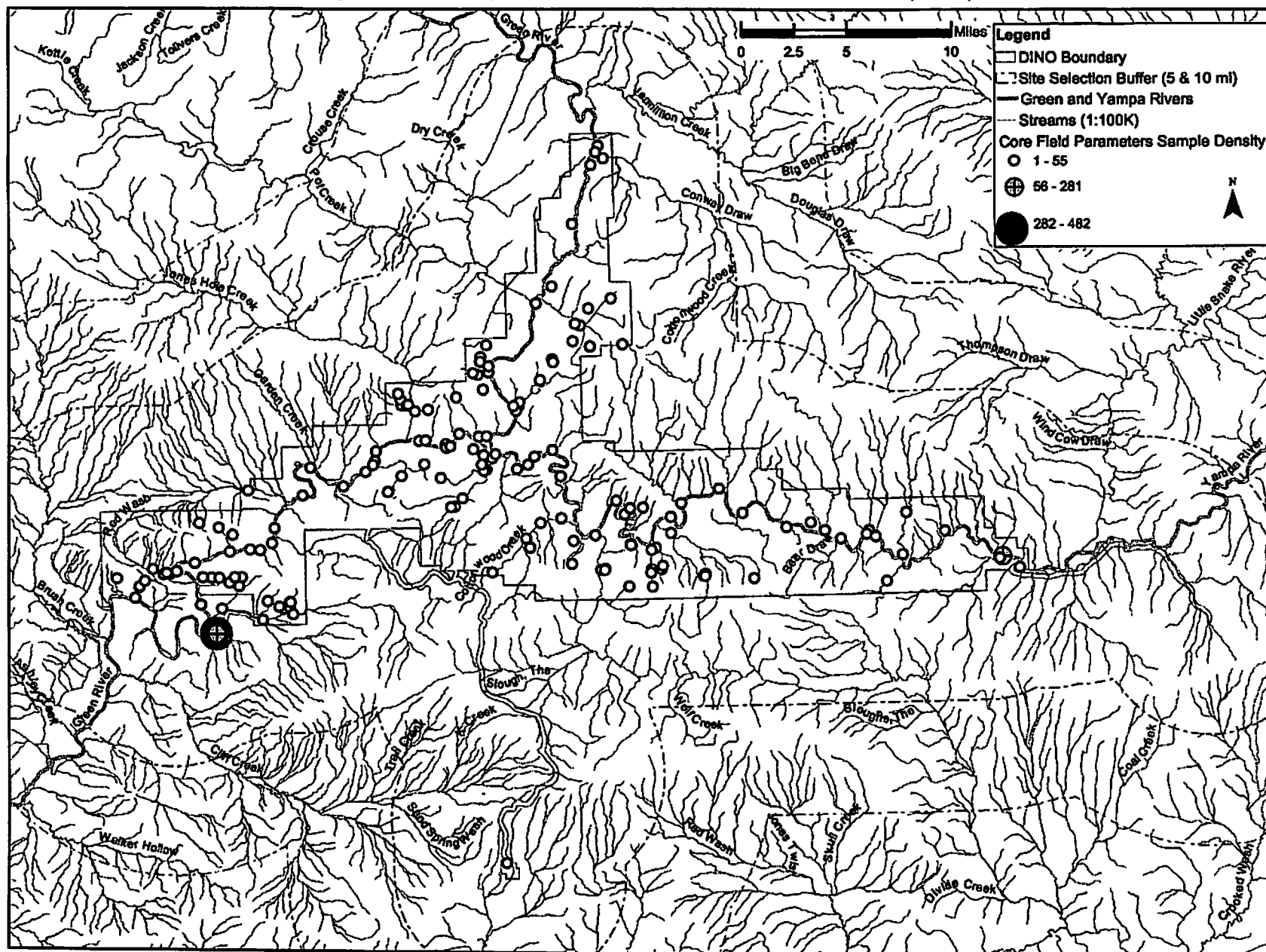


Historic Water Sample Sites in Dinosaur National Monument (DINO), 1951-2002

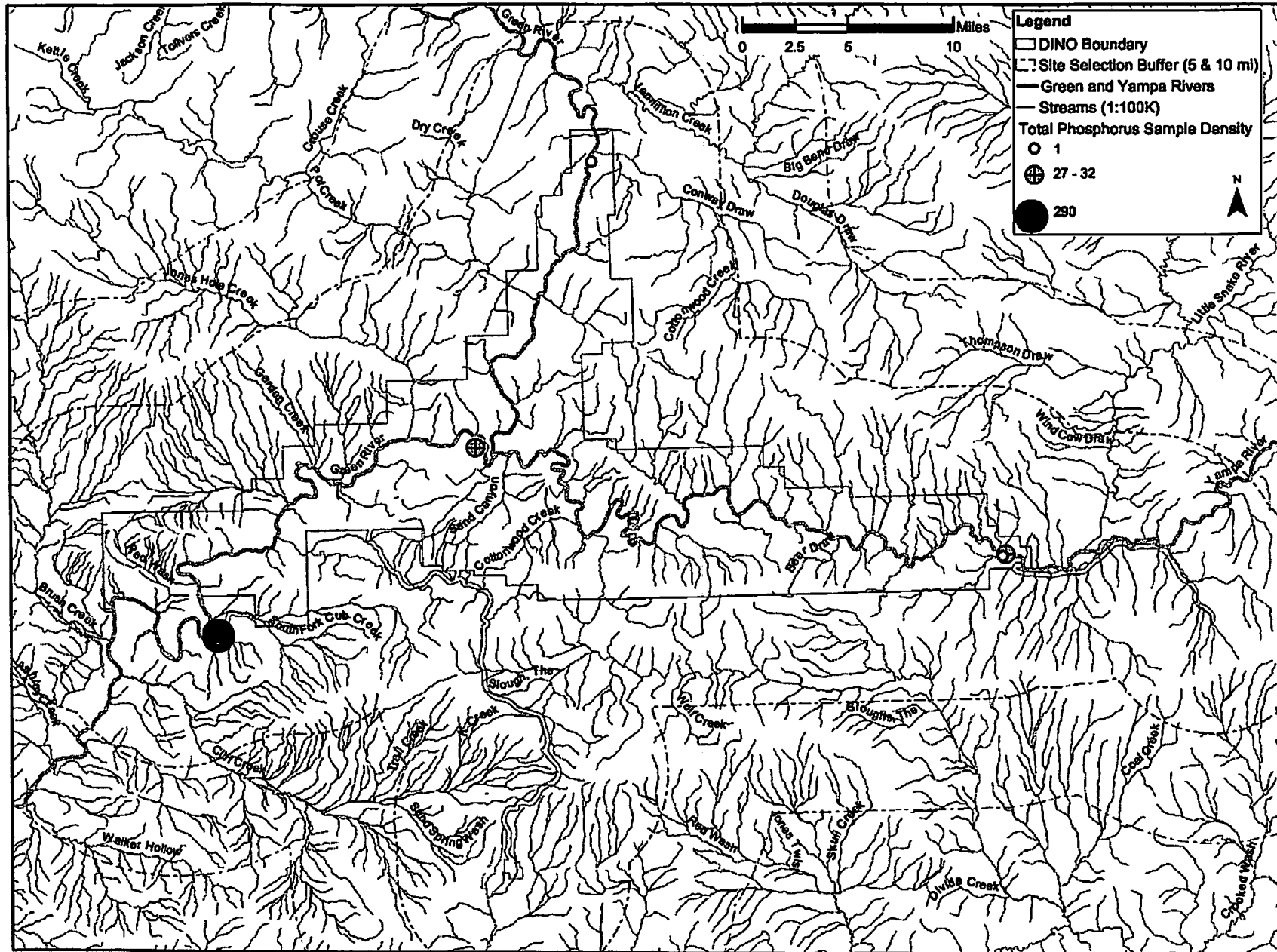




Sample Density for Core Field parameters in Dinosaur National Monument (DINO), 1958-2002



Total Phosphorus Water Sample Density in Dinosaur National Monument (DINO), 1974-2002



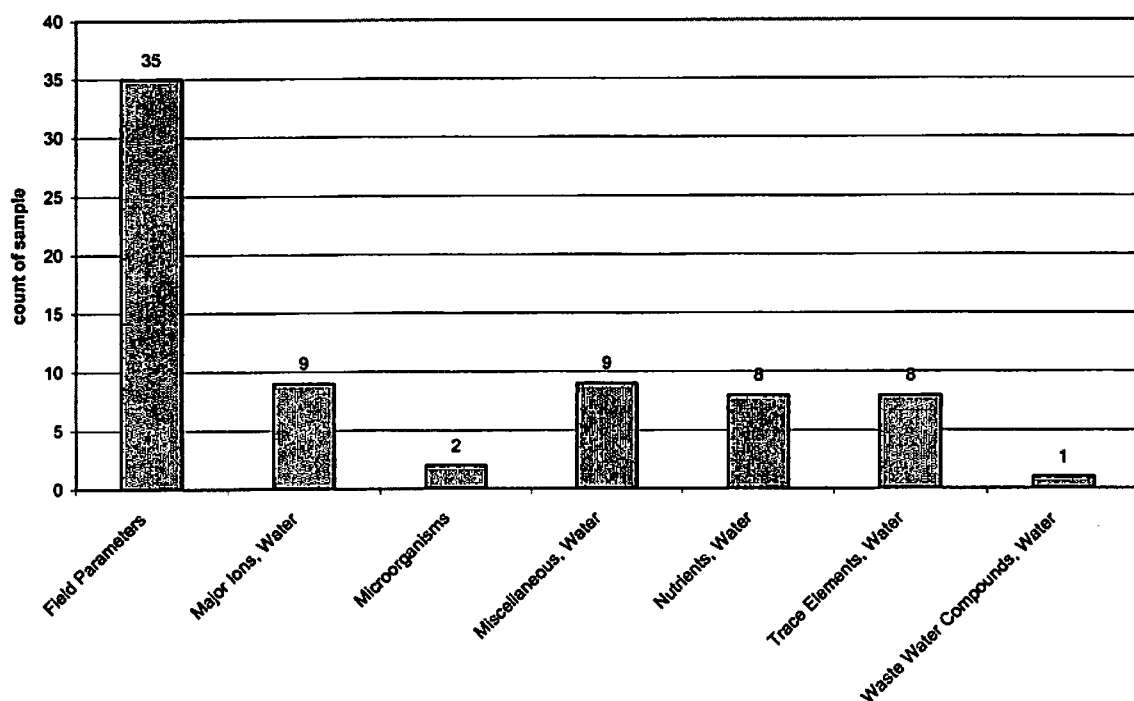
Fossil Butte NM (FOBU) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

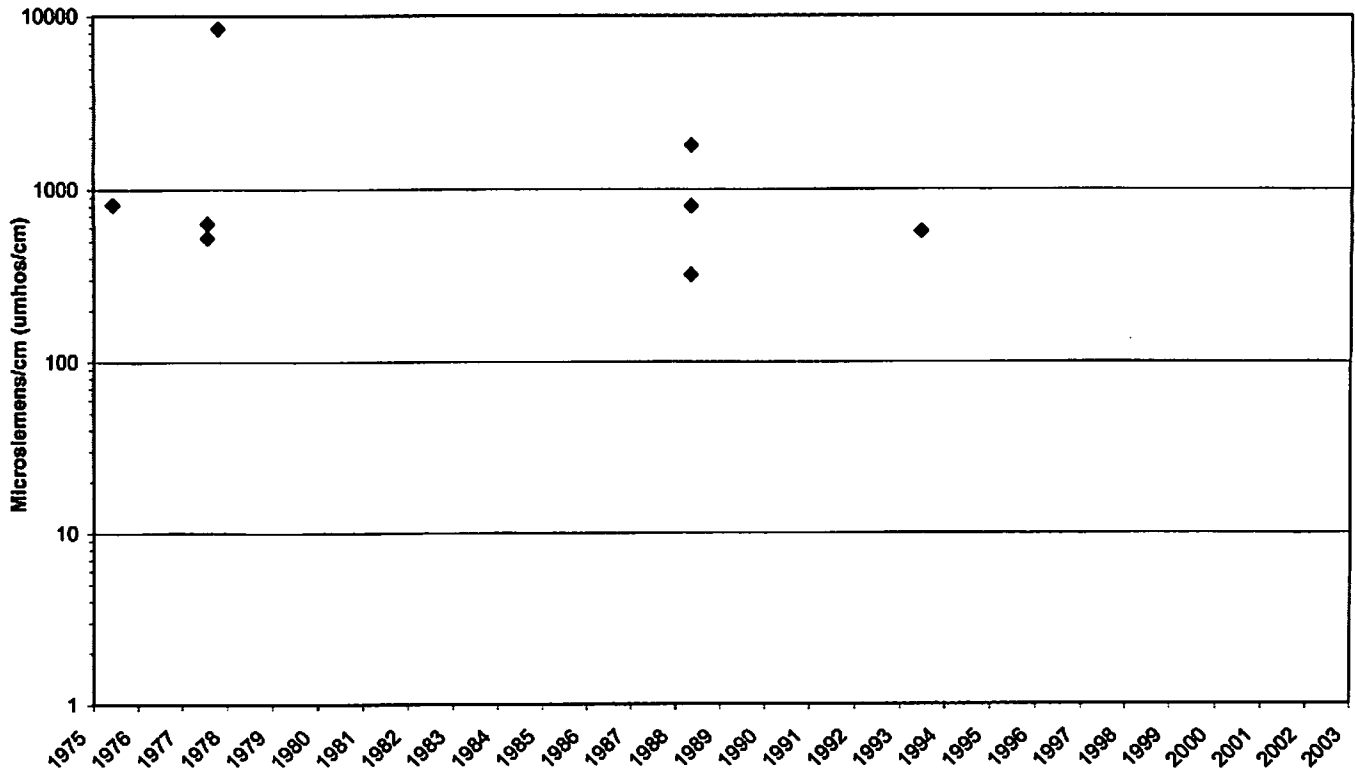
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁶⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	8	35	06/08/1975	06/16/1993
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	2	2	06/08/1975	06/16/1993
Microorganisms	2	2	05/05/1988	05/05/1988
Major Ions	6	9	06/08/1975	06/16/1993
Total and Dissolved Selenium	4	5	10/20/1977	04/21/1989
Total Dissolved Solids	3	3	10/20/1977	06/16/1993
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	6	8	07/26/1977	06/16/1993
Pesticides	0	n/a	n/a	n/a
Nutrients	5	8	06/08/1975	04/21/1989
Unionized Ammonia	1	1	10/20/1977	10/20/1977
Ammonia	1	1	10/20/1977	10/20/1977
Nitrite	0	n/a	n/a	n/a
Nitrate	5	8	06/08/1975	04/21/1989
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	1	1	10/20/1977	10/20/1977
Total Phosphorus	0	n/a	n/a	n/a
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

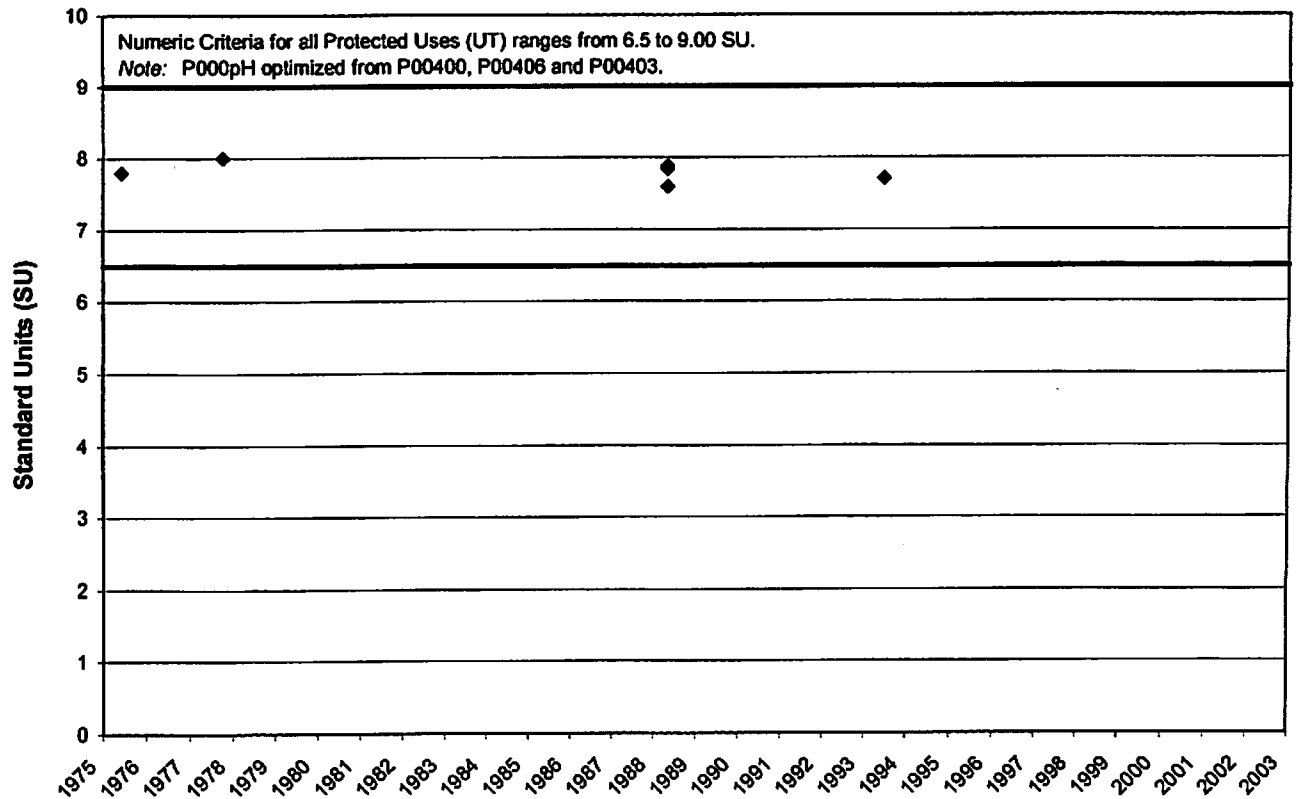
Water Sample Density by Category in Fossil Butte National Monument (FOBU)

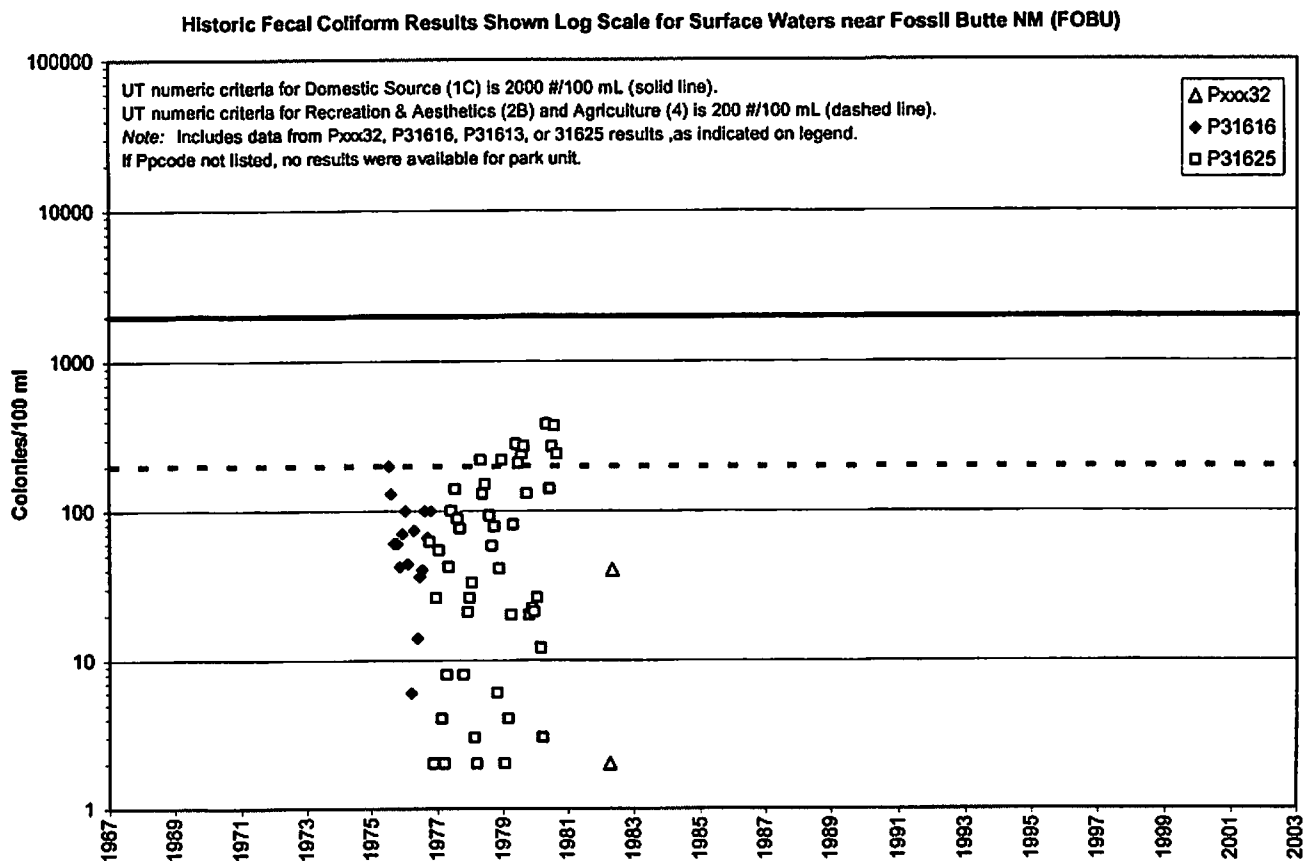


**Specific Conductivity (PSPcnd) Results for Ground and Spring Water
in Fossil Butte National Monument (FOBU)**
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)

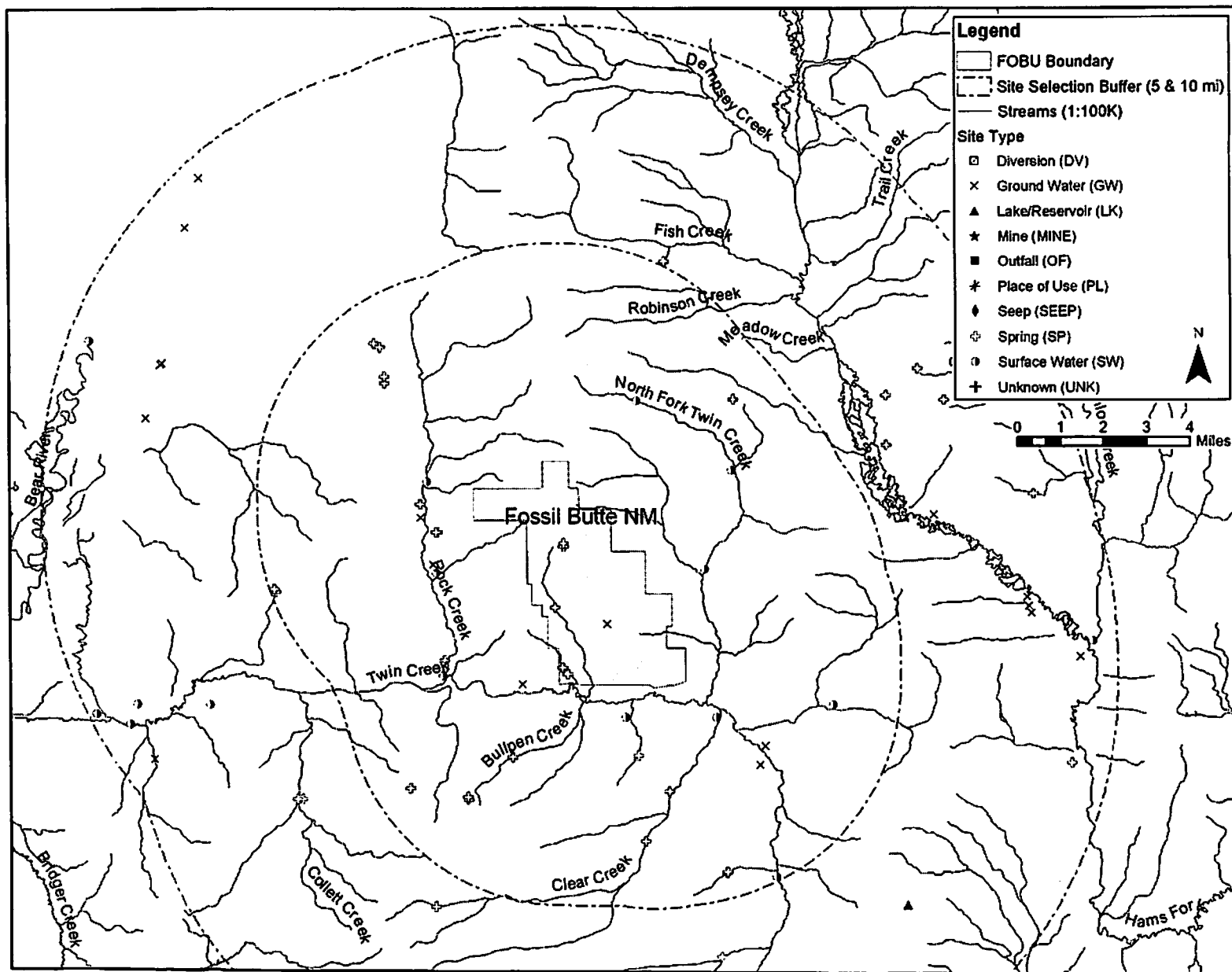


pH (P000pH) Results for Ground and Spring Water in Fossil Butte National Monument (FOBU)

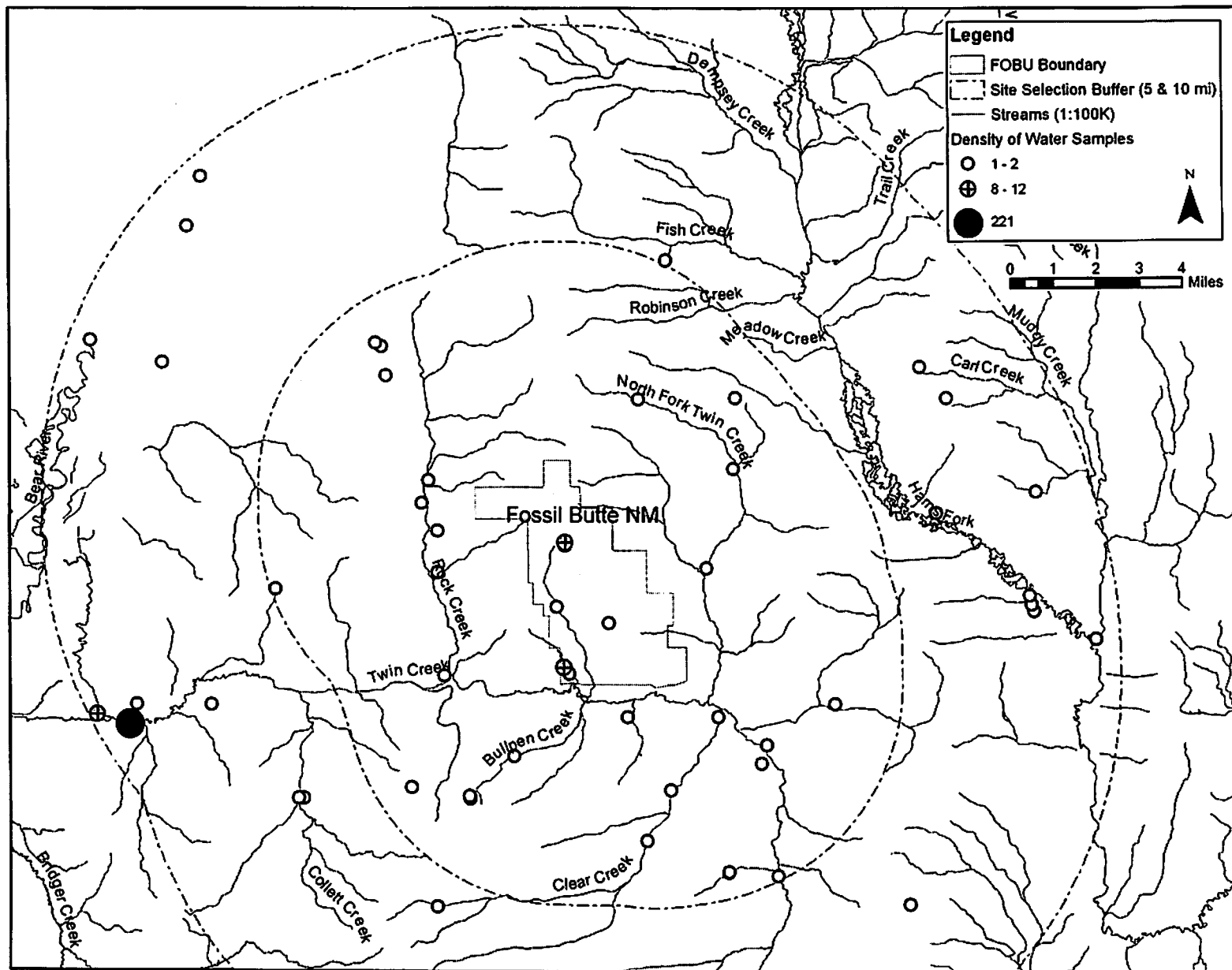




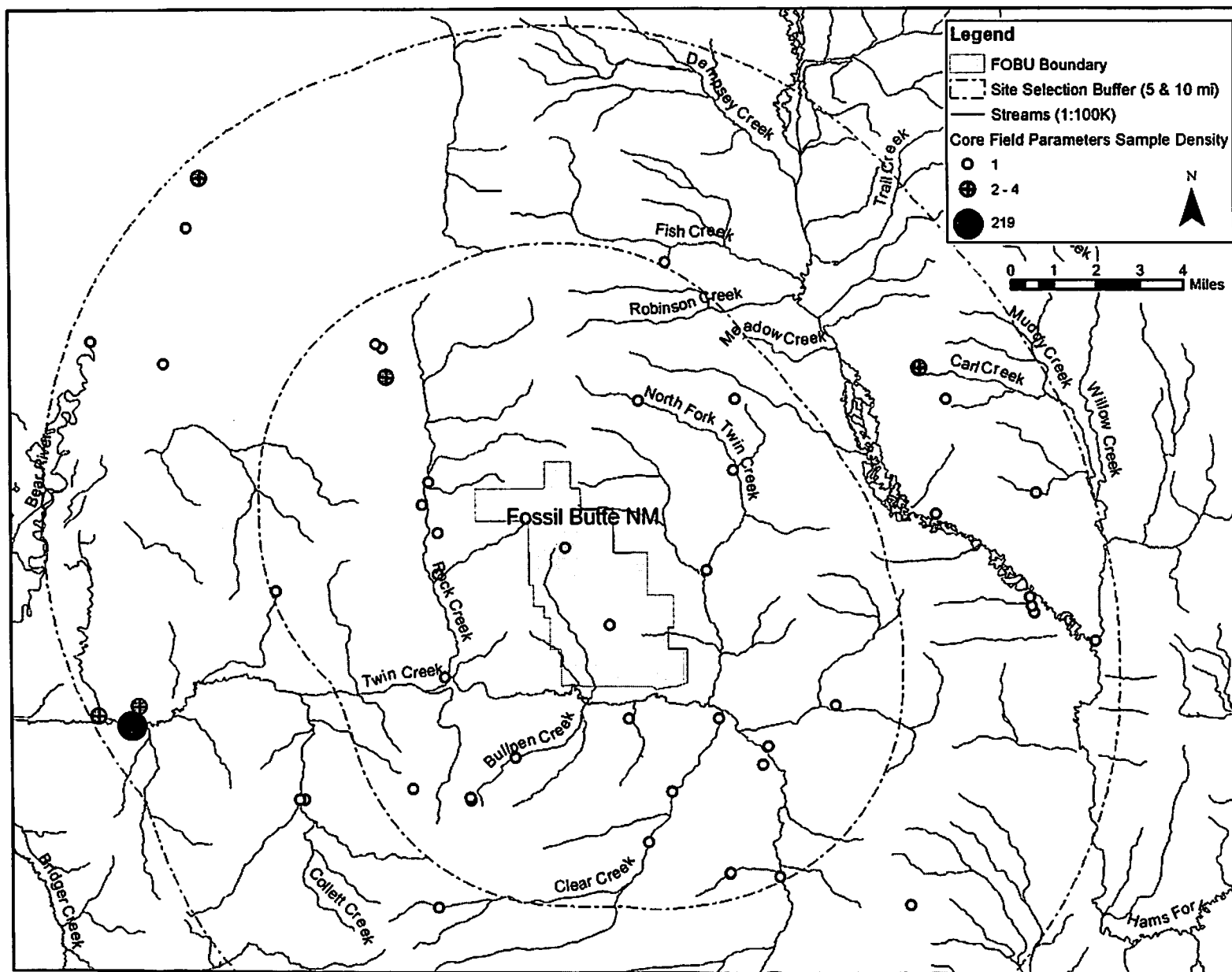
Historic Sample Site Locations by Site Type, Fossil Butte National Monument (FOBU), 1967-2002



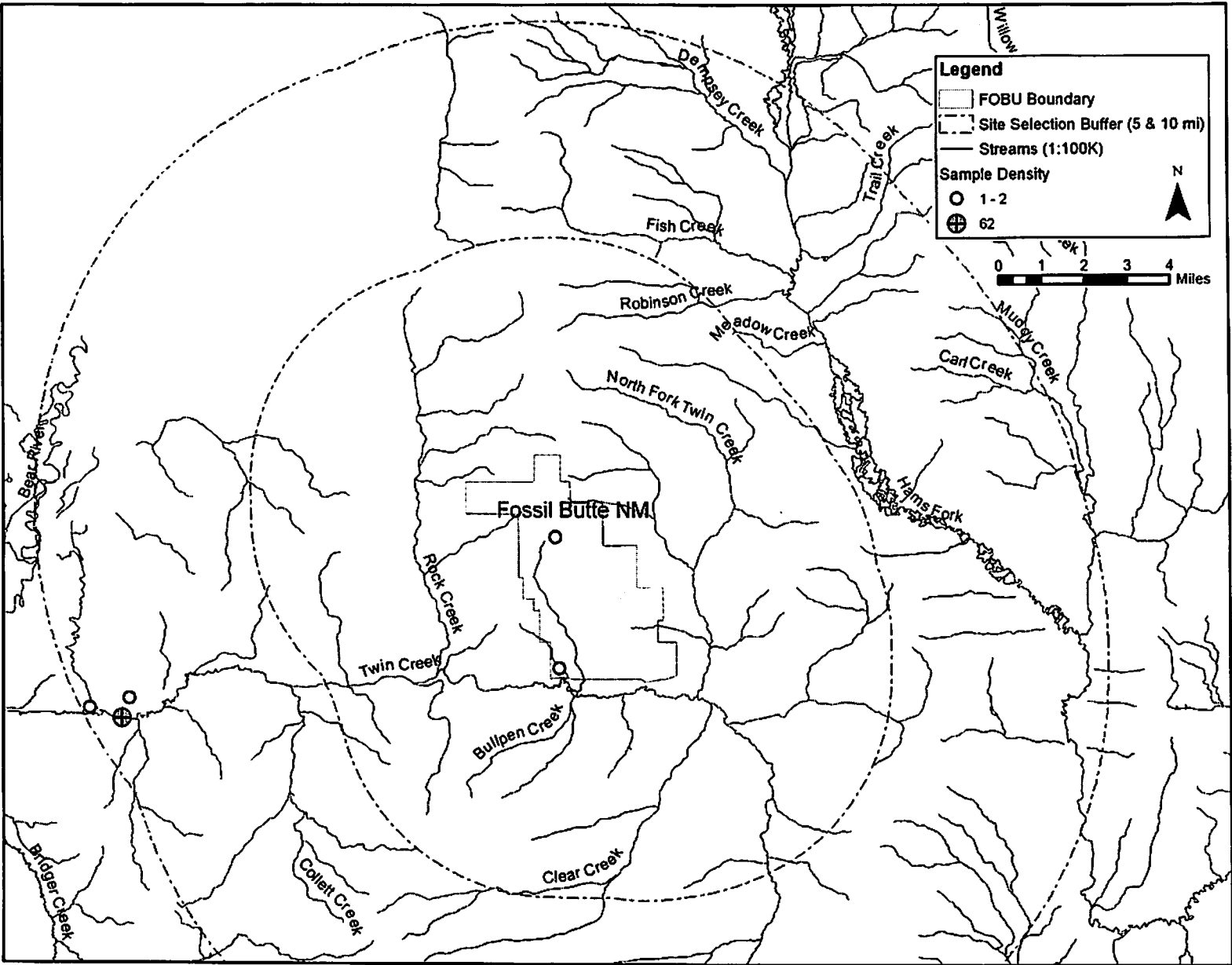
Water Sample Density, Fossil Butte National Monument (FOBU), 1967-2002



Core Field Parameters Sample Density, Fossil Butte National Monument (FOBU), 1967-2002



Microorganisms Sample Density, Fossil Butte National Monument (FOBU), 1975-1988

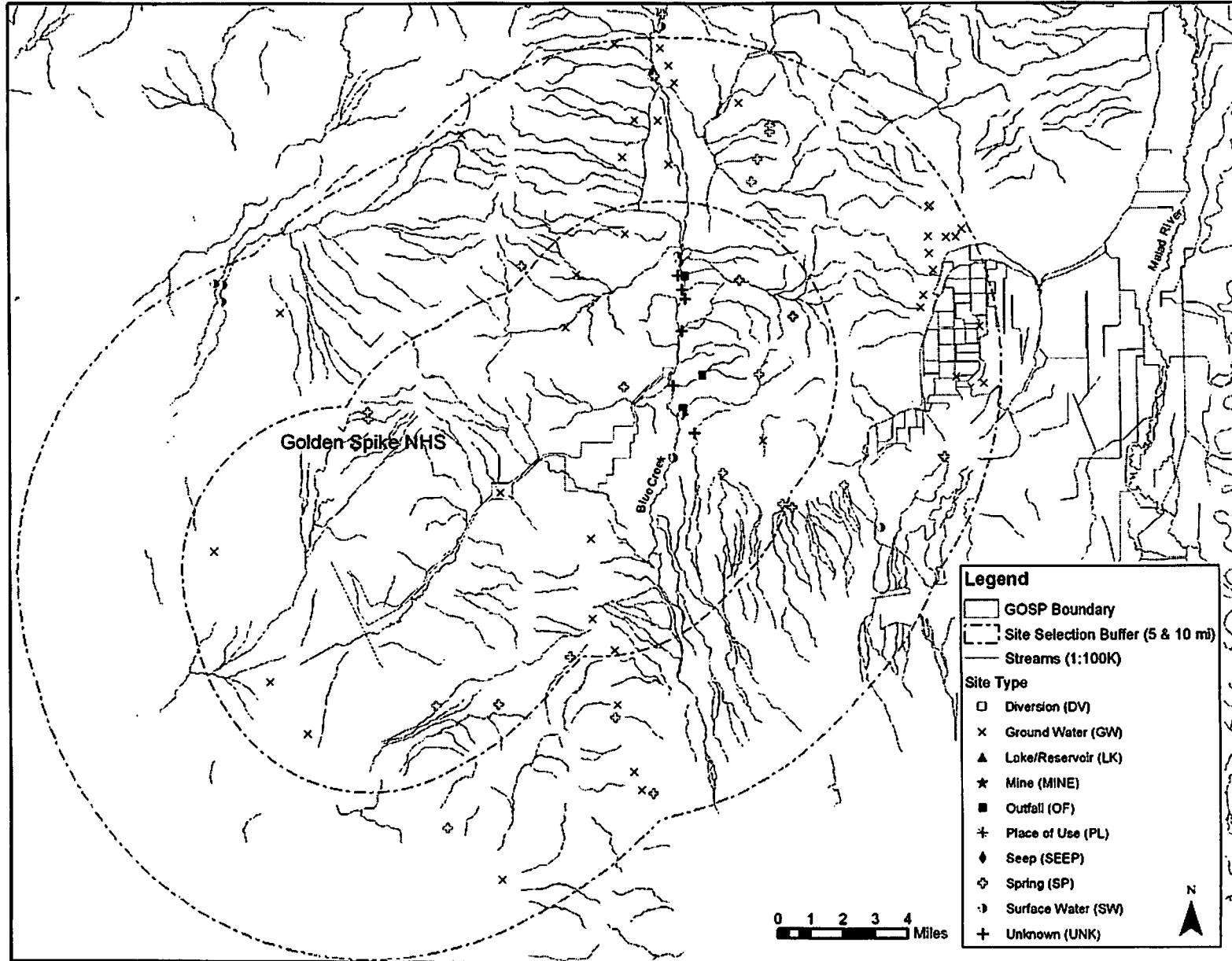


Golden Spike NHS (GOSP) SummarySite and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

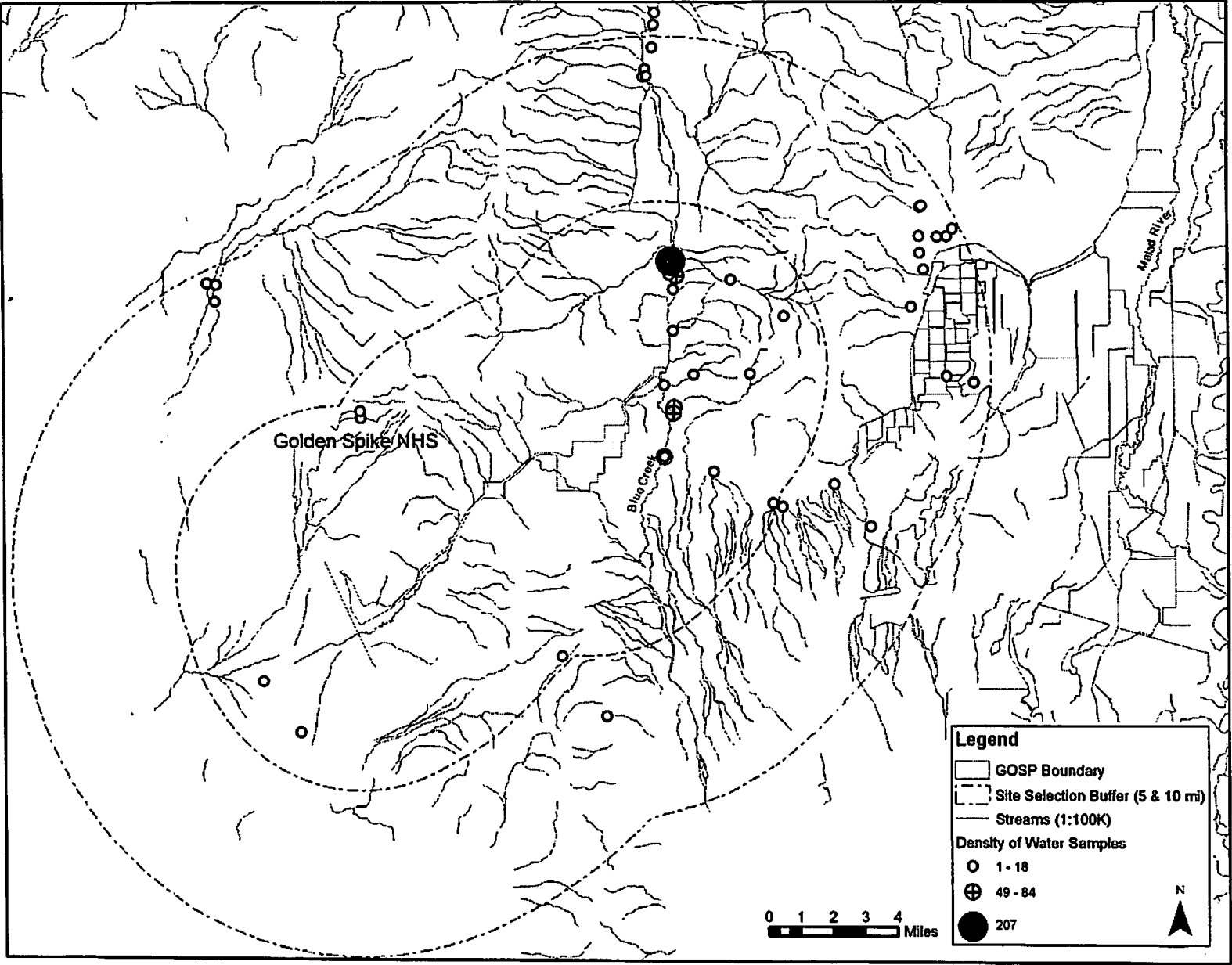
Sample Type⁽⁴⁾	No. of Sites	No. of Samples	Earliest Sample Date	Latest Sample Date⁽²⁾
All water samples	0	n/a	n/a	n/a
Streamflow	0	n/a	n/a	n/a
Core Field Parameters⁽³⁾	0	n/a	n/a	n/a
Microorganisms	0	n/a	n/a	n/a
Major Ions	0	n/a	n/a	n/a
Total and Dissolved Selenium	0	n/a	n/a	n/a
Total Dissolved Solids	0	n/a	n/a	n/a
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	0	n/a	n/a	n/a
Pesticides	0	n/a	n/a	n/a
Nutrients	0	n/a	n/a	n/a
Unionized Ammonia	0	n/a	n/a	n/a
Ammonia	0	n/a	n/a	n/a
Nitrite	0	n/a	n/a	n/a
Nitrate	0	n/a	n/a	n/a
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	0	n/a	n/a	n/a
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit.

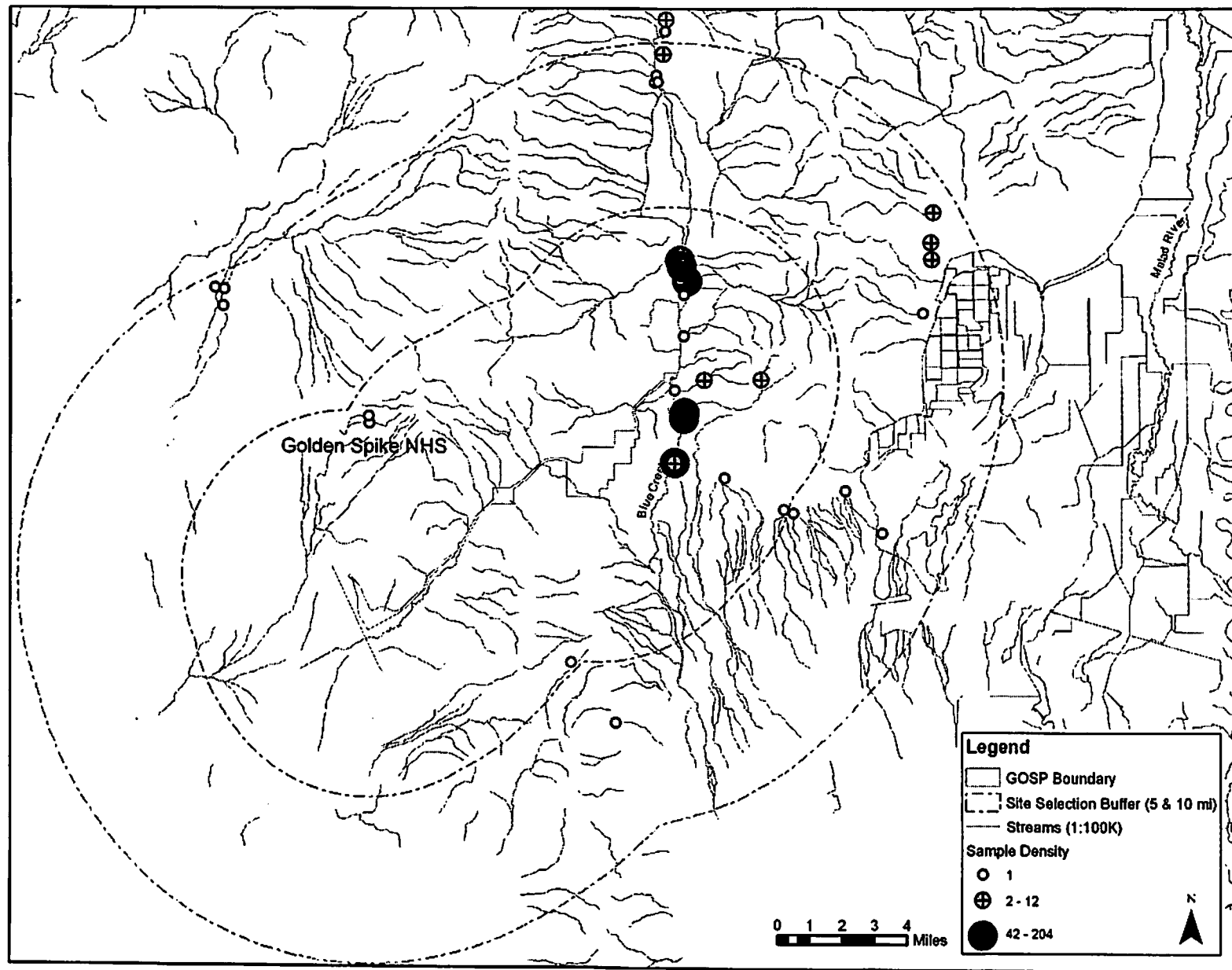
Historic Sample Site Locations by Site Type, Golden Spike National Historic Site (GOSP), 1959-2002



Water Sample Density, Golden Spike National Historic Site (GOSP), 1959-2002



Major Ions Water Sample Density, Golden Spike National Historic Site (GOSP), 1959-2002



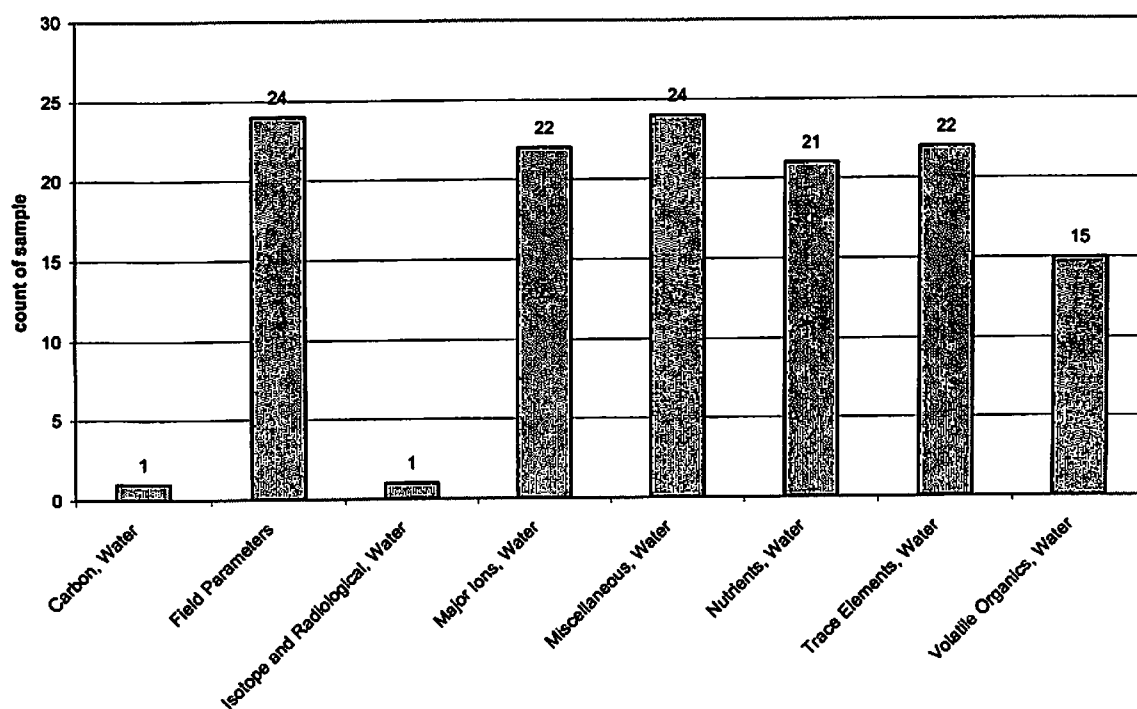
Hovenweep NM (HOVE) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

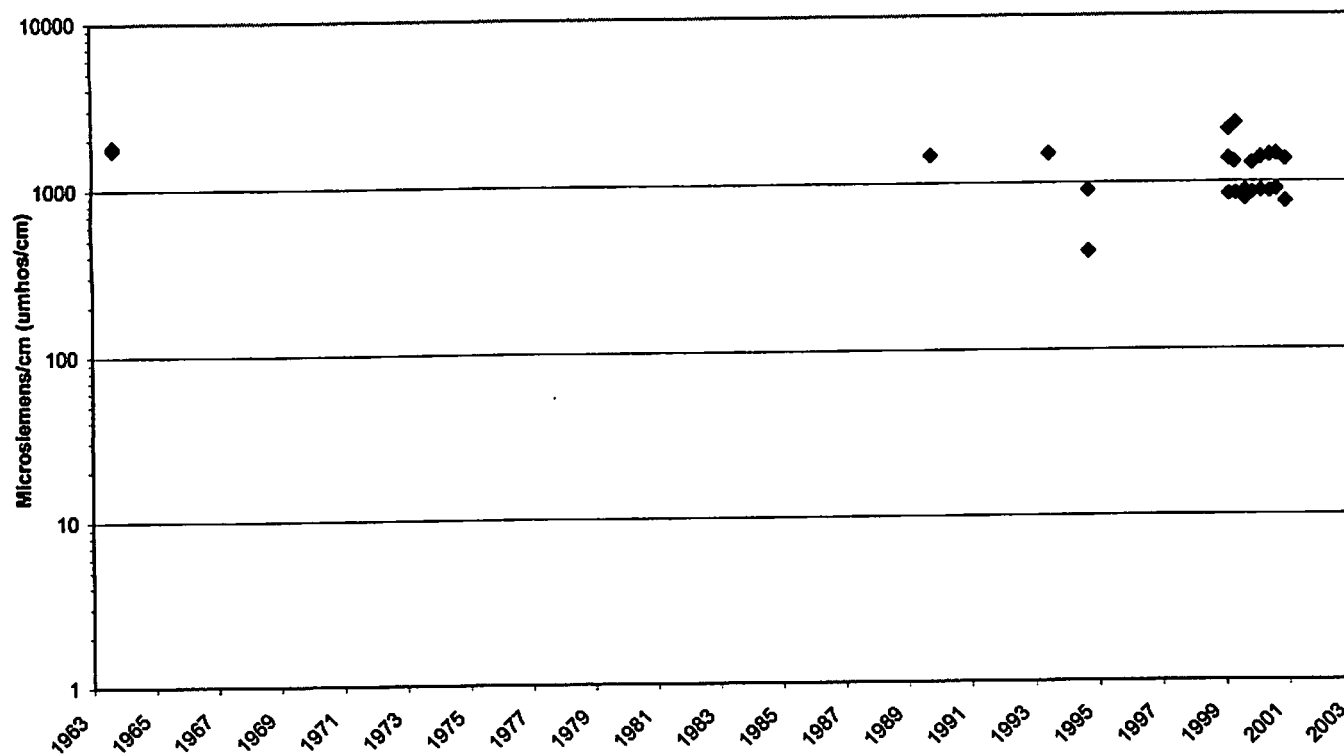
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	7	23	09/07//1963	12/06/2000
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	5	19	09/07/1963	12/06/2000
Microorganisms	0	n/a	n/a	n/a
Major Ions	7	22	09/07/1963	12/06/2000
Total and Dissolved Selenium	5	19	09/14/1994	12/06/2000
Total Dissolved Solids	4	4	09/07/1963	09/14/1994
Total Suspended Solids	3	13	12/19/1999	12/06/2000
Trace Elements	7	22	09/07/1963	12/06/2000
Pesticides	0	n/a	n/a	n/a
Nutrients	6	21	09/07/1963	12/06/2000
Unionized Ammonia	3	6	02/19/1999	05/09/1999
Ammonia	0	n/a	n/a	n/a
Nitrite	0	n/a	n/a	n/a
Nitrate	6	21	09/07/1963	12/06/2000
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	3	16	02/19/1999	08/21/2000
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

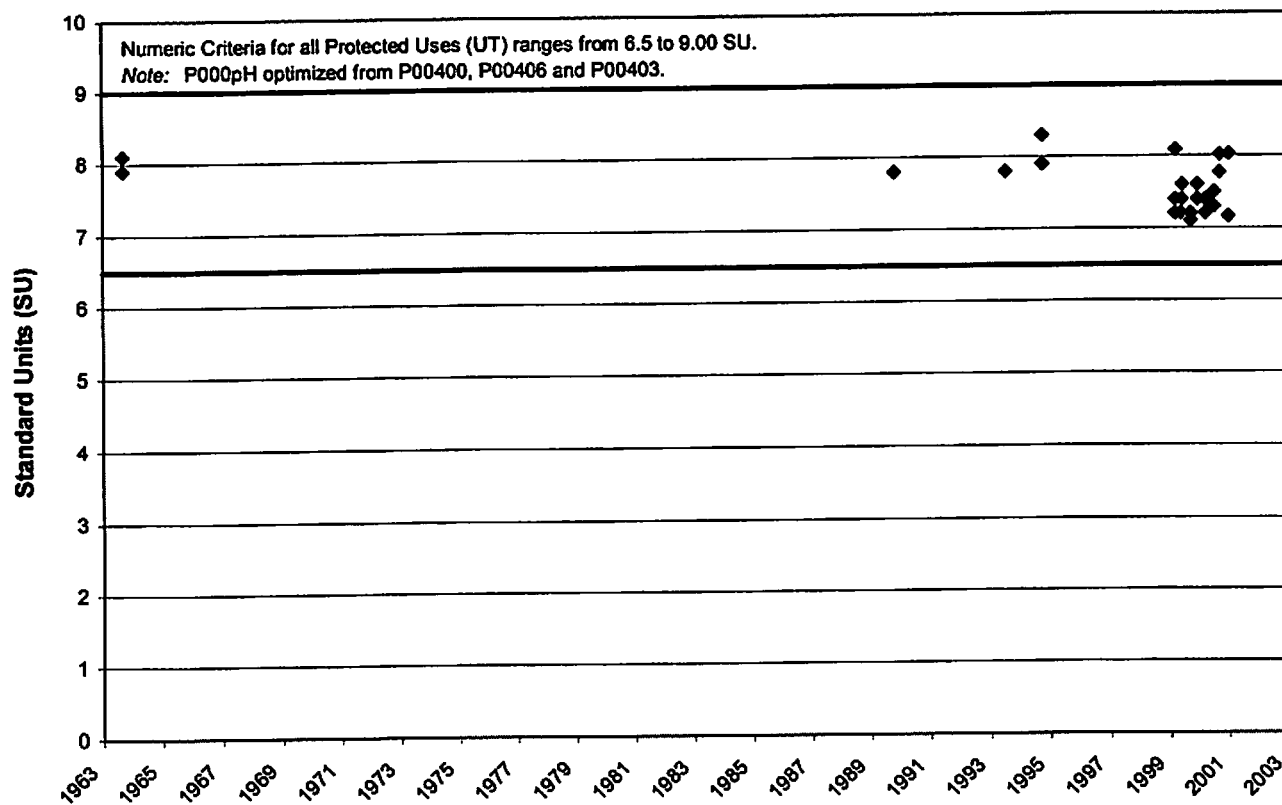
Water Sample Density by Category in Hovenweep National Monument (HOVE)

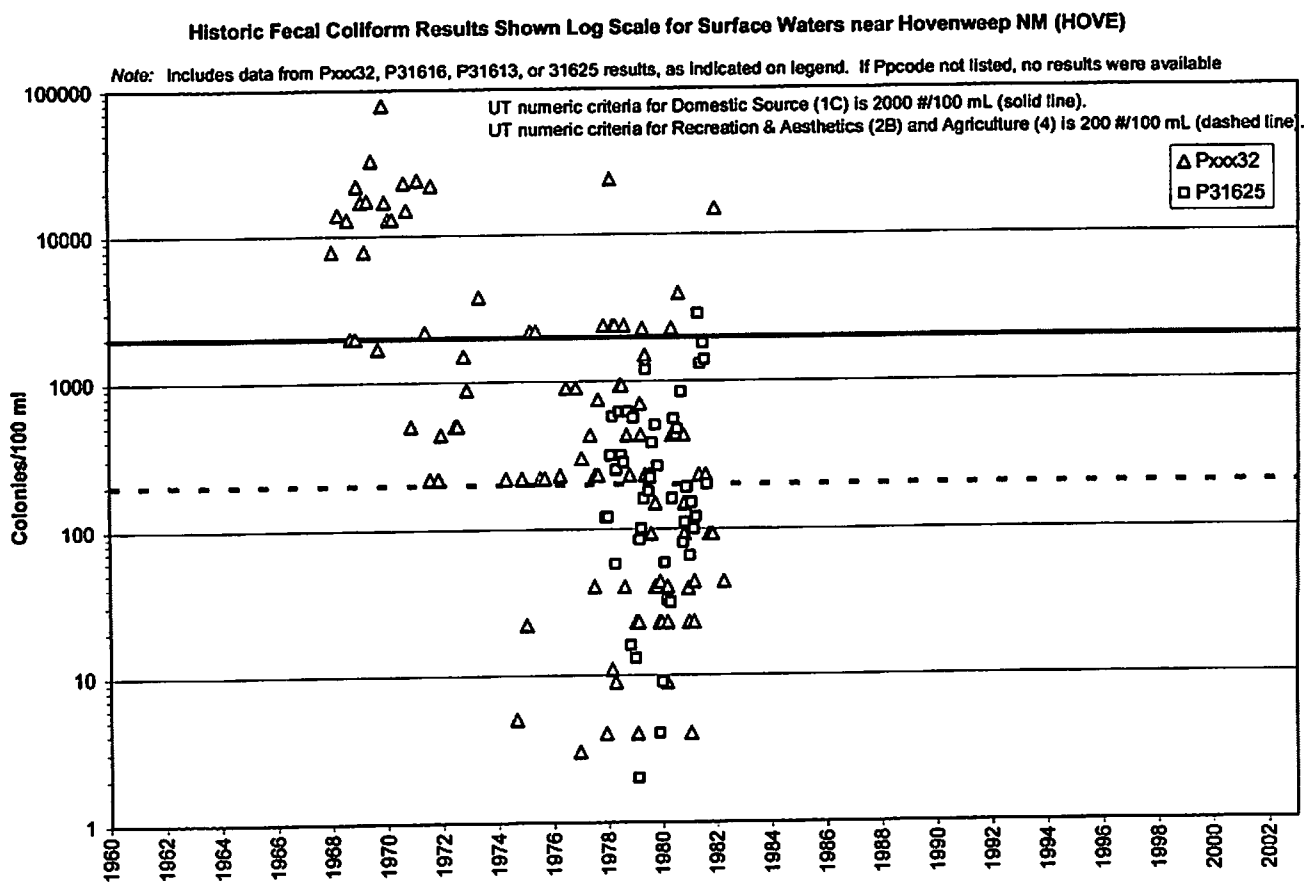
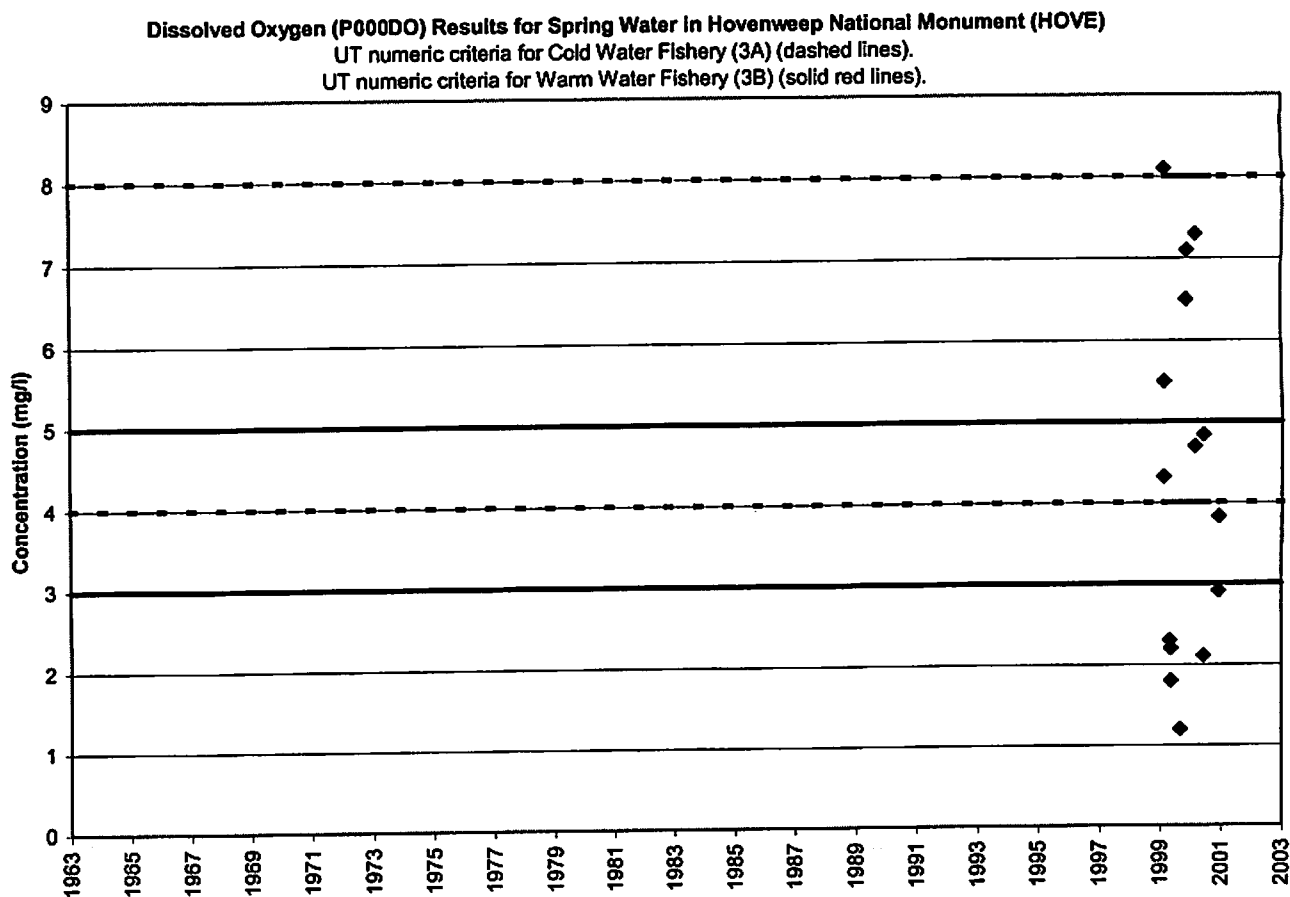


**Specific Conductivity (PSPCnd) Results for Ground and Spring Water
in Hovenweep National Monument (HOVE)**
(PSPCnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



pH (P000pH) Results for Ground and Spring Water in Hovenweep National Monument (HOVE)

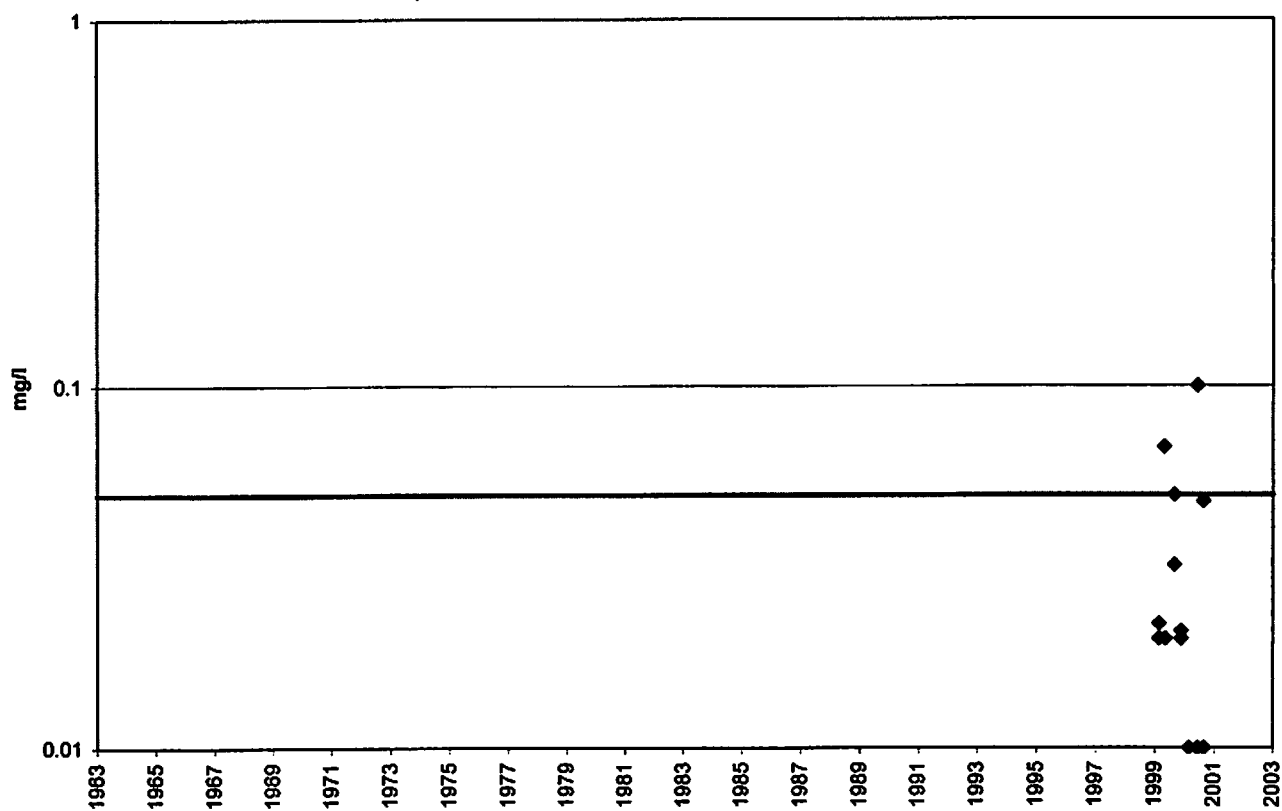




Total Phosphorus (P_{total}P) Results for Spring Water in Hovenweep National Monument (HOVE)

Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

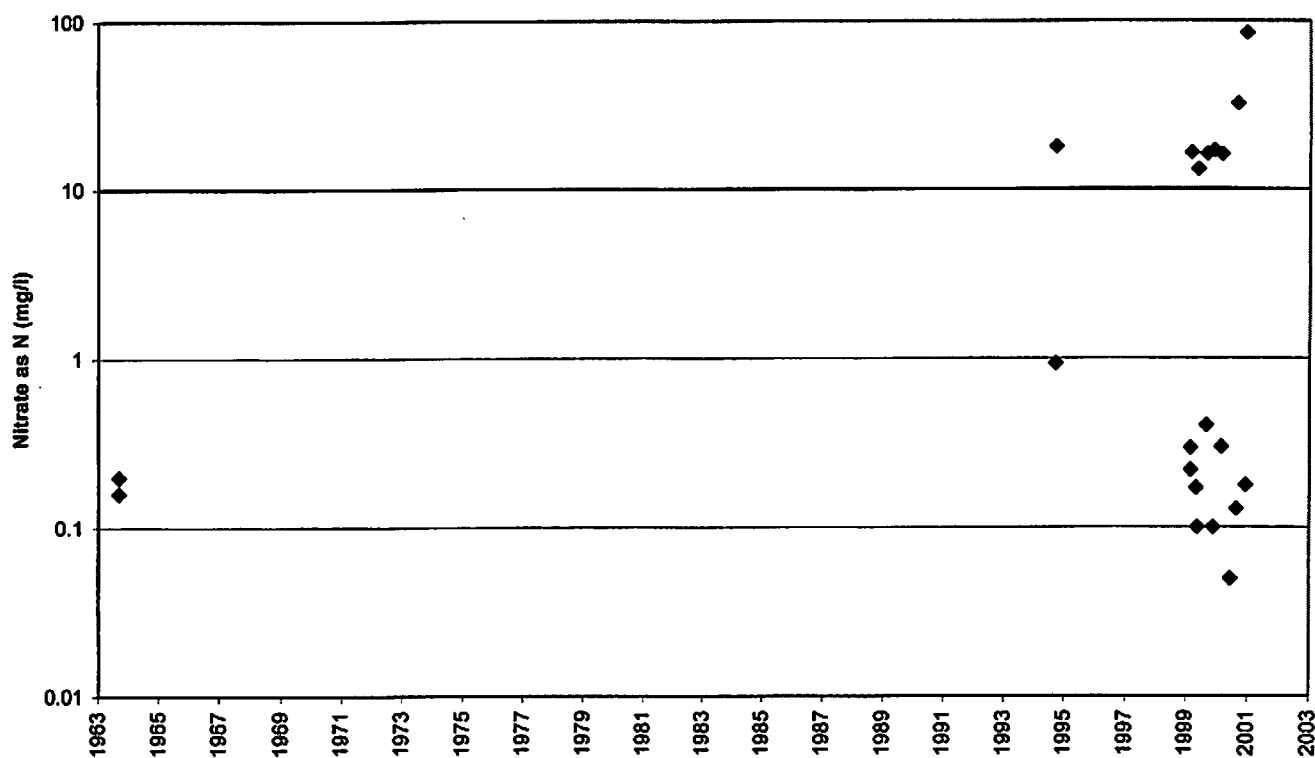
Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.



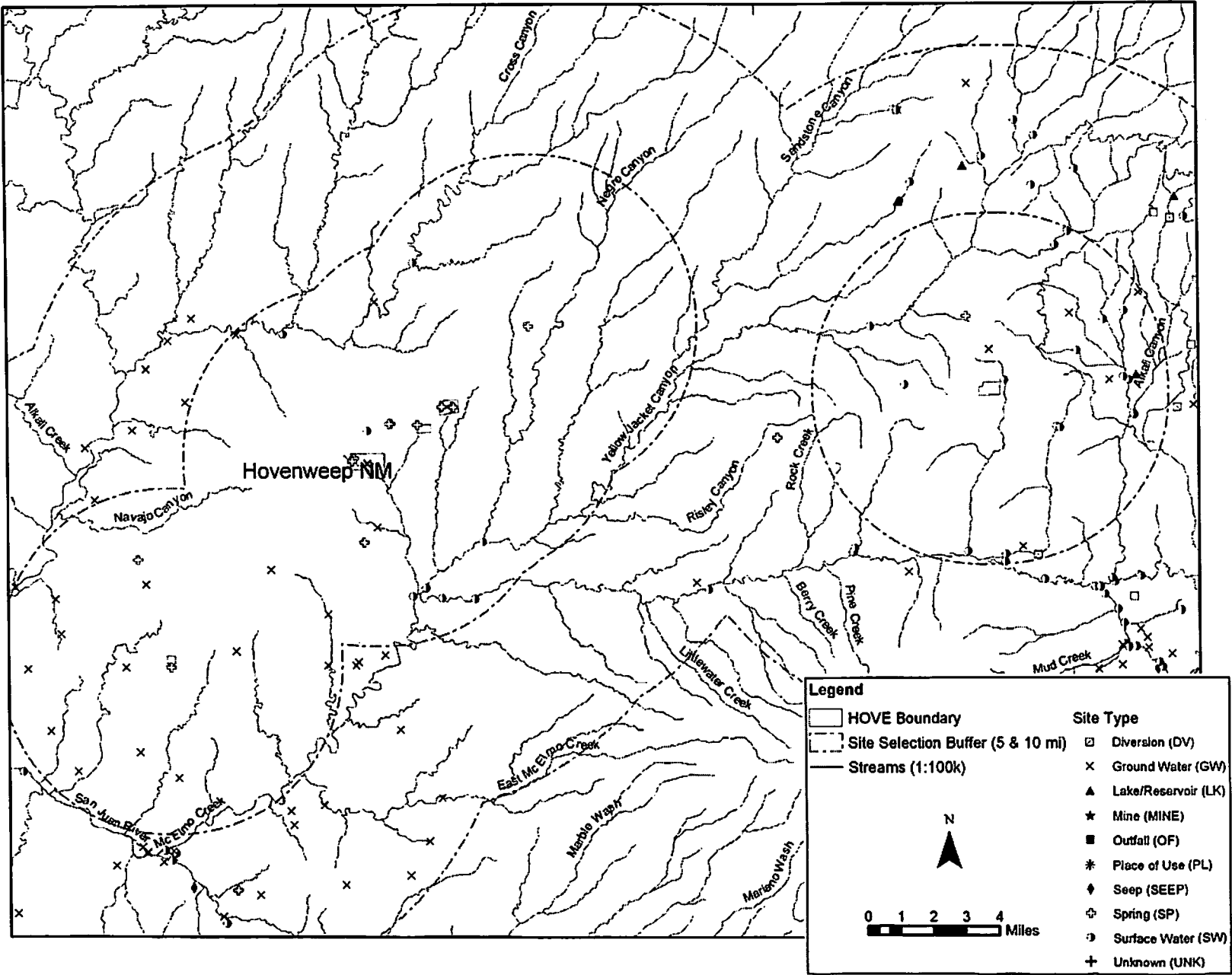
Nitrate Results for Spring and Ground Water in Hovenweep National Monument (HOVE)

Numeric Criteria for Domestic Source (UT) is 10 mg/l.

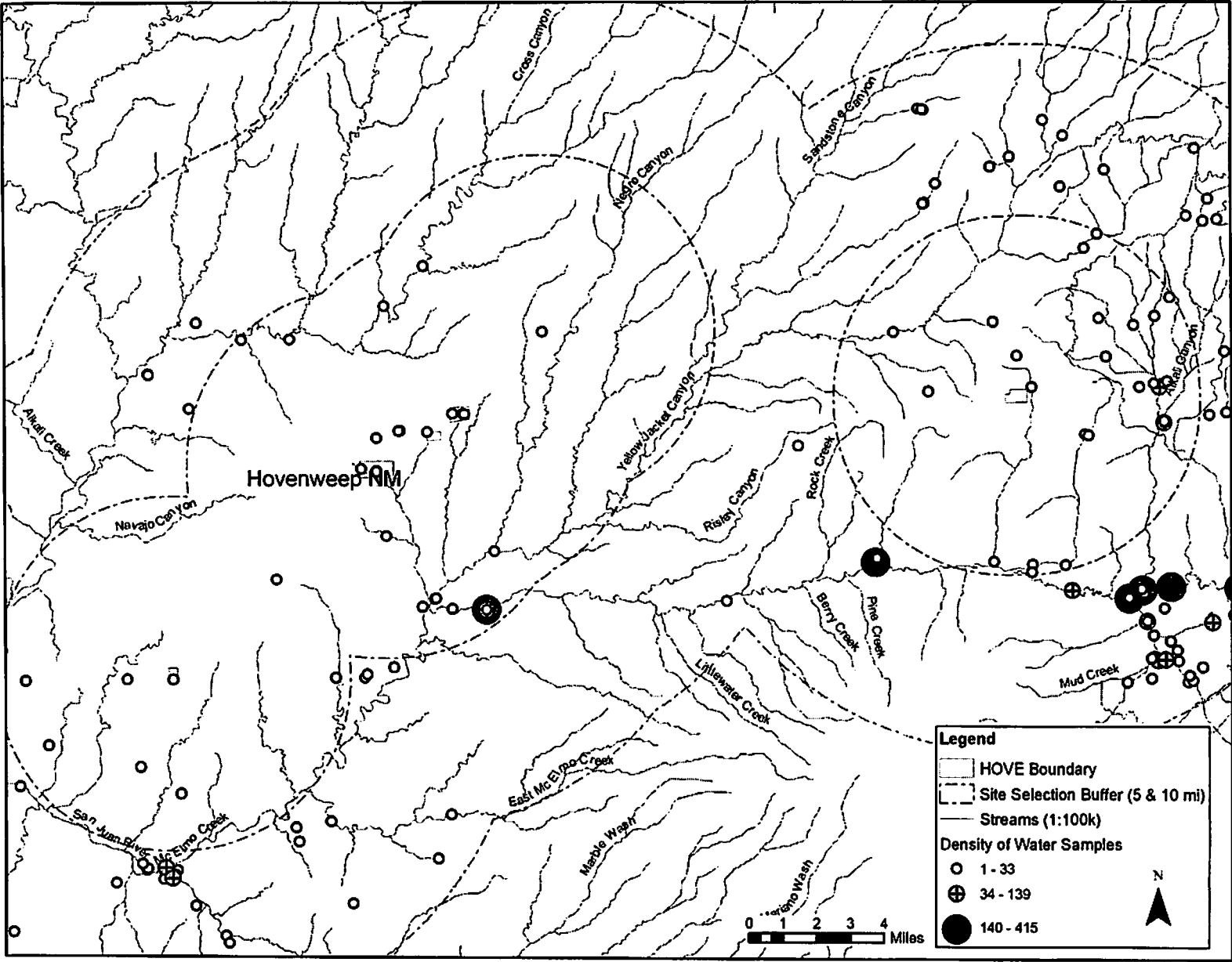
Note: Pnitrate optimized from P00631, P00618, P71851, P00630, P00620, P71850.



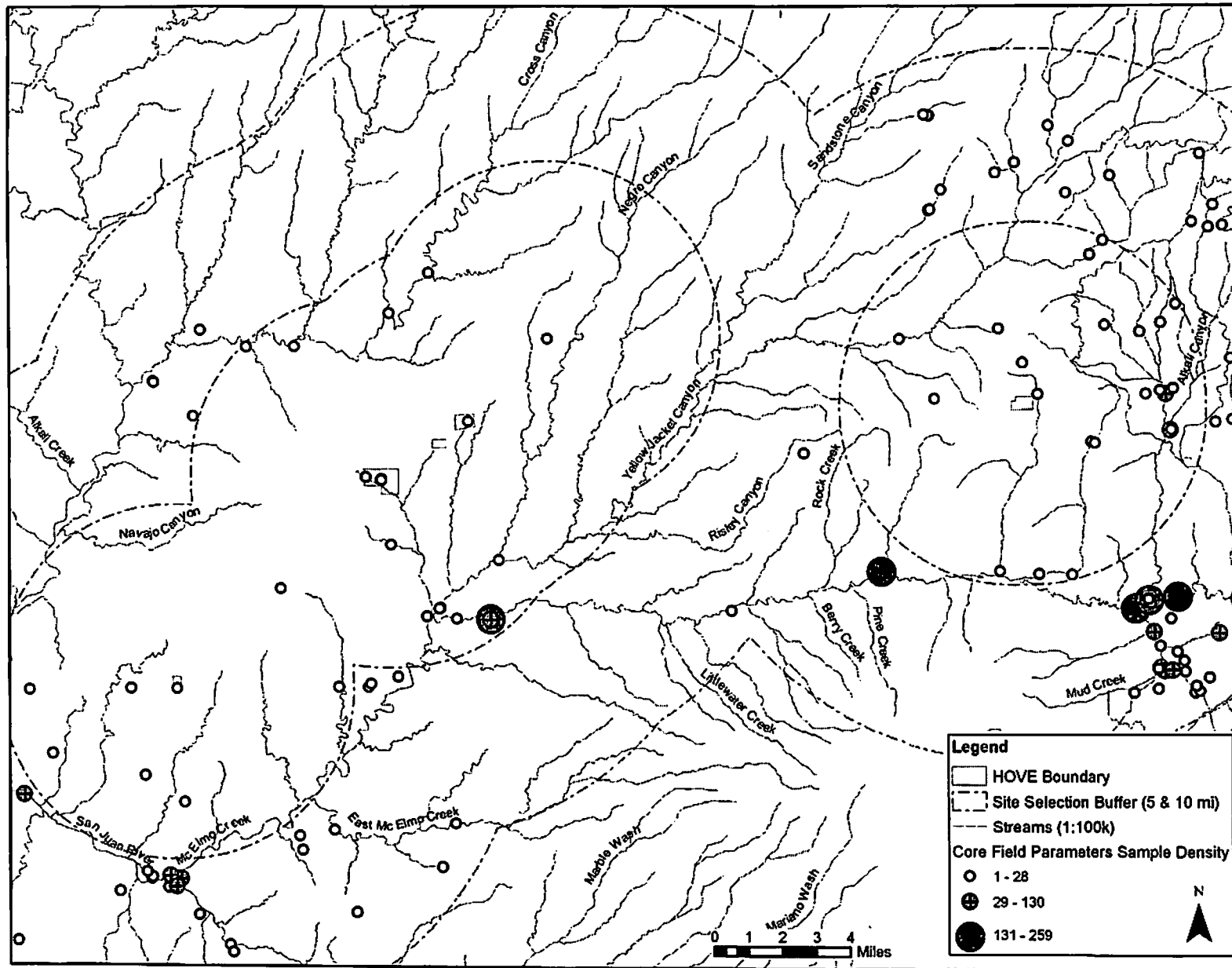
Historic Sample Site Locations by Site Type, Hovenweep National Monument (HOVE), 1960-2002



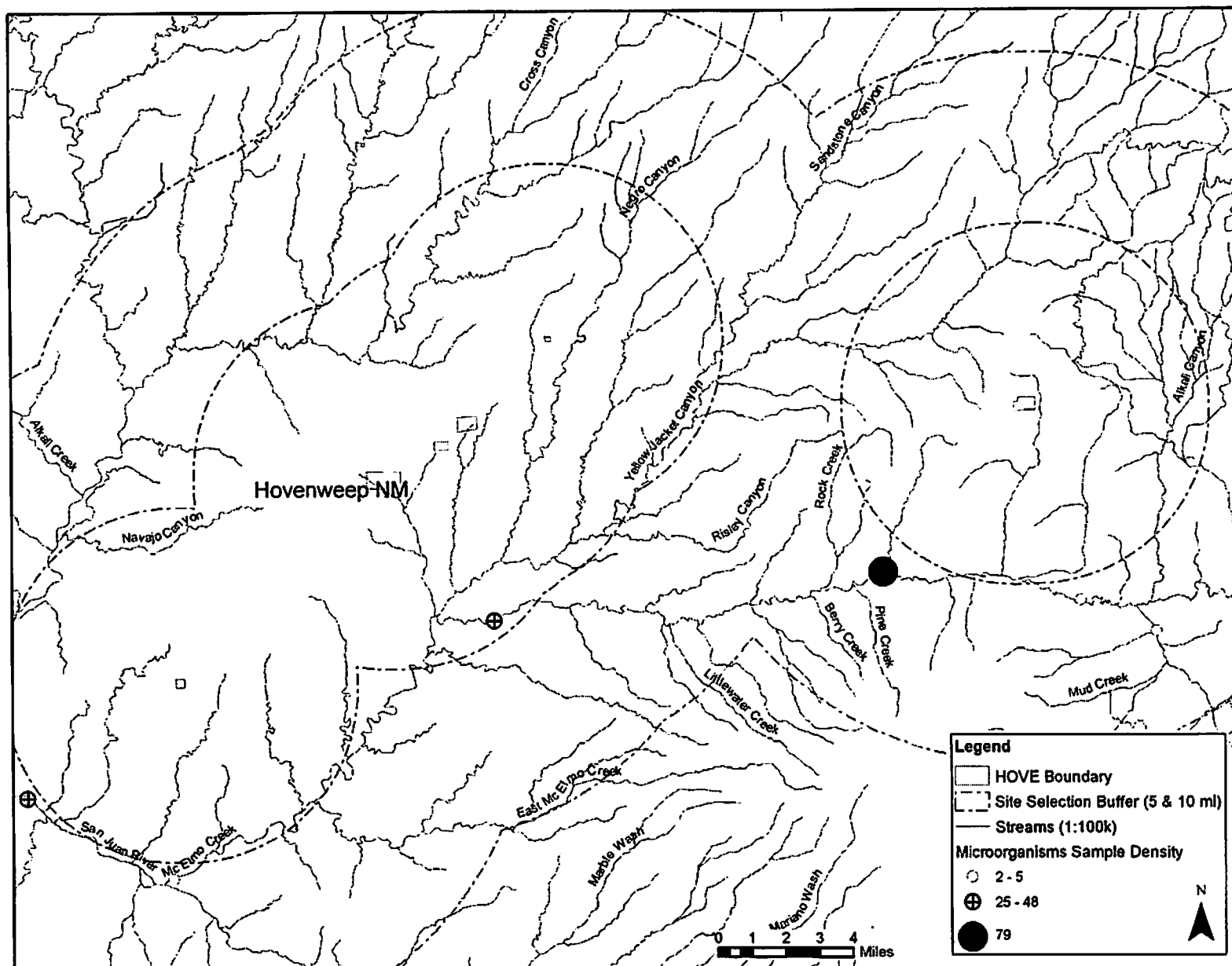
Water Sample Density, Hovenweep National Monument (HOVE), 1960-2002



Core Field Parameters Sample Density, Hovenweep National Monument (HOVE), 1960-2002



Microorganisms Sample Density, Hovenweep National Monument (HOVE), 1968-2002



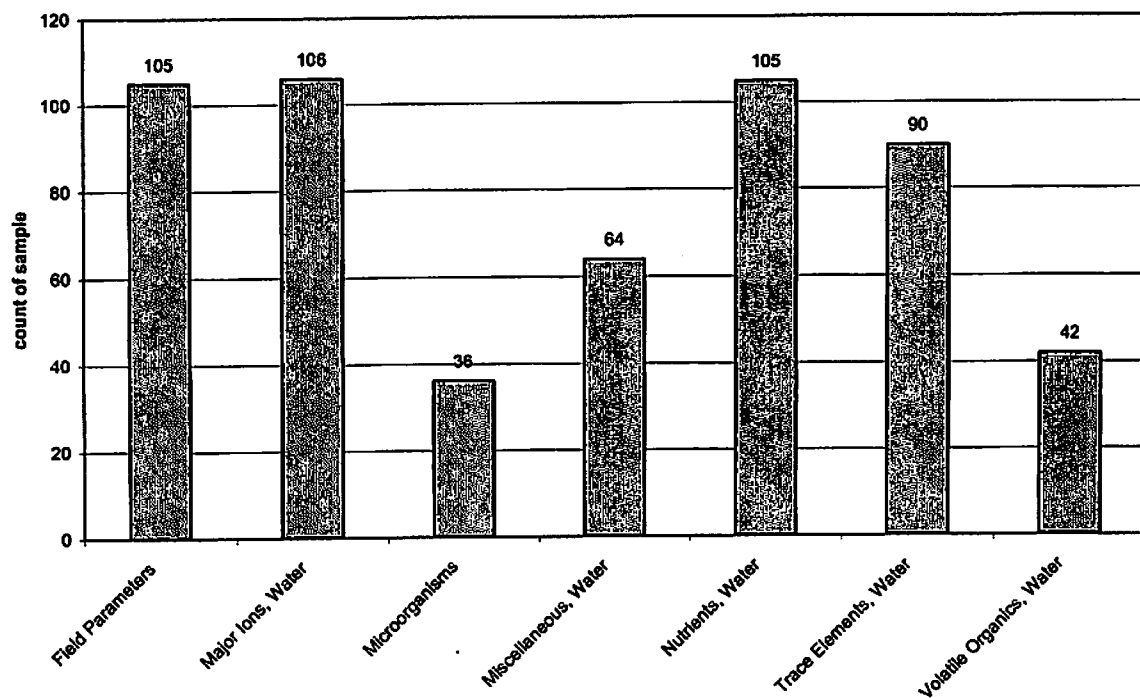
Natural Bridges NM (NABR) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

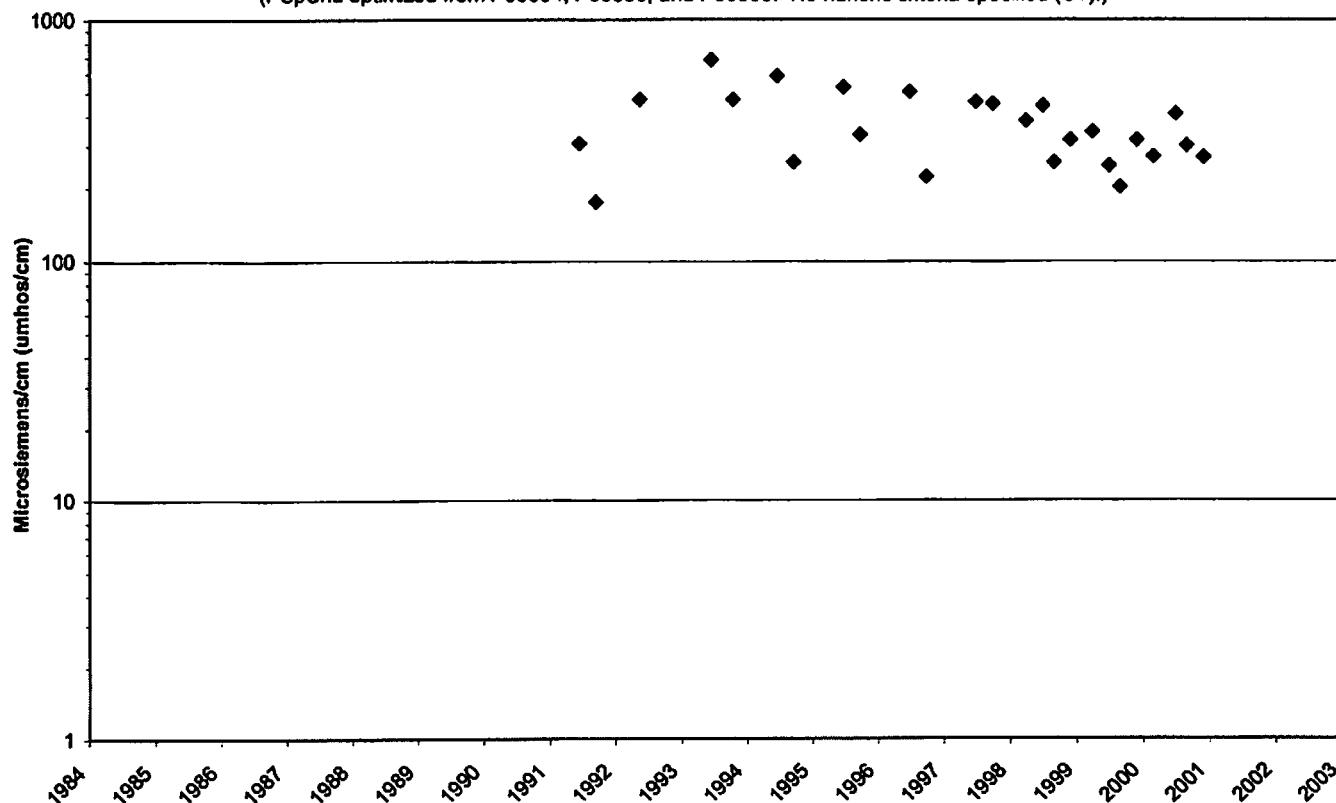
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	8	106	11/20/1984	11/30/2000
Streamflow	1	1	11/20/1984	11/20/1984
Core Field Parameters ⁽³⁾	8	105	11/20/1984	11/30/2000
Microorganisms	5	36	09/18/1985	06/04/1990
Major Ions	8	106	11/20/1984	11/30/2000
Total and Dissolved Selenium	3	48	06/09/1991	08/18/2000
Total Dissolved Solids	0	n/a	n/a	n/a
Total Suspended Solids	3	41	06/10/1991	11/30/2000
Trace Elements	8	90	11/20/1984	11/30/2000
Pesticides	0	n/a	n/a	n/a
Nutrients	8	105	11/20/1984	11/30/2000
Unionized Ammonia	3	43	06/09/1991	03/02/1999
Ammonia	0	n/a	n/a	n/a
Nitrite	0	n/a	n/a	n/a
Nitrate	8	100	11/20/1984	11/30/2000
Total Nitrogen	3	11	06/10/1991	09/11/1996
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	3	58	06/09/1991	08/18/2000
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

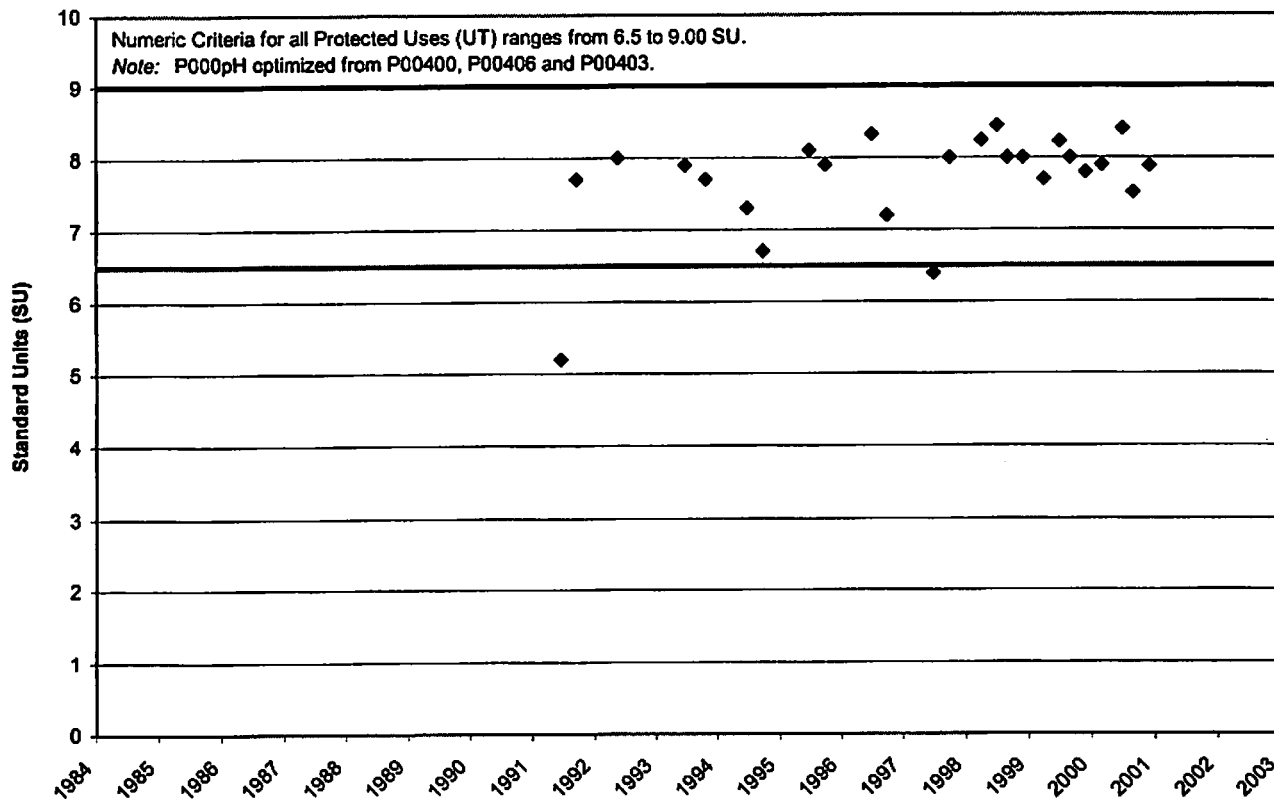
Water Sample Density by Category in Natural Bridges National Monument (NABR)



**Specific Conductivity (PSPcnd) Results for Surface Water
in Natural Bridges National Monument (NABR)**
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



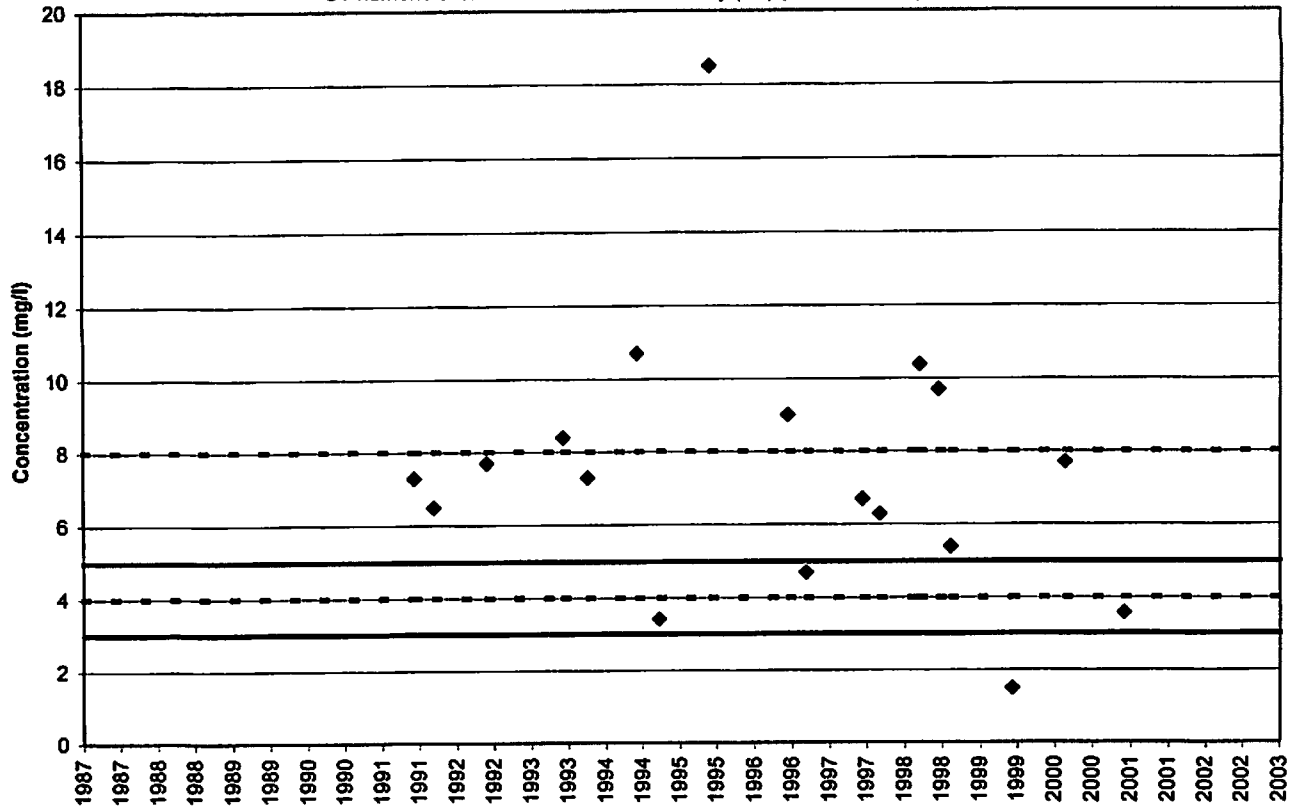
pH (P000pH) Results for Surface Water in Natural Bridges National Monument (NABR)



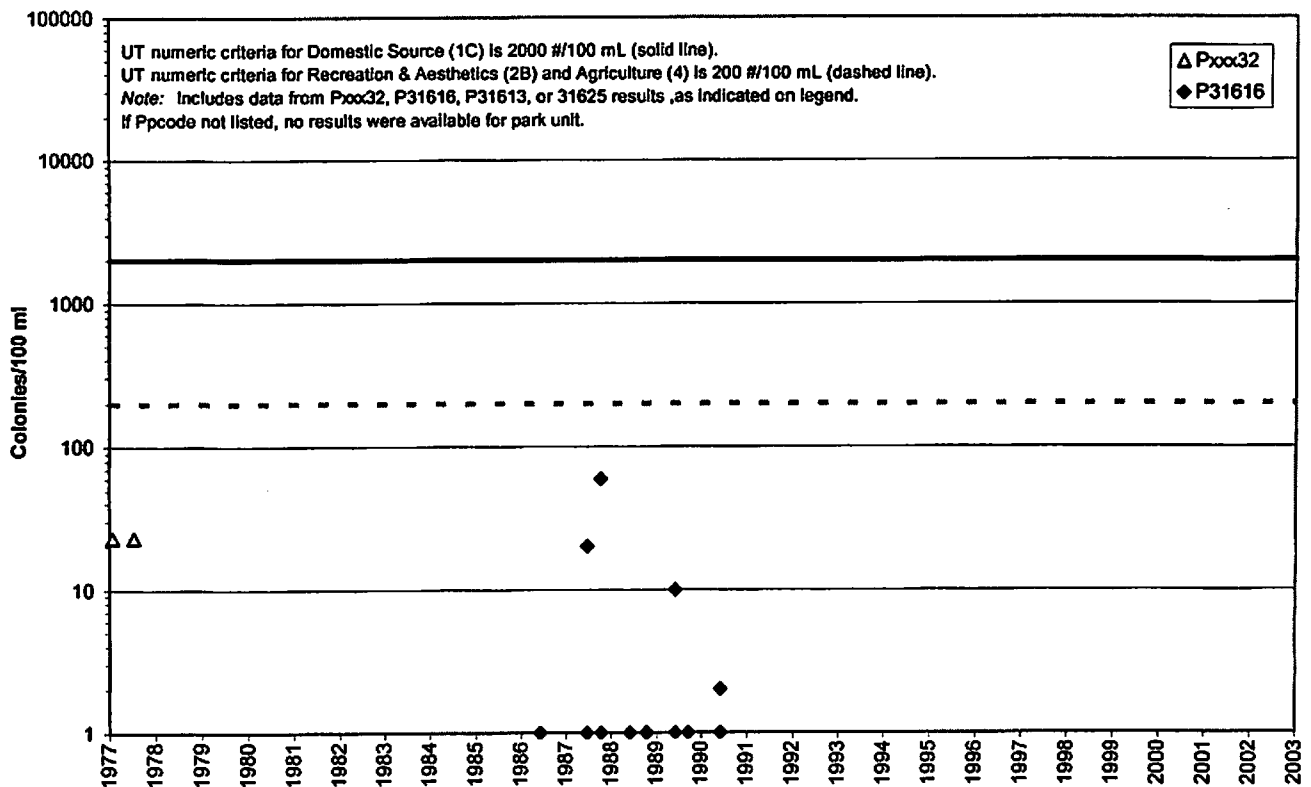
Dissolved Oxygen (P000DO) Results for Surface Water in Natural Bridges National Monument (NABR)

UT numeric criteria for Cold Water Fishery (3A) (dashed lines).

UT numeric criteria for Warm Water Fishery (3B) (solid red lines).



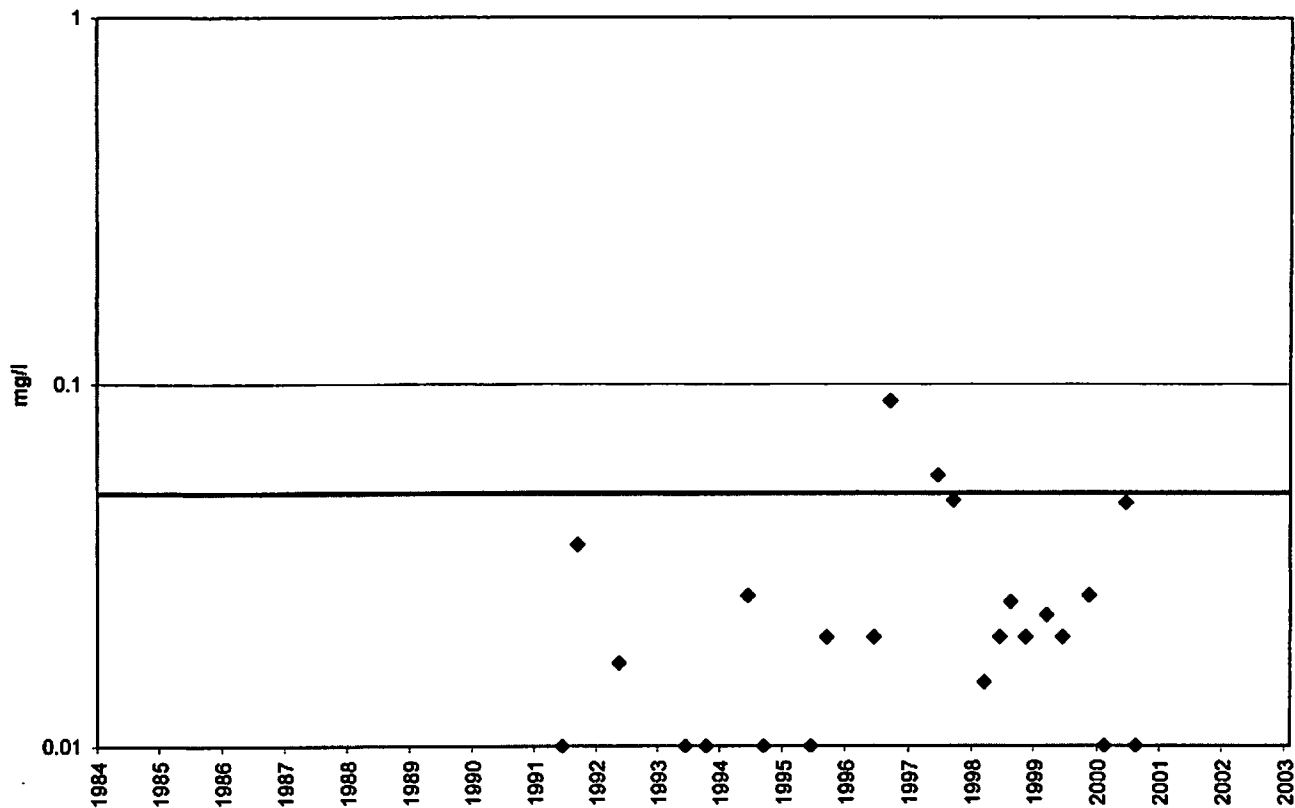
Historic Fecal Coliform Results Shown Log Scale for Springs and Seeps In and near Natural Bridges NM (NABR)



Total Phosphorus (PtotalP) Results for Surface Water in Natural Bridges National Monument (NABR)

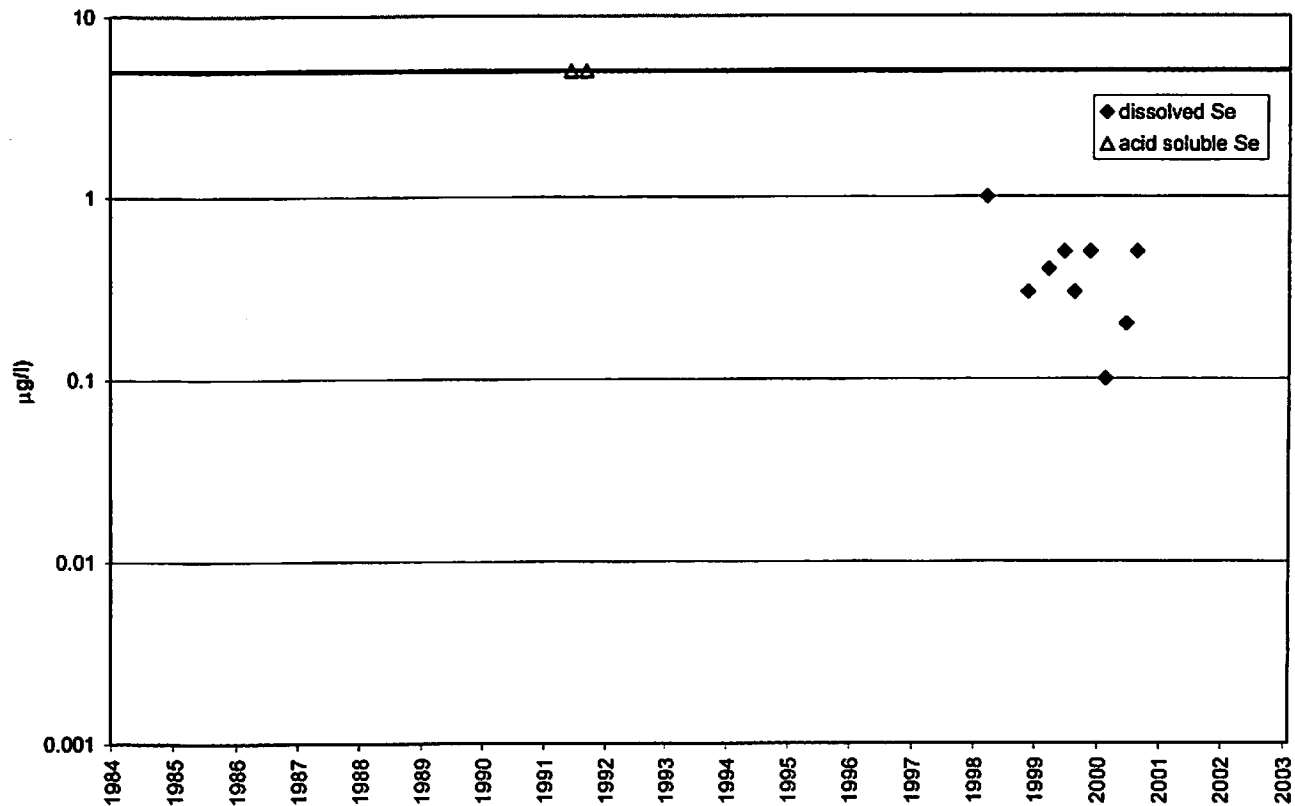
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.

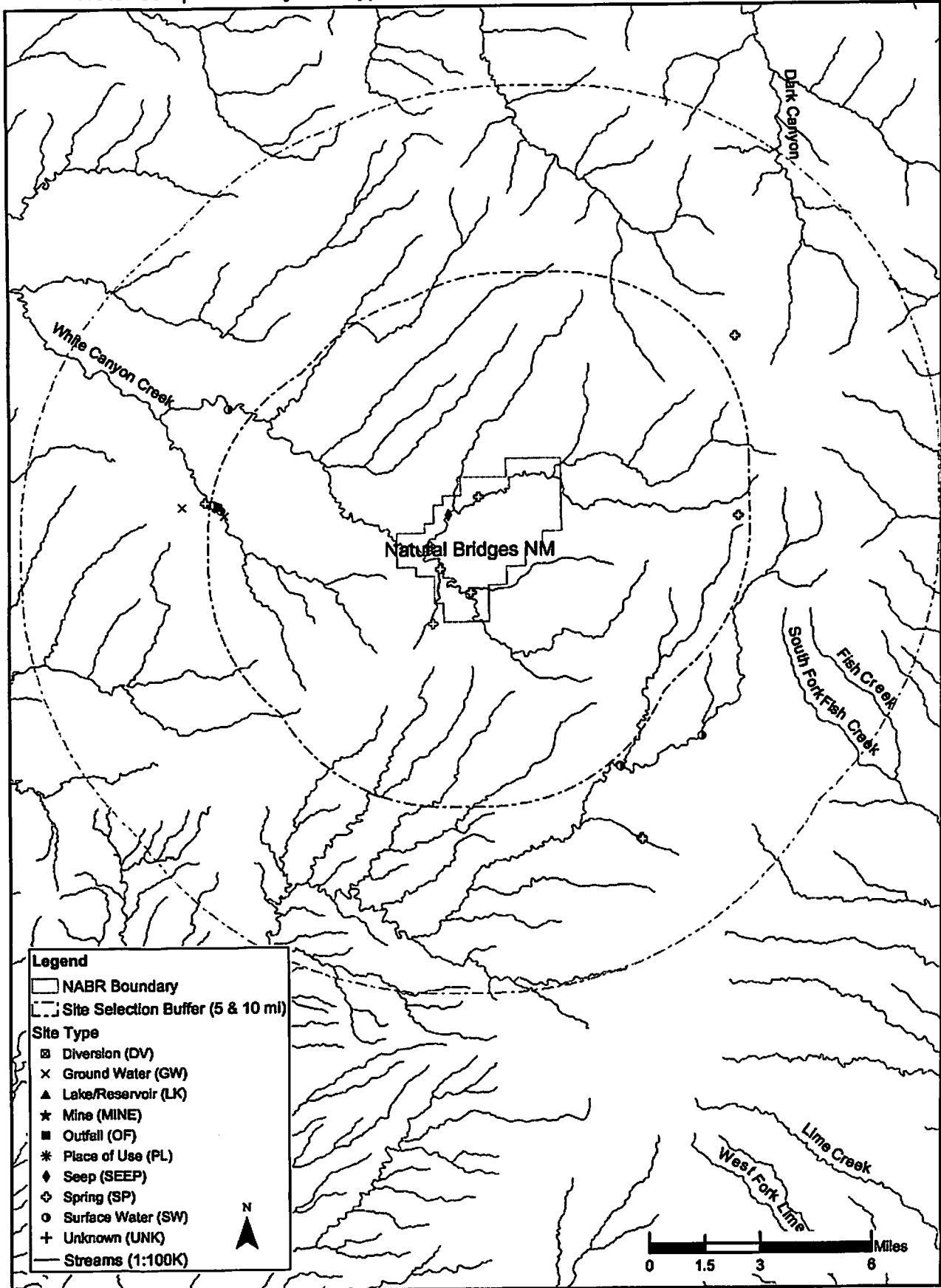


Selenium Results for Surface Water in Natural Bridges National Monument (NABR)

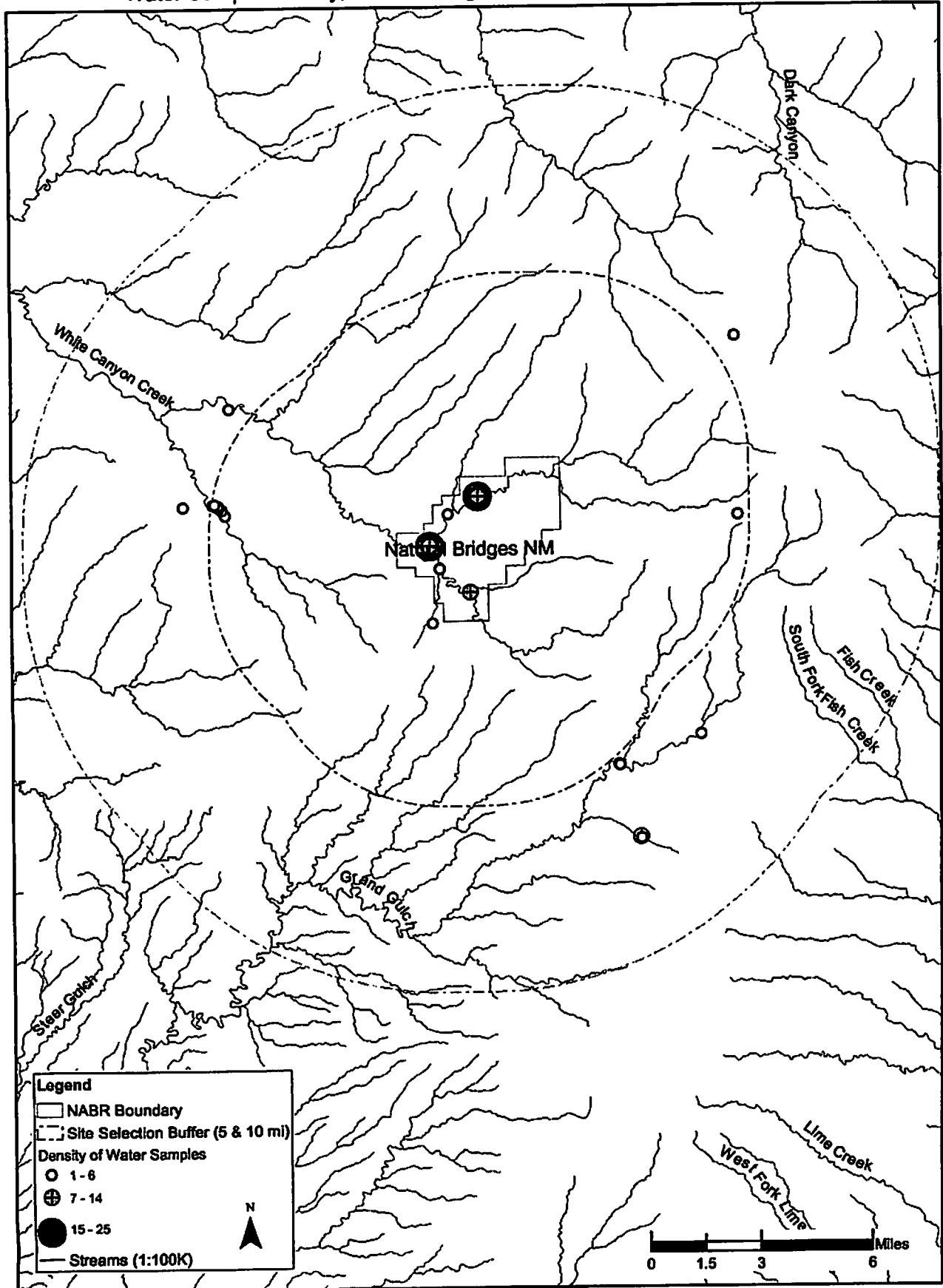
USEPA Numeric Criteria for Aquatic Wildlife =5 µg/l.



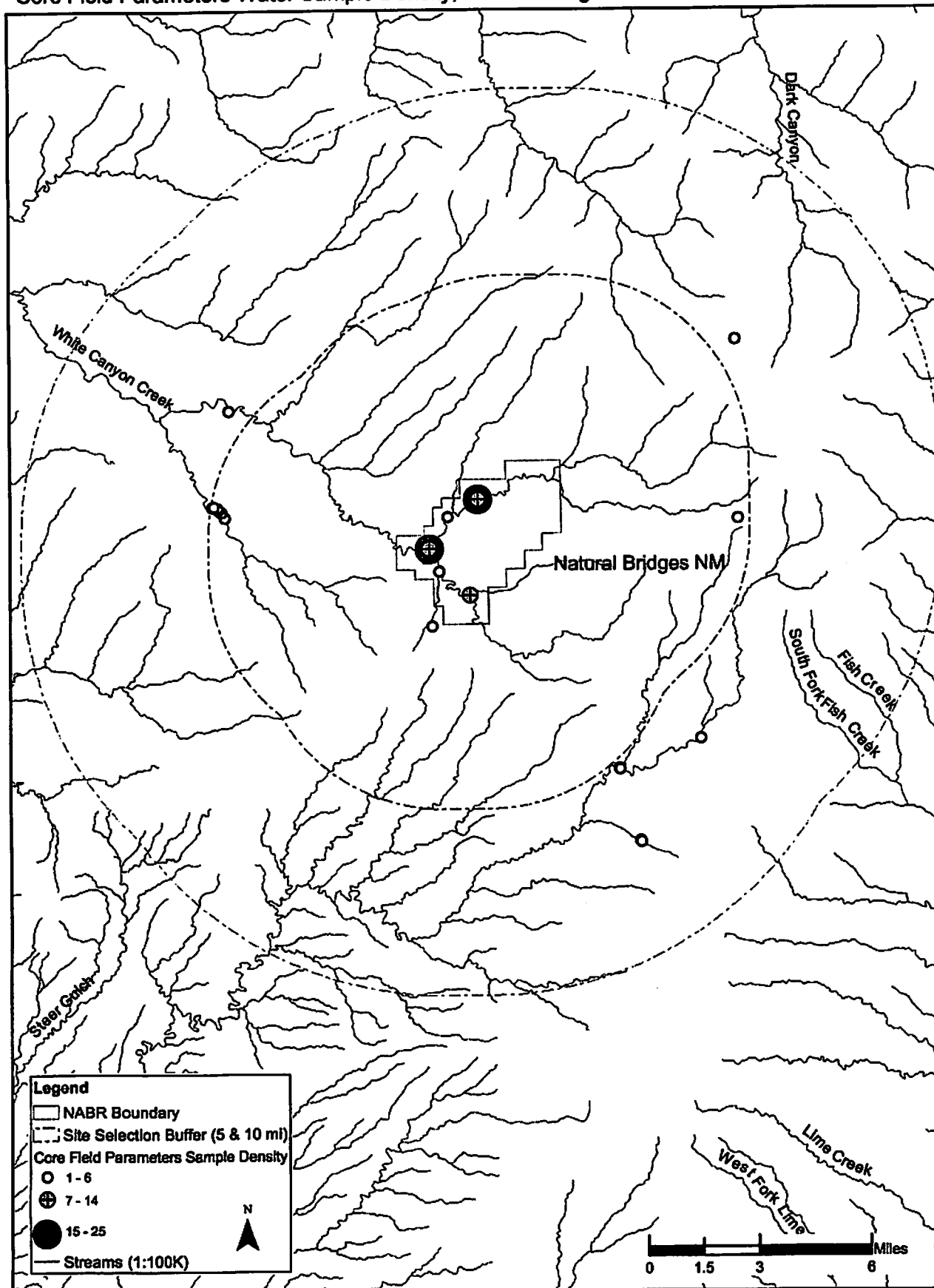
Water Sample Sites by Site Type, Natural Bridges National Monument, 1977-2000



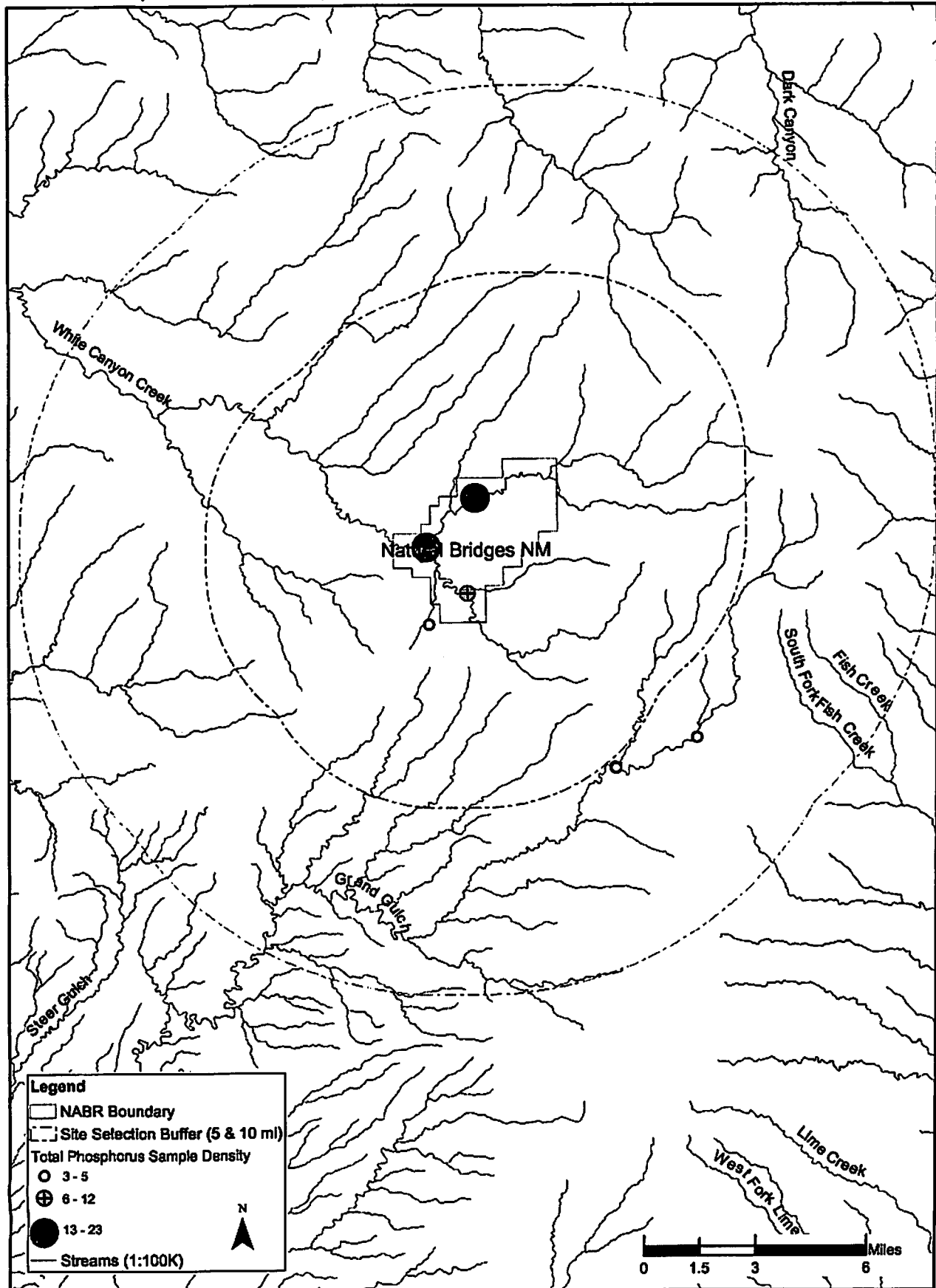
Water Sample Density, Natural Bridges National Monument, 1977-2000



Core Field Parameters Water Sample Density, Natural Bridges National Monument, 1977-2000



Total Phosphorus Water Sample Density, Natural Bridges National Monument, 1991-2000



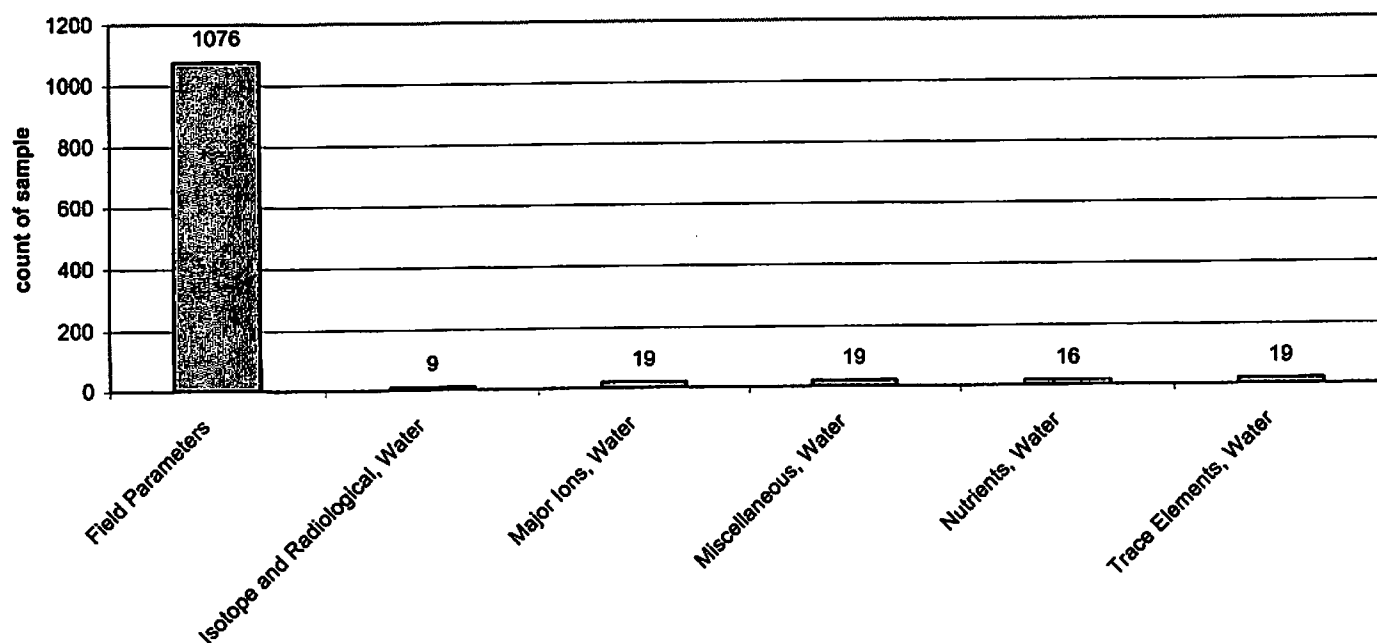
Pipe Spring NM (PISP) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

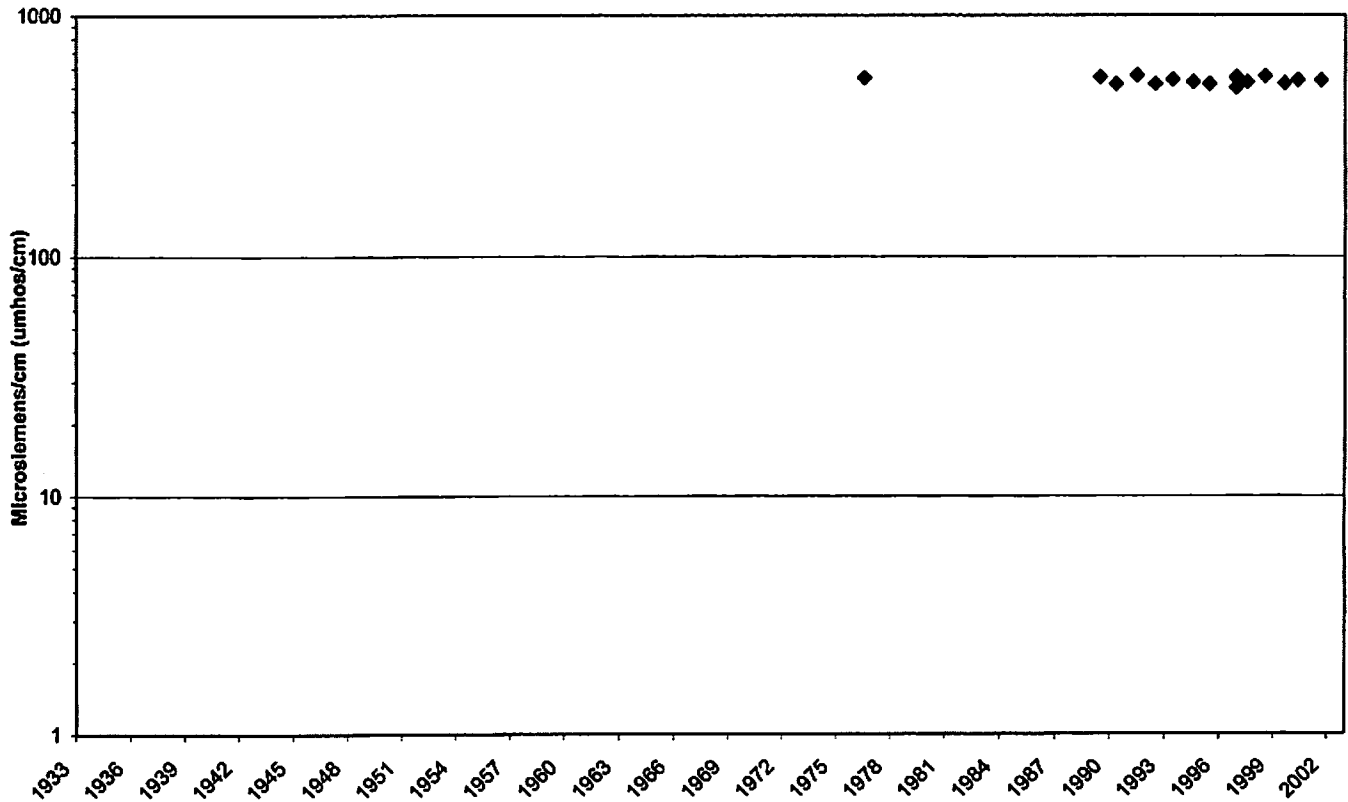
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁶⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	14	1077	09/13/1933	08/30/2001
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	6	19	07/27/1976	08/30/2001
Microorganisms	0	n/a	n/a	n/a
Major Ions	6	19	07/27/1976	08/30/2001
Total and Dissolved Selenium	6	6	12/10/1996	12/10/1996
Total Dissolved Solids	6	19	07/27/1976	08/30/2001
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	6	19	07/27/1976	08/30/2001
Pesticides	0	n/a	n/a	n/a
Nutrients	5	16	07/27/1976	08/30/2001
Unionized Ammonia	5	13	06/24/1992	08/30/2001
Ammonia	5	13	06/24/1992	08/30/2001
Nitrite	5	13	06/24/1992	08/30/2001
Nitrate	5	16	07/27/1976	08/30/2001
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	5	16	07/27/1976	08/30/2001
Total Phosphorus	4	4	12/10/1996	12/10/1996
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

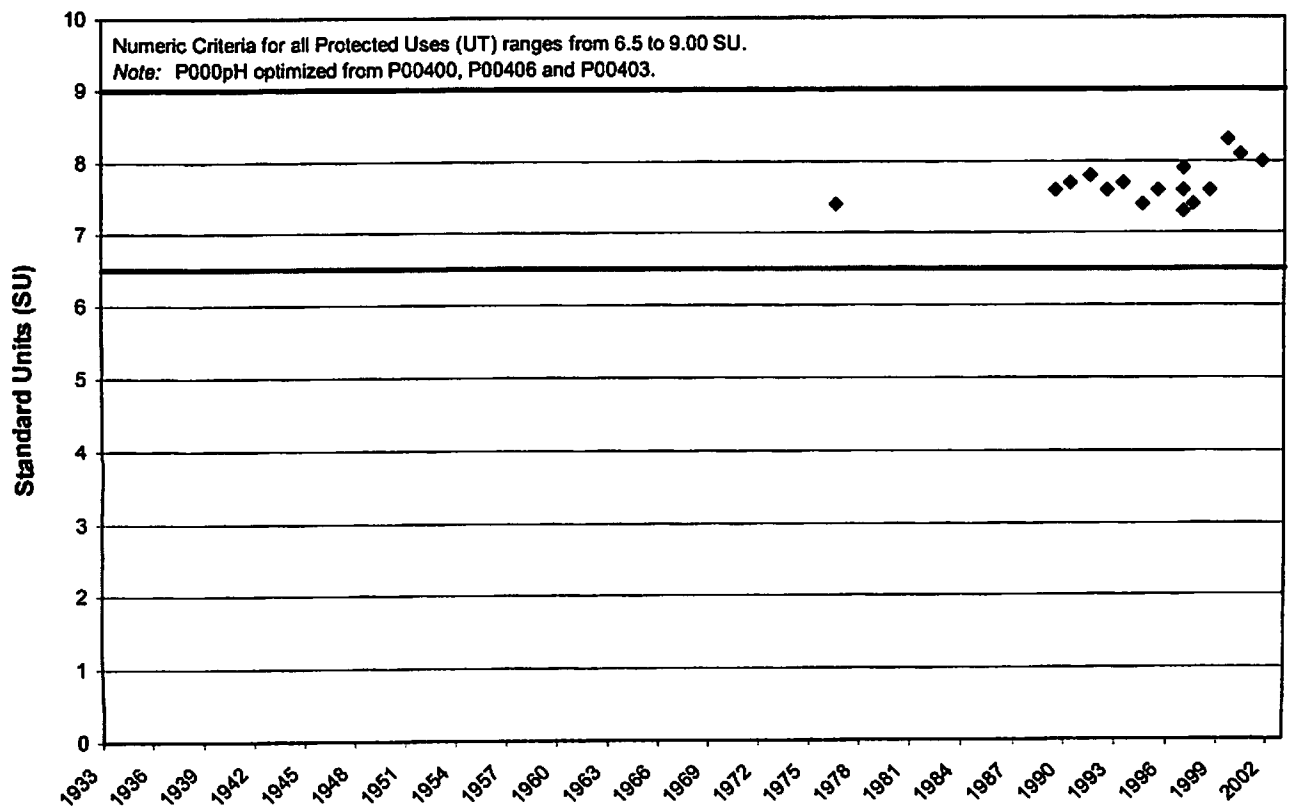
Water Sample Density by Category in Pipe Spring National Monument (PISP)



Specific Conductivity (PSPcnd) Results for Spring Water in Pipe Spring National Monument (PISP)
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



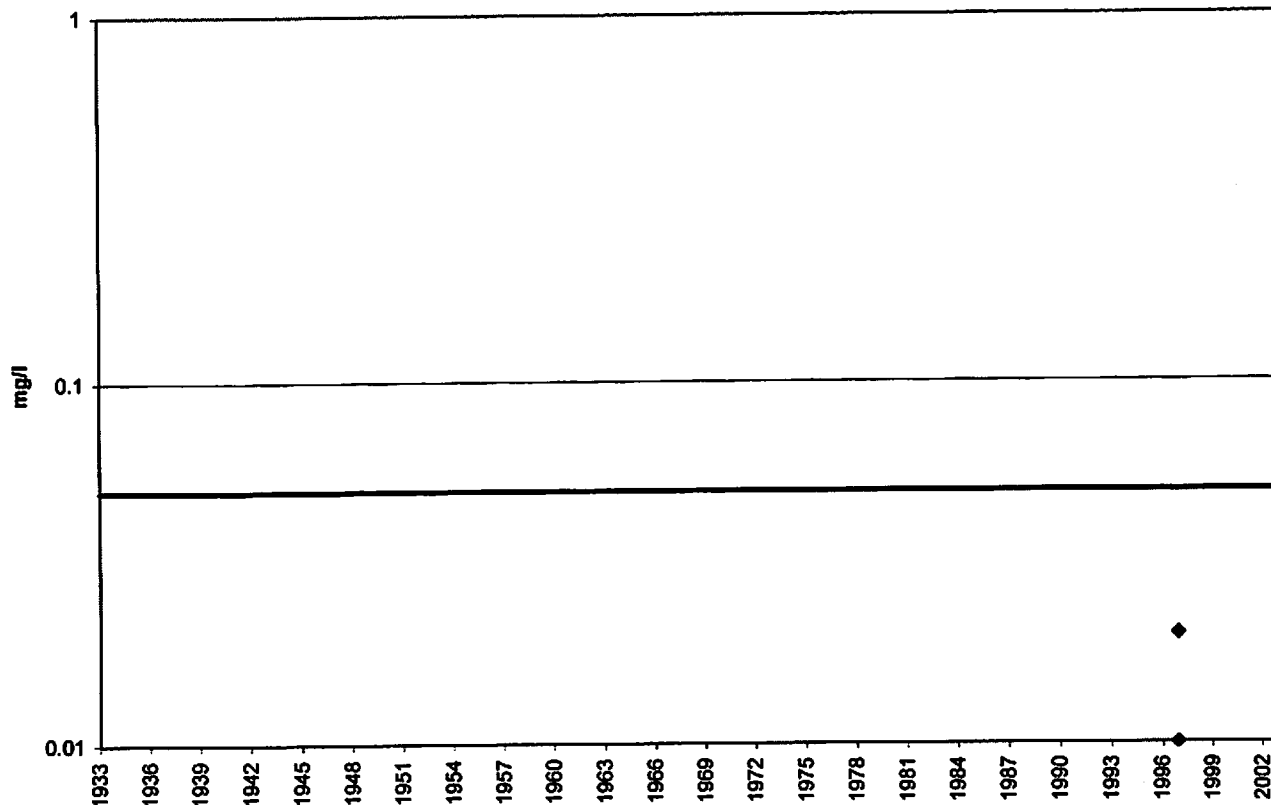
pH (P000pH) Results for Spring Water in Pipe Spring National Monument (PISP)



Total Phosphorus (PtotalP) Results for Spring Water in Pipe Spring National Monument (PISP)

Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

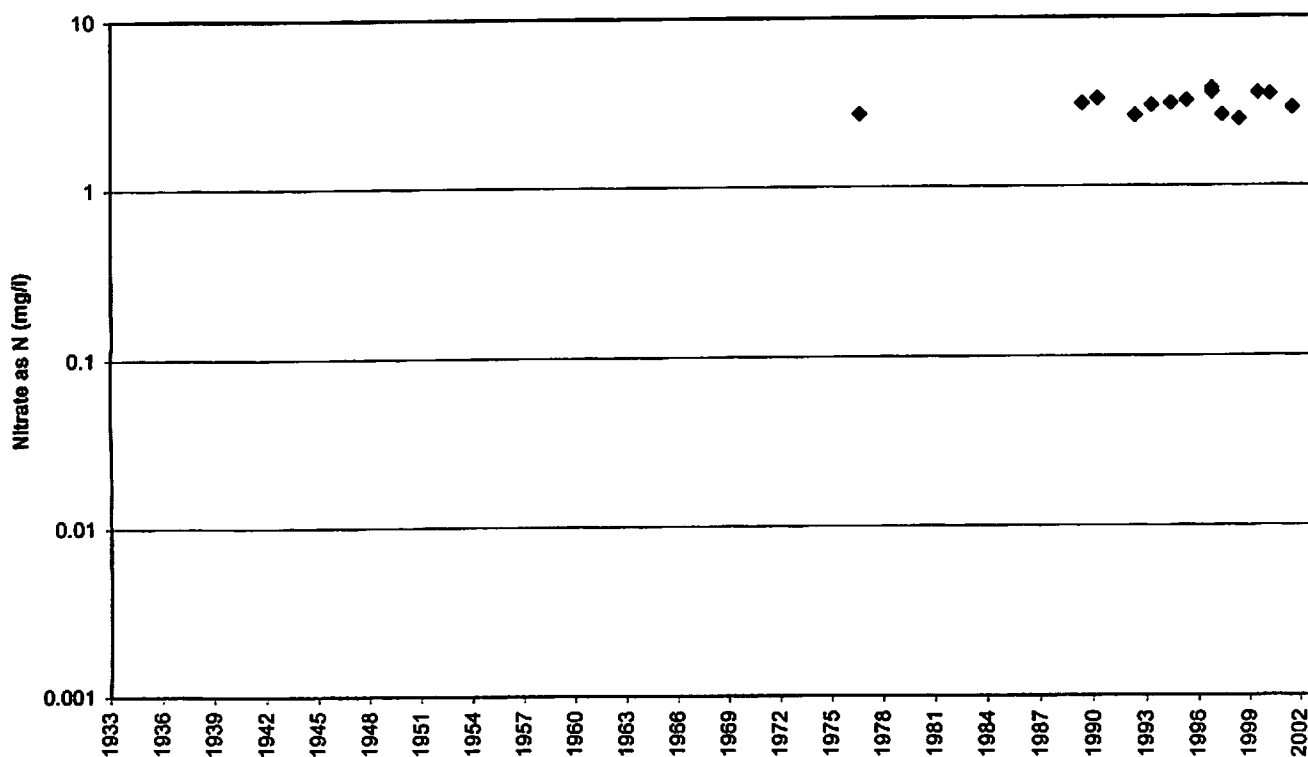
Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.



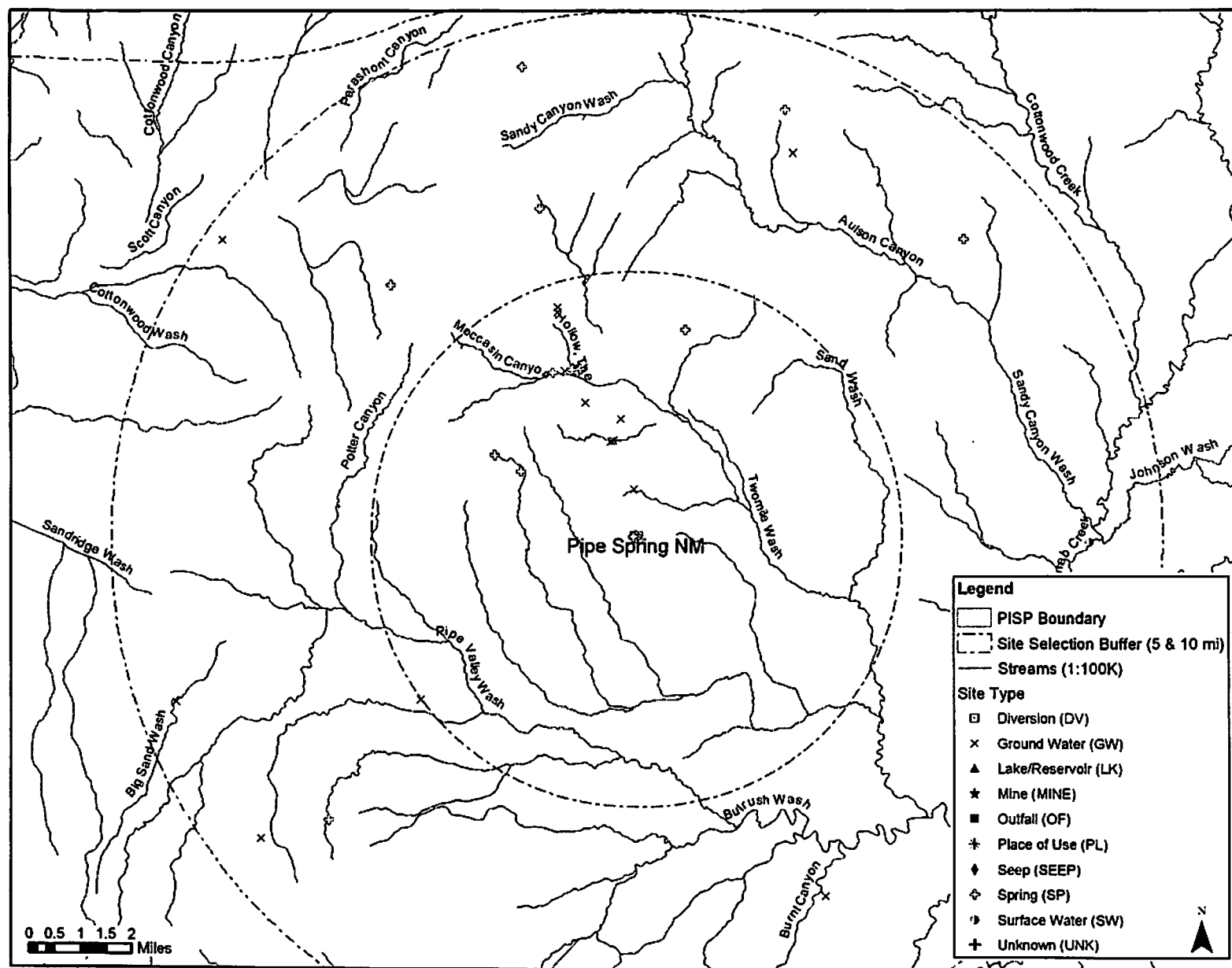
Nitrate Results for Surface Water in Pipe Spring National Monument (PISP)

Numeric Criteria for Domestic Source (UT) is 10 mg/l.

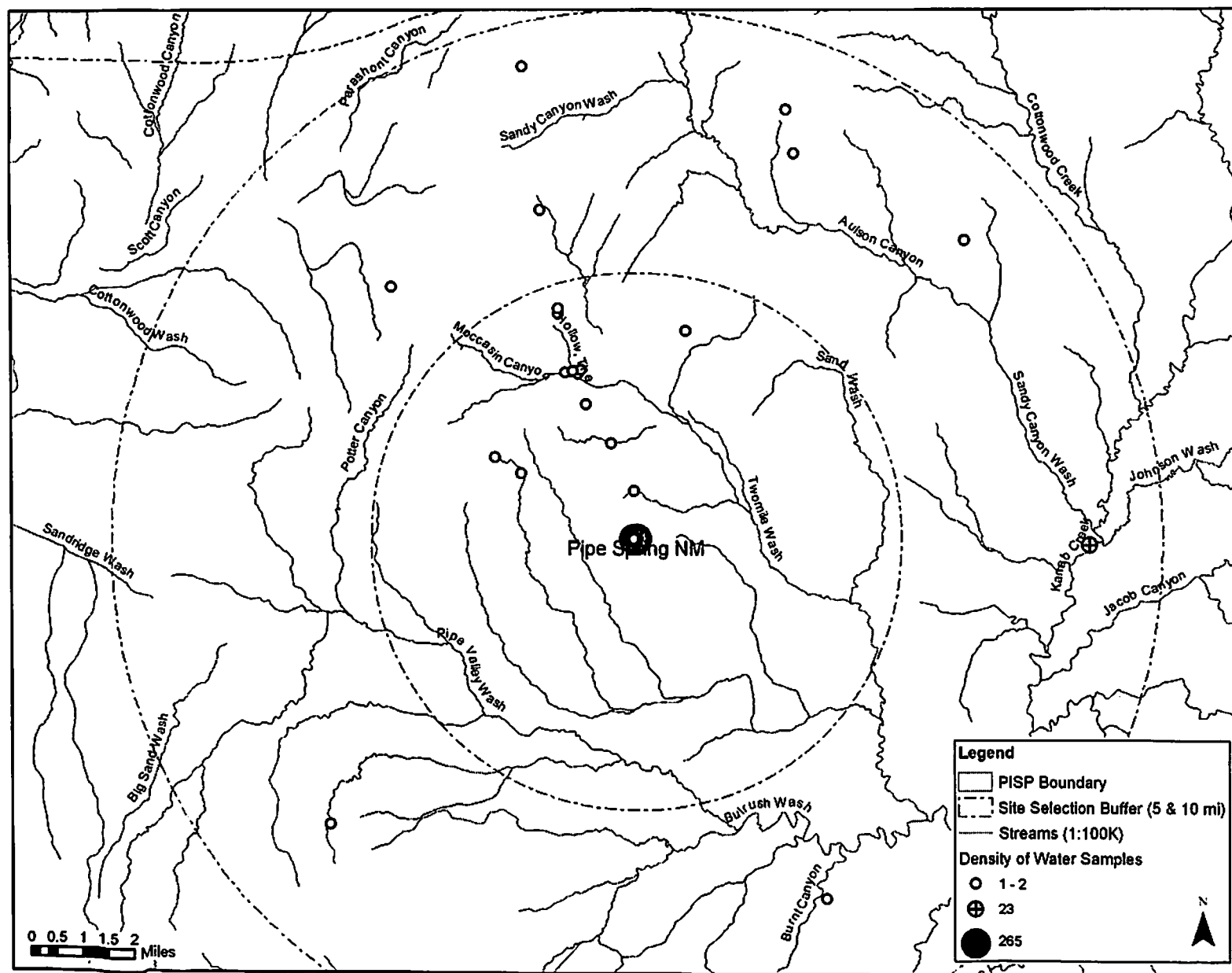
Note: Pnitrate optimized from P00631, P00618, P71851, P00630, P00620, P71850.



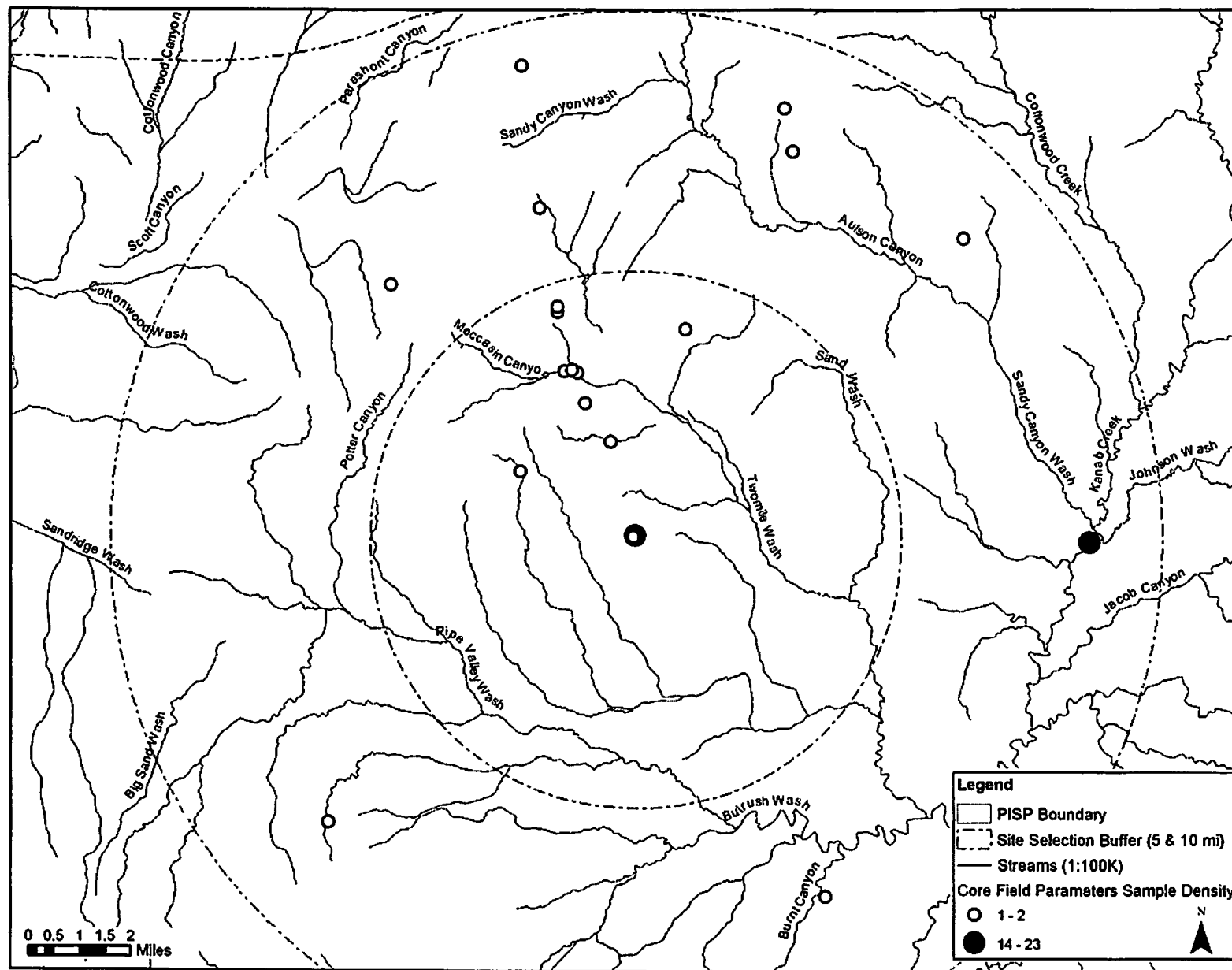
Historic Sample Site Locations by Site Type, Pipe Spring National Monument (PISP), 1933-2001



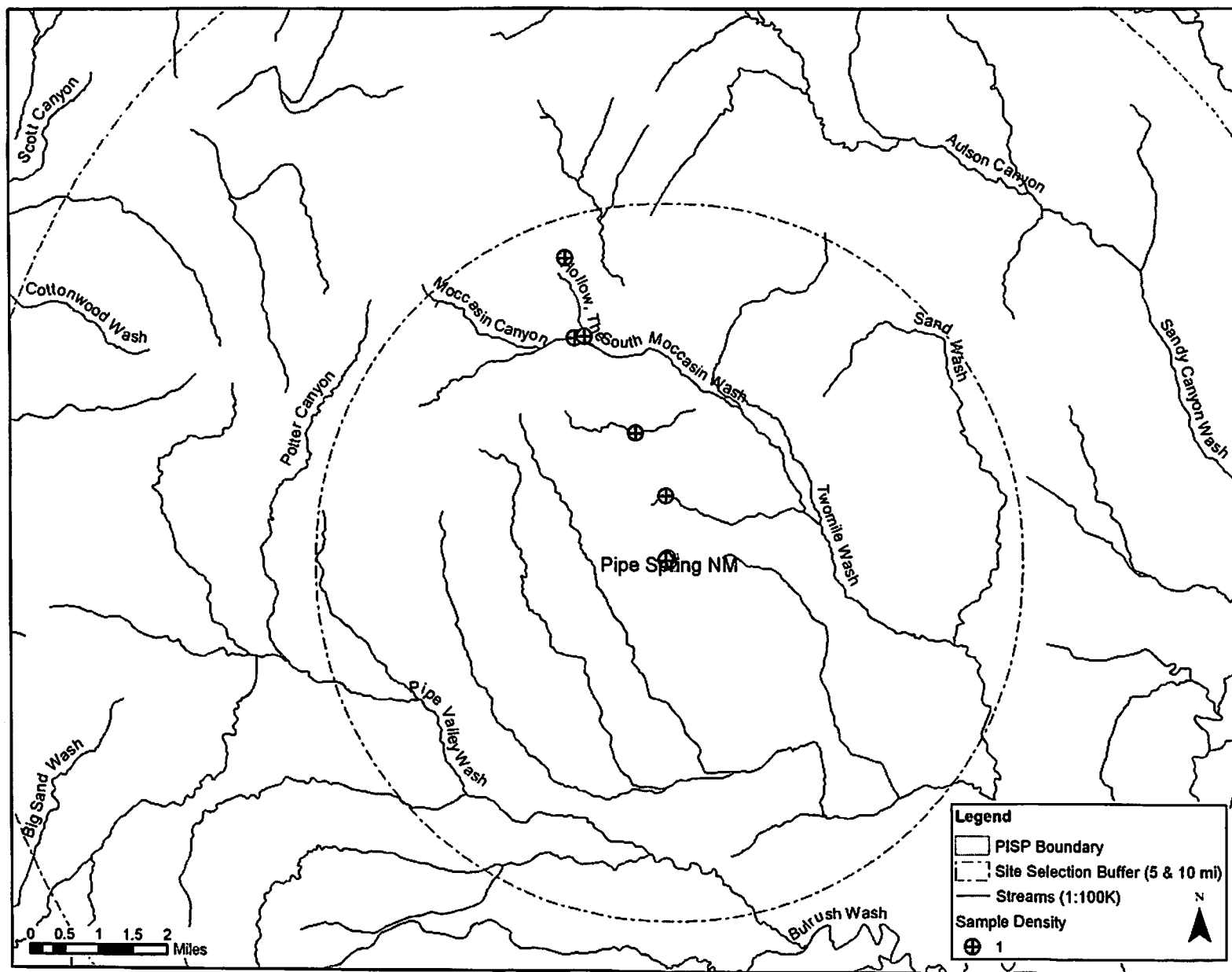
Water Sample Density, Pipe Spring National Monument (PISP), 1933-2001



Core Field Parameters Sample Density, Pipe Spring National Monument (PISP), 1967-2001



Total Phosphorus Water Sample Density, Pipe Spring National Monument (PISP), 1996-1997



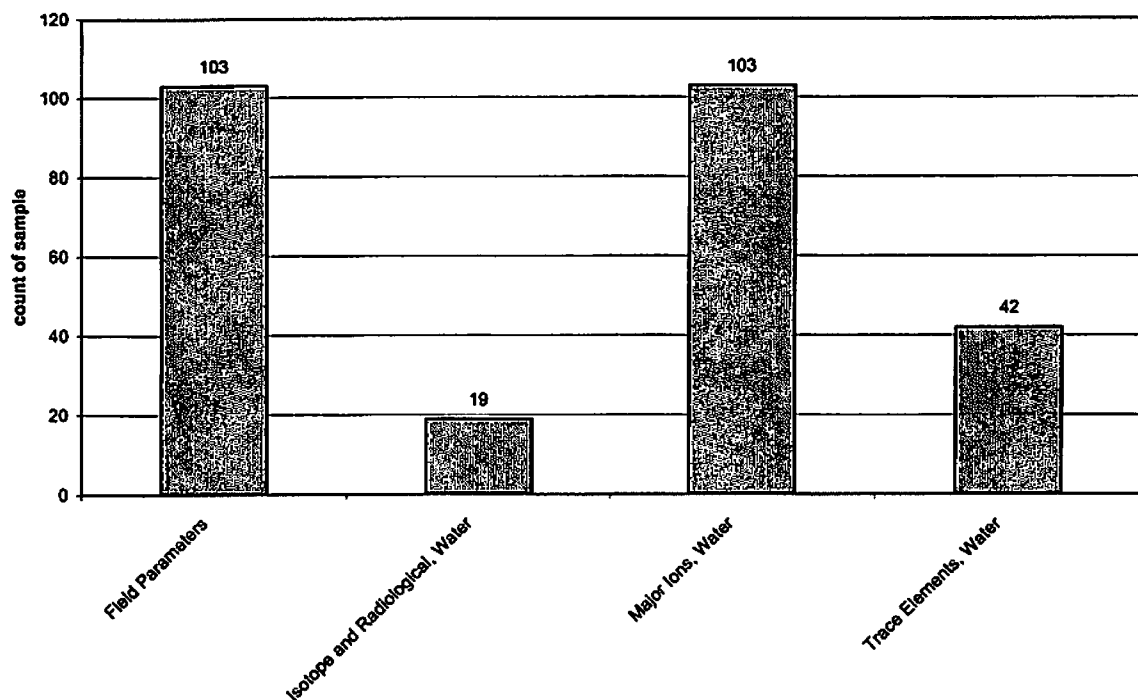
Timpanogos Cave NM (TICA) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

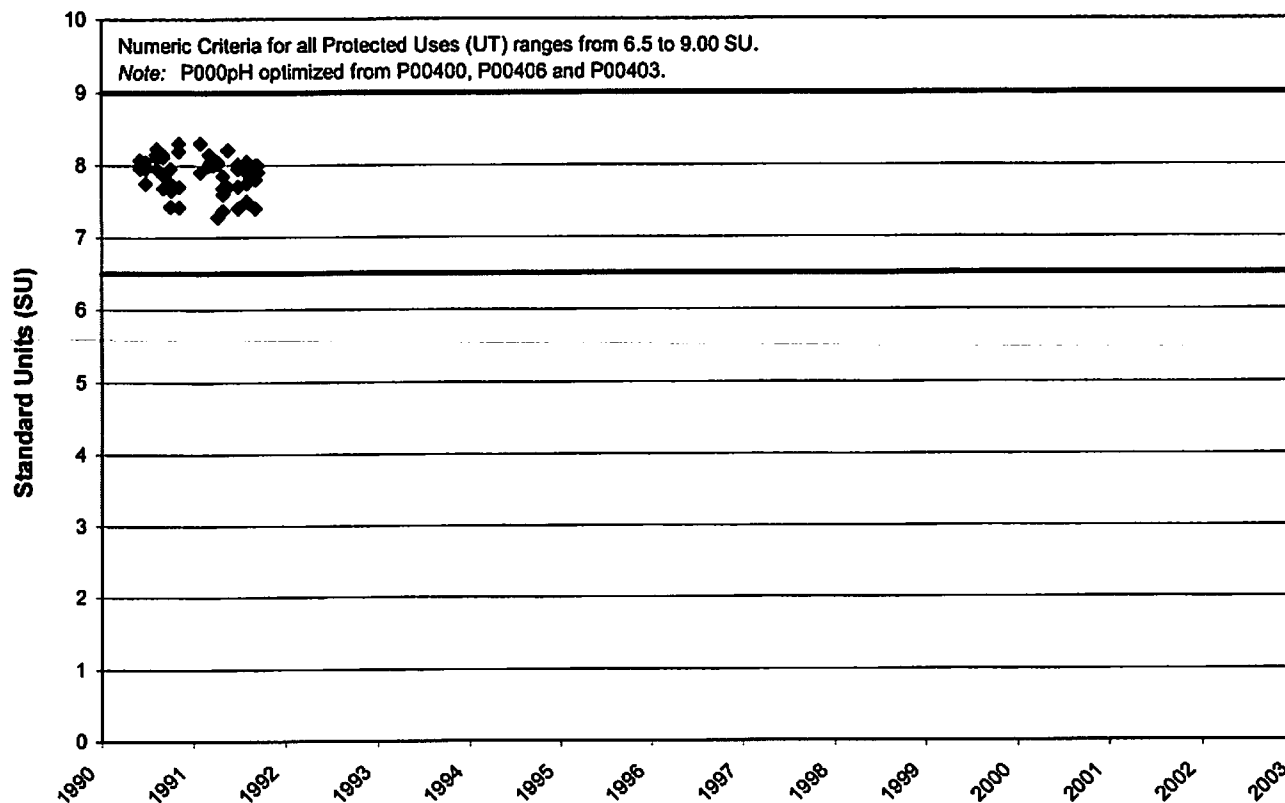
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	9	103	06/04/1990	09/18/1991
Streamflow	0	n/a	n/a	n/a
Core Field Parameters ⁽³⁾	8	98	06/04/1990	09/18/1991
Microorganisms	0	n/a	n/a	n/a
Major Ions	9	103	06/04/1990	09/18/1991
Total and Dissolved Selenium	0	n/a	n/a	n/a
Total Dissolved Solids	7	101	06/04/1990	09/18/1991
Total Suspended Solids	0	n/a	n/a	n/a
Trace Elements	7	42	06/04/1990	02/02/1991
Pesticides	0	n/a	n/a	n/a
Nutrients	0	n/a	n/a	n/a
Unionized Ammonia	0	n/a	n/a	n/a
Ammonia	0	n/a	n/a	n/a
Nitrite	0	n/a	n/a	n/a
Nitrate	0	n/a	n/a	n/a
Total Nitrogen	0	n/a	n/a	n/a
Ortho-Phosphorus	0	n/a	n/a	n/a
Total Phosphorus	0	n/a	n/a	n/a
Macroinvertebrates	0	n/a	n/a	n/a

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

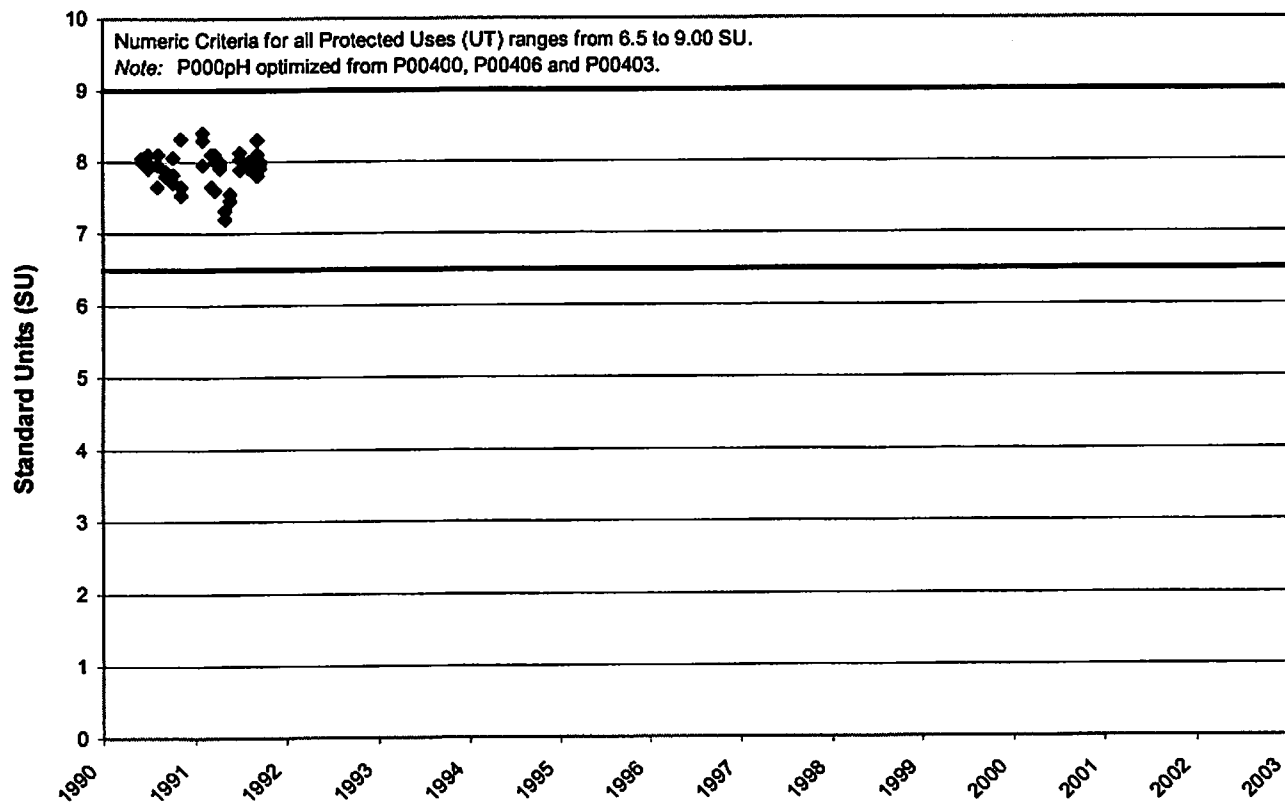
Water Sample Density by Category in Timpanogos Cave National Monument (TICA)



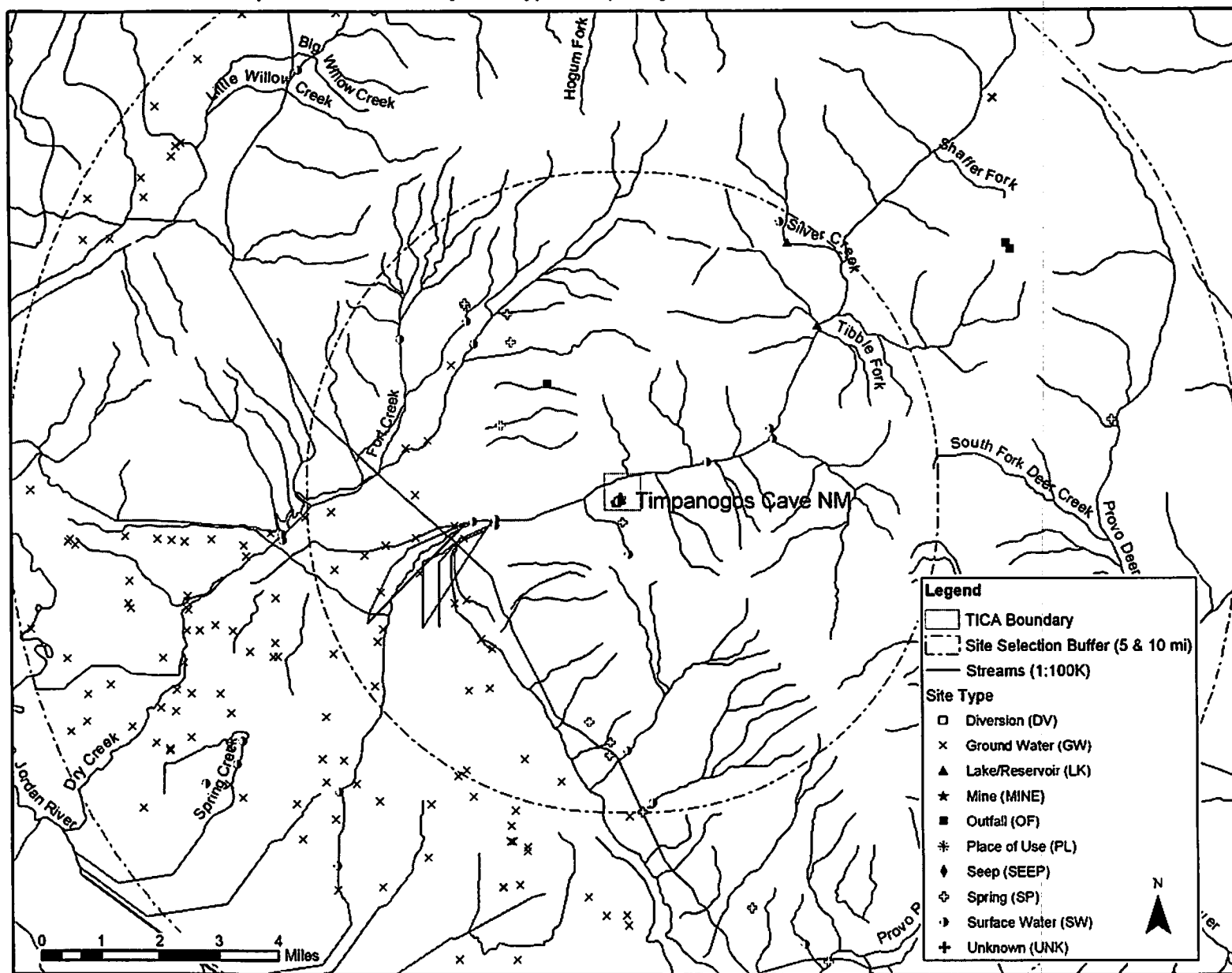
pH (P000pH) Results for Cave Pools in Timpanogos Cave National Monument (TICA)



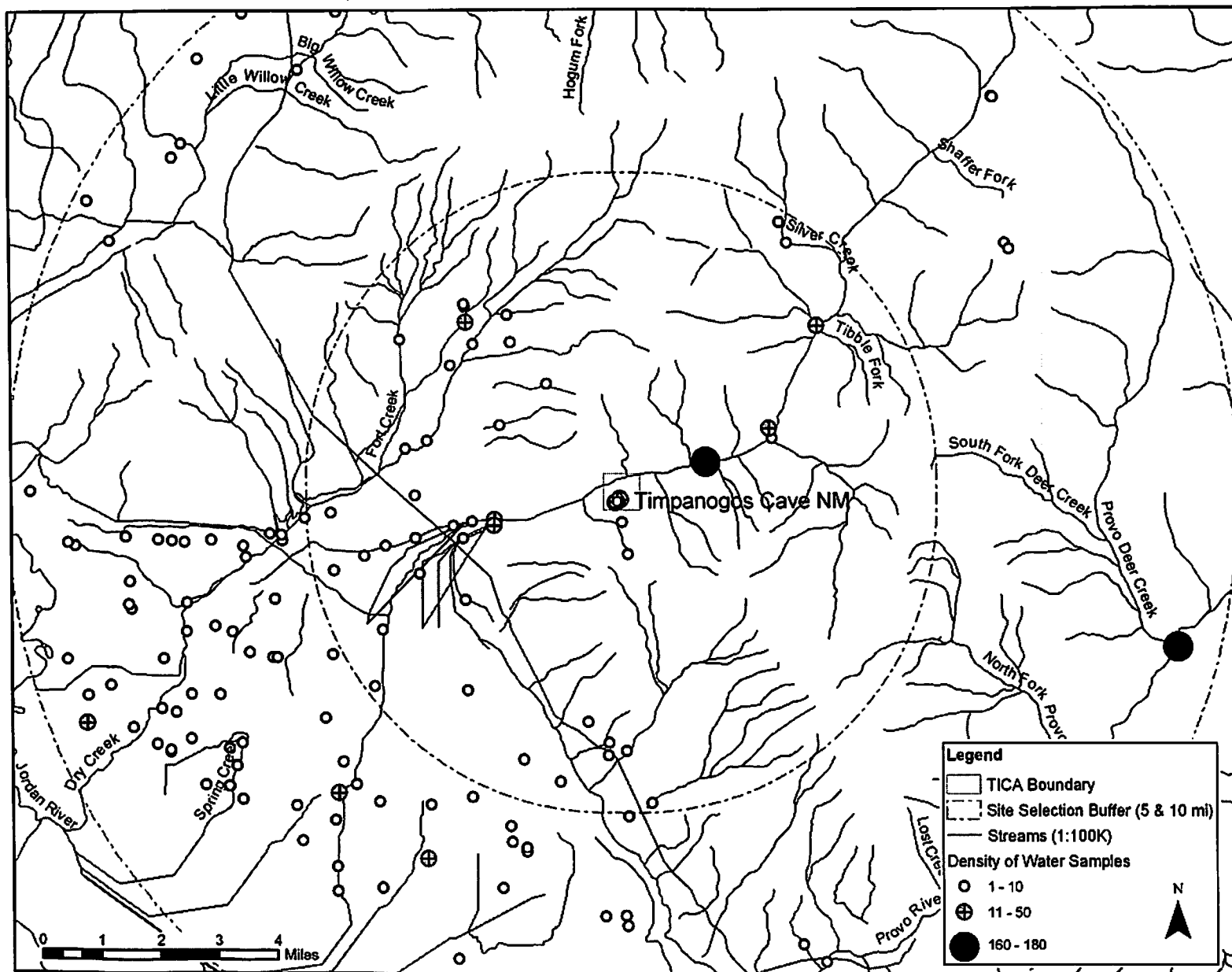
pH (P000pH) Results for Spring Water in Timpanogos Cave National Monument (TICA)



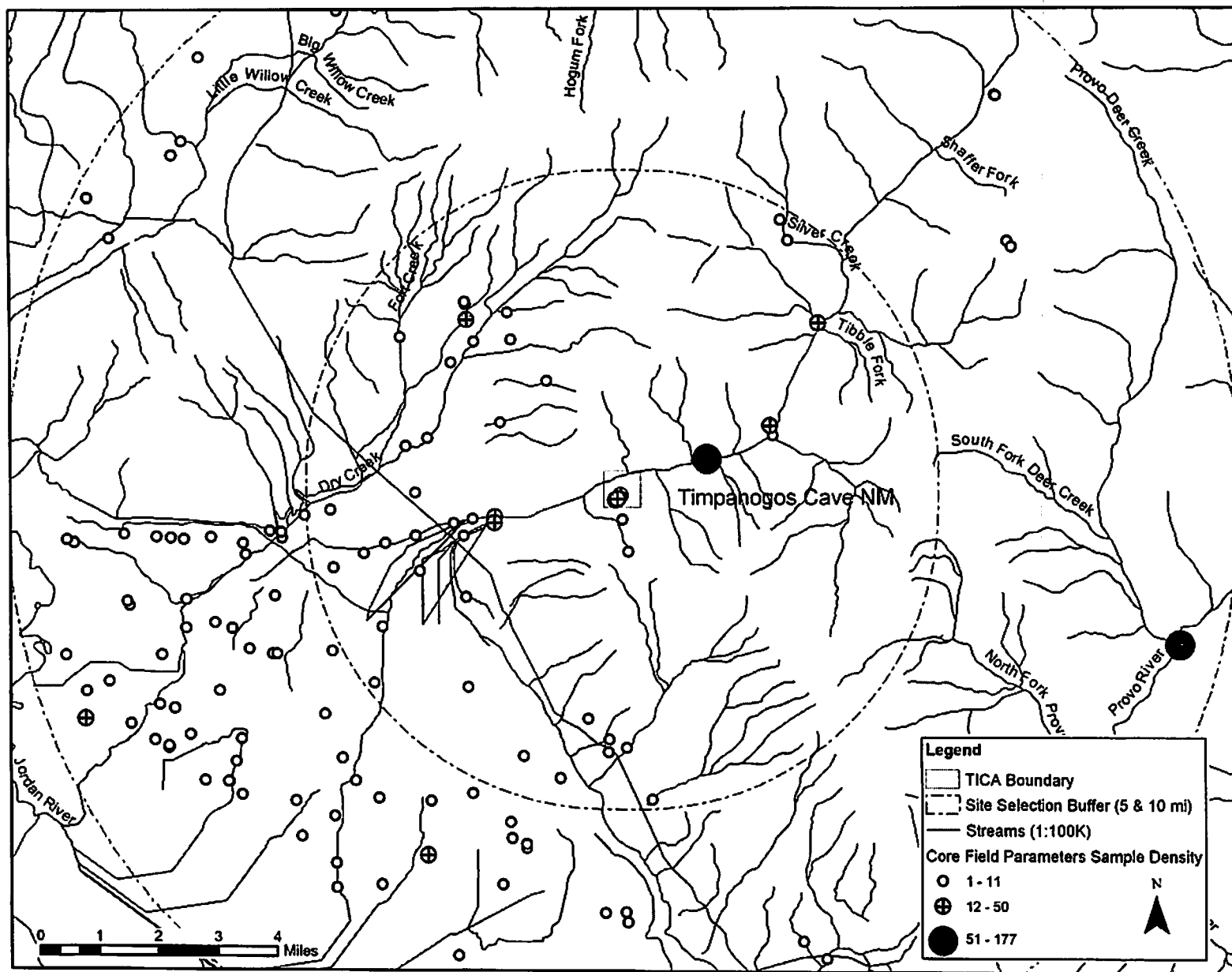
Historic Sample Site Locations by Site Type, Timpanogos Cave National Monument (TICA), 1962-2002



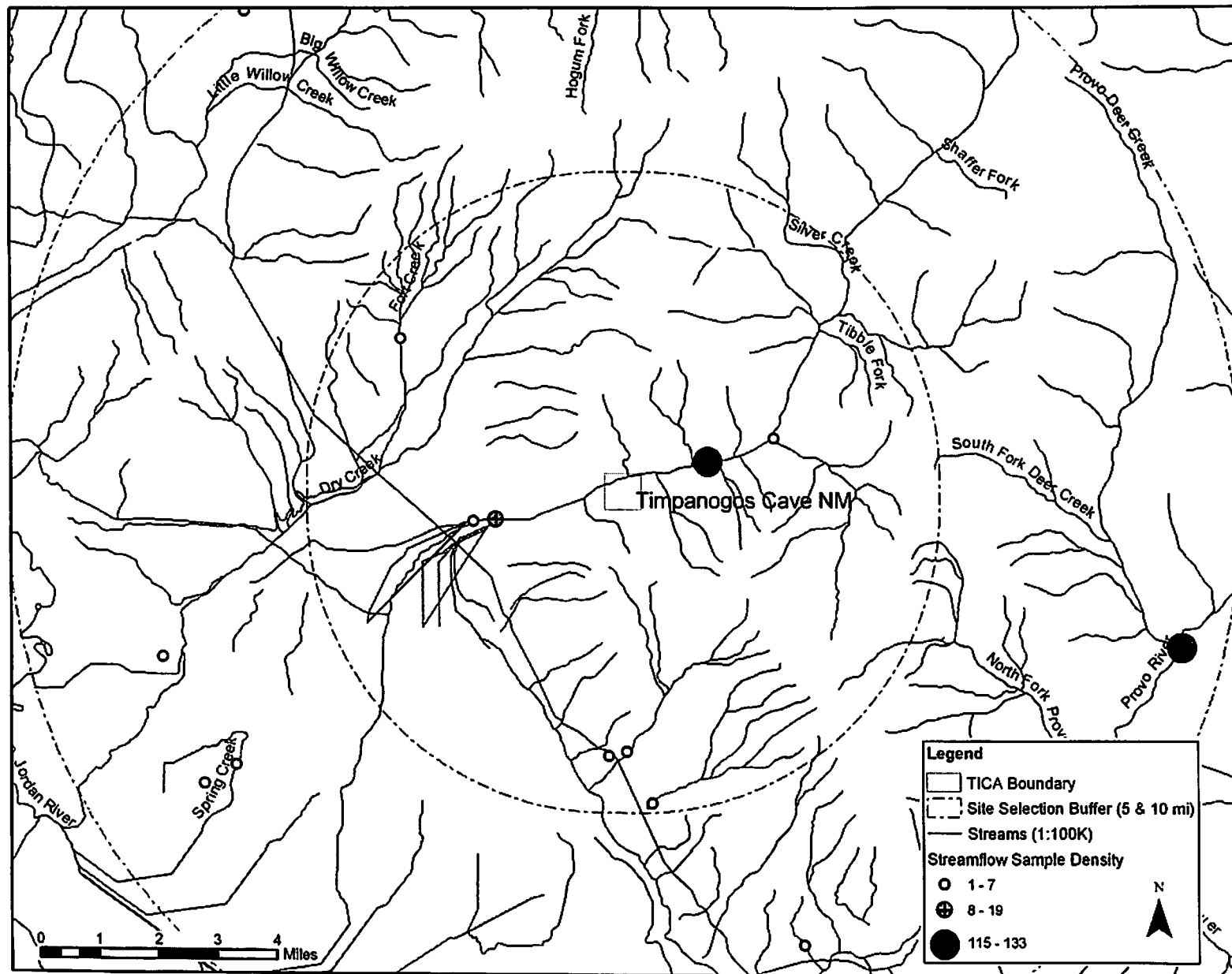
Water Sample Density, Timpanogos Cave National Monument (TICA), 1962-2002



Core Field Parameters Water Sample Density, Timpanogos Cave National Monument (TICA), 1962-2002



Streamflow Sample Density, Timpanogos Cave National Monument (TICA), 1974-2000



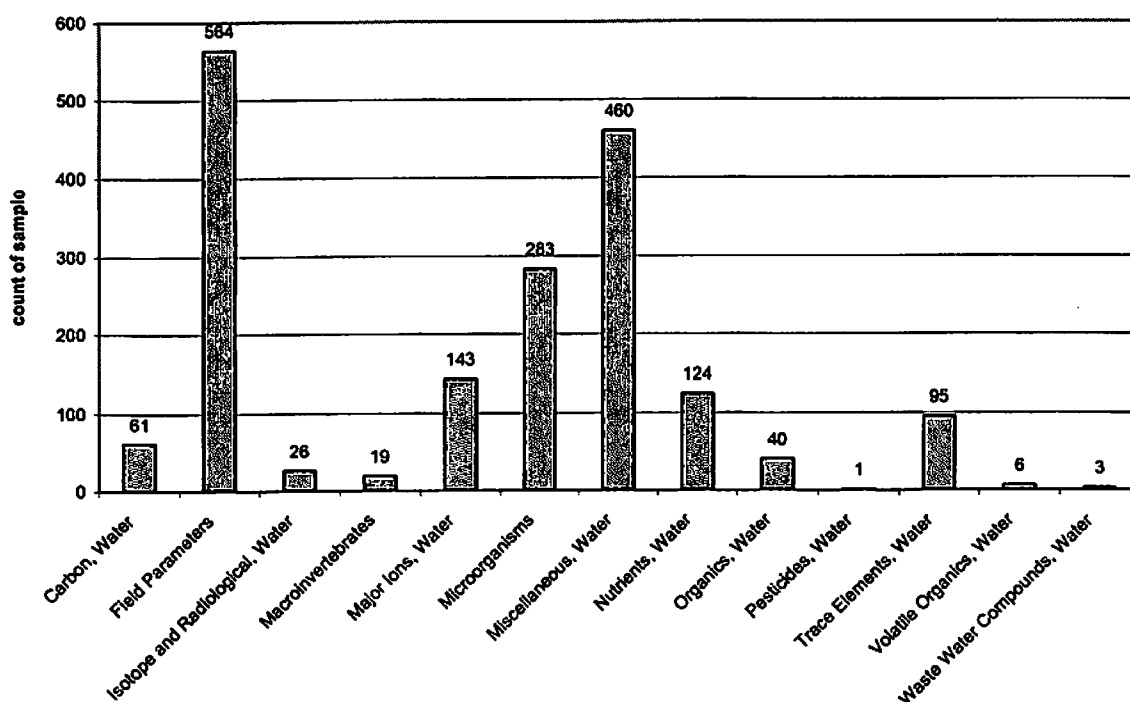
Zion NP (ZION) Summary

Site and Sample Density Counts and Sampling Date Ranges for Selected Categories and Constituents⁽¹⁾:

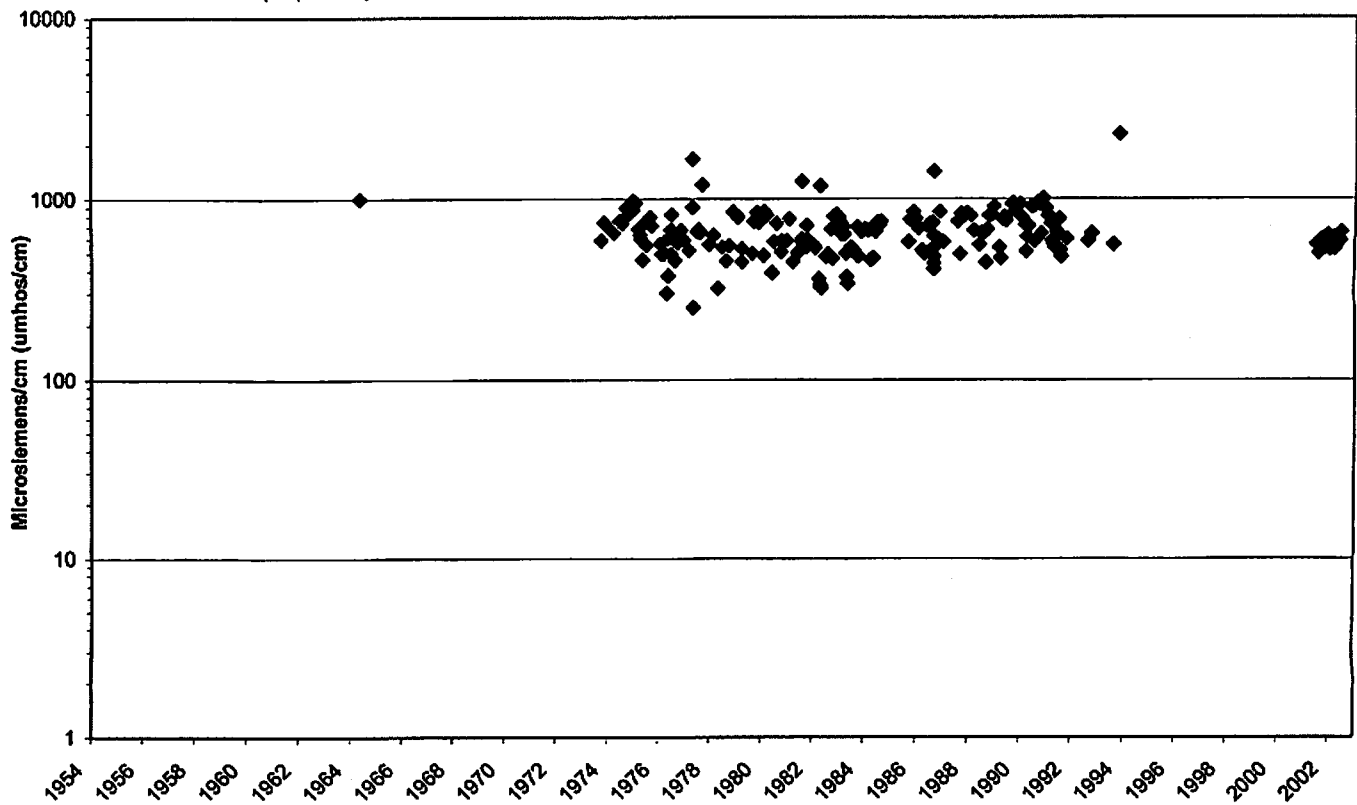
Sample Type ⁽⁴⁾	No. of Sites	No. of Samples ⁽⁵⁾	Earliest Sample Date	Latest Sample Date ⁽²⁾
All water samples	69	578	10/16/1954	06/12/2002
Streamflow	12	112	10/15/1974	08/13/1991
Core Field Parameters⁽³⁾	46	278	10/16/1954	06/12/2002
Microorganisms	19	283	02/04/1976	09/21/2001
Major Ions	34	143	10/16/1954	06/12/2002
Total and Dissolved Selenium	5	47	10/16/1954	11/10/1993
Total Dissolved Solids	17	31	10/16/1954	11/14/1990
Total Suspended Solids	2	60	02/04/1976	05/01/2002
Trace Elements	28	95	10/16/1954	01/16/2002
Pesticides	1	1	11/14/1990	11/14/1990
Nutrients	22	124	11/08/1963	06/12/2002
Unionized Ammonia	3	54	04/29/1975	11/10/1993
Ammonia	1	1	11/14/1990	11/14/1990
Nitrite	2	22	01/18/1977	11/14/1990
Nitrate	20	109	11/08/1963	06/12/2002
Total Nitrogen	5	51	02/04/1976	11/10/1993
Ortho-Phosphorus	10	52	04/29/1975	11/14/1990
Total Phosphorus	5	64	09/08/1976	02/27/2002
Macroinvertebrates	1	19	10/01/1985	11/20/1996

⁽¹⁾ For all waters, sample types excluding quality control samples, sites inside park unit. ⁽²⁾ Based on data retrieved from USEPA STORET and USGS NWIS national databases in December 2003. ⁽³⁾ Core field parameters include pH, specific conductivity, dissolved oxygen, and water temperature. ⁽⁴⁾ Sample types in bold identified as potential management concern or core vital sign for specified park unit. ⁽⁵⁾ Sample is defined as a unique occurrence of site, date, time and source.

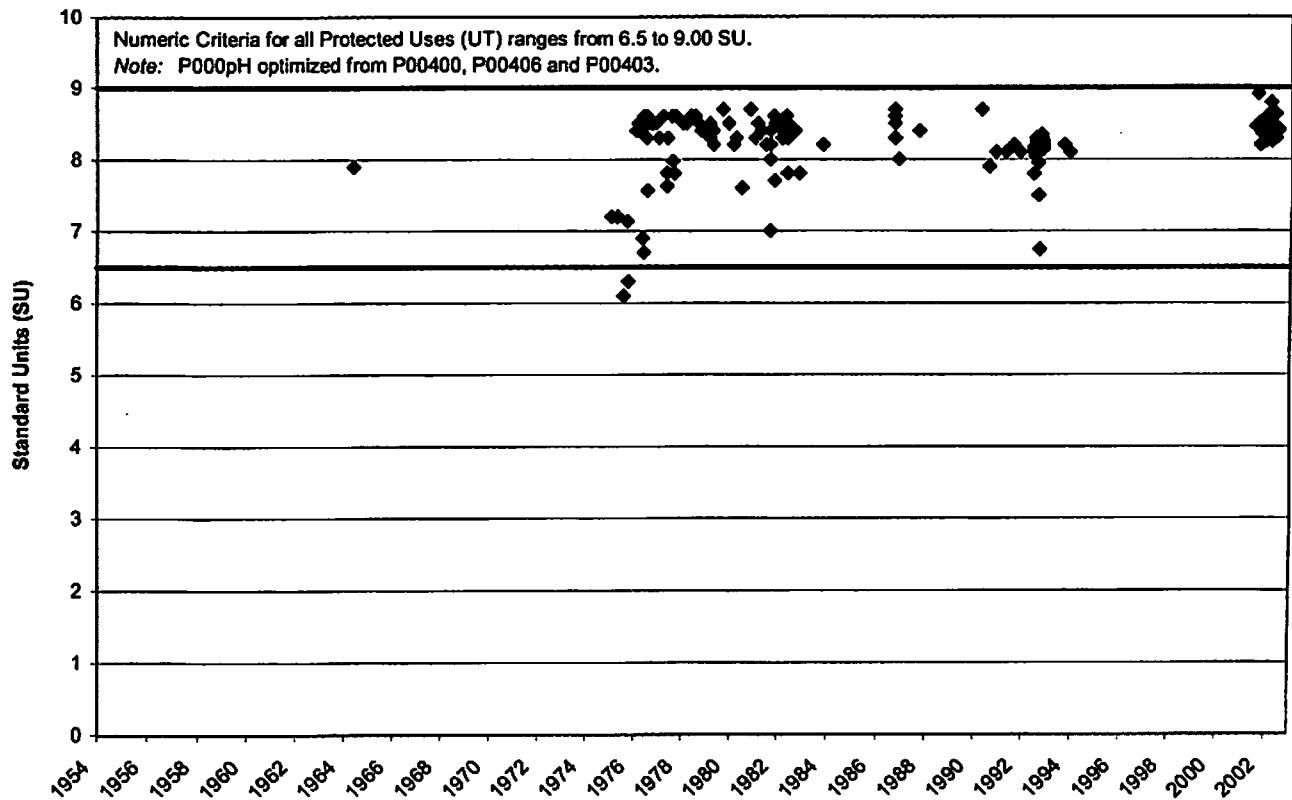
Water Sample Density by Category in Zion National Park (ZION)

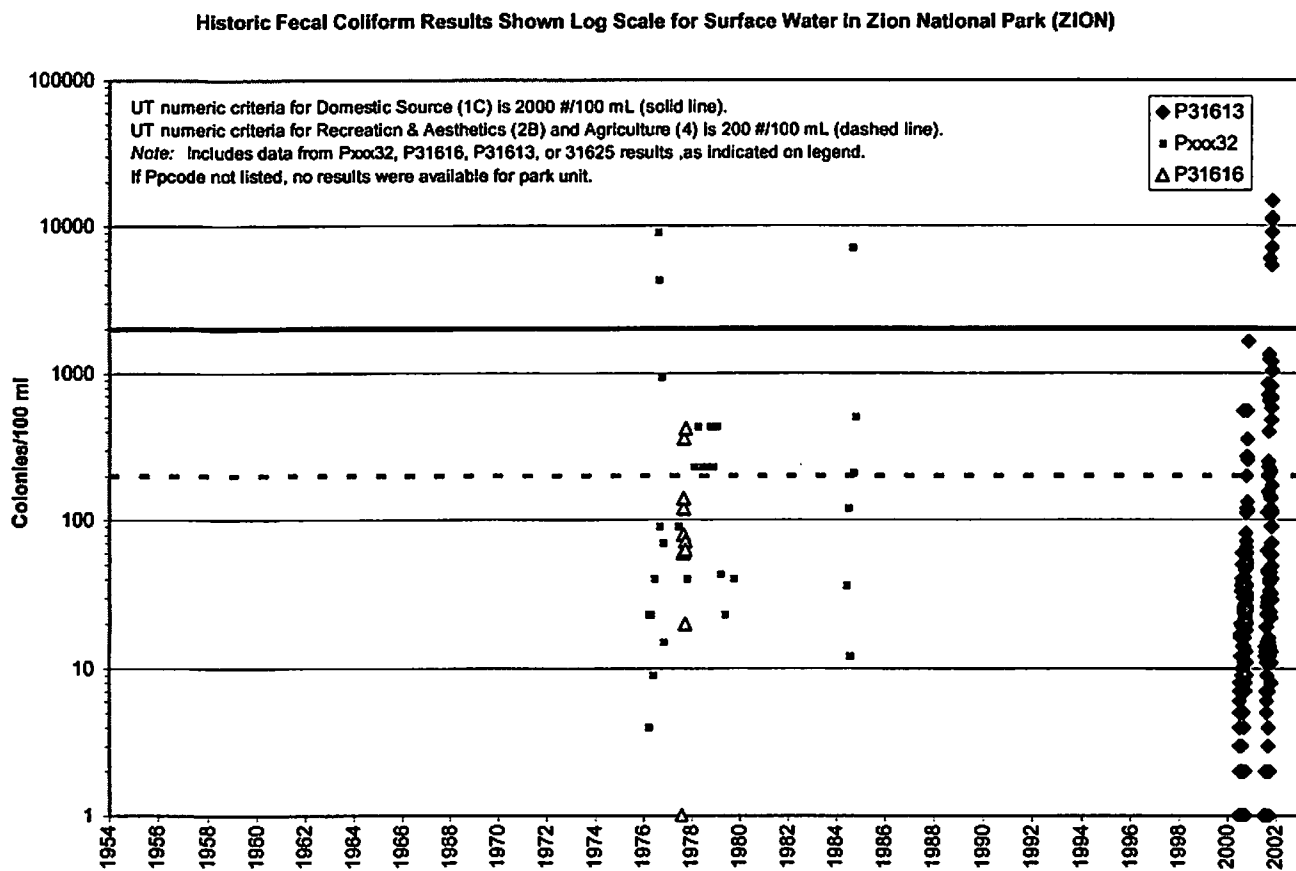
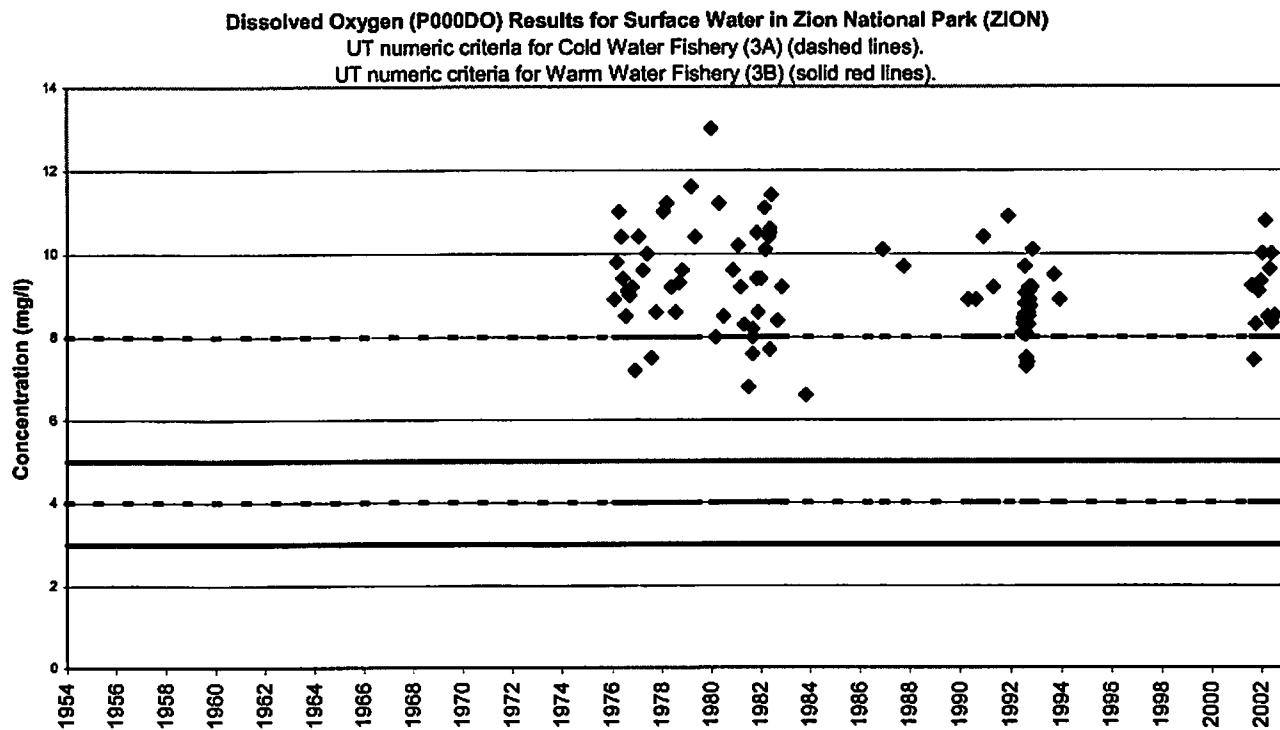


Specific Conductivity (PSPcnd) Results for Surface Water in Zion National Park (ZION)
(PSPcnd optimized from P00094, P00095, and P90095. No numeric criteria specified (UT).)



pH (P000pH) Results for Surface Water in Zion National Park (ZION)

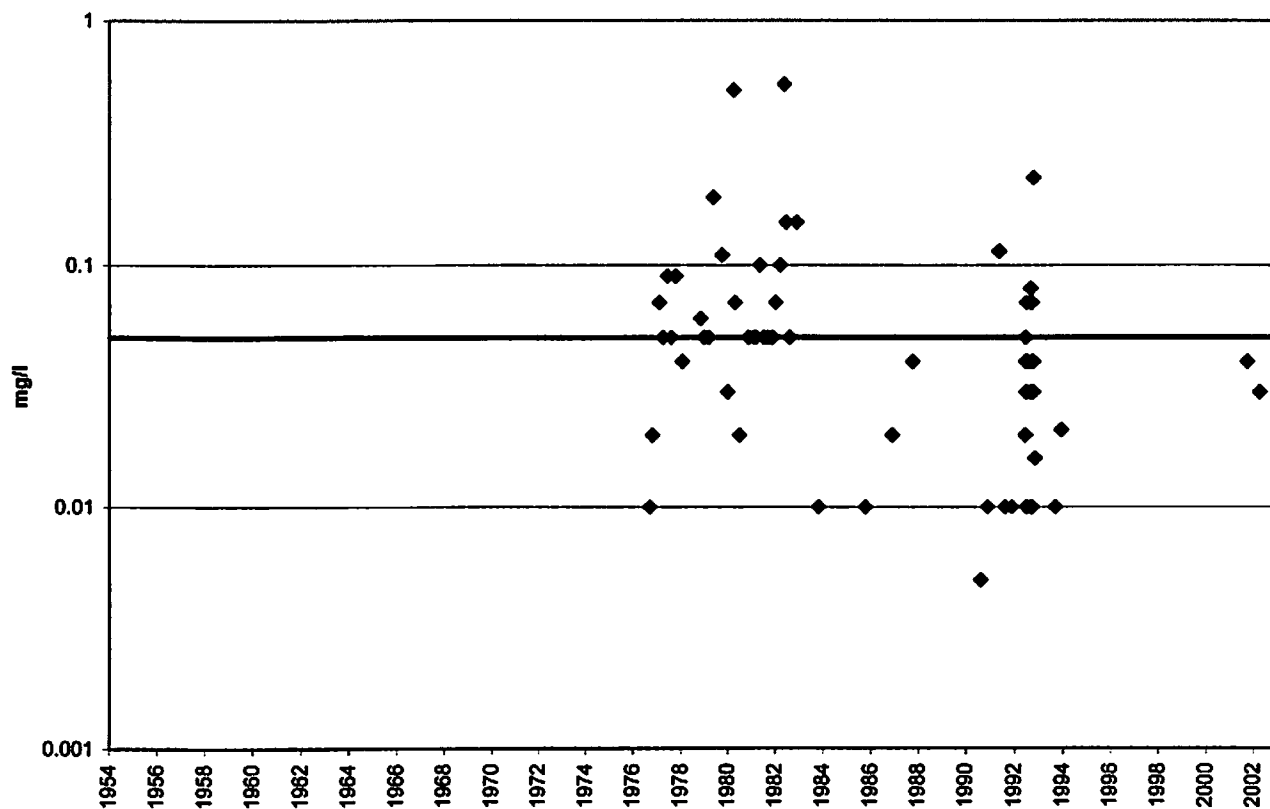




Total Phosphorus (PtotalP) Results for Surface Water in Zion National Park (ZION)

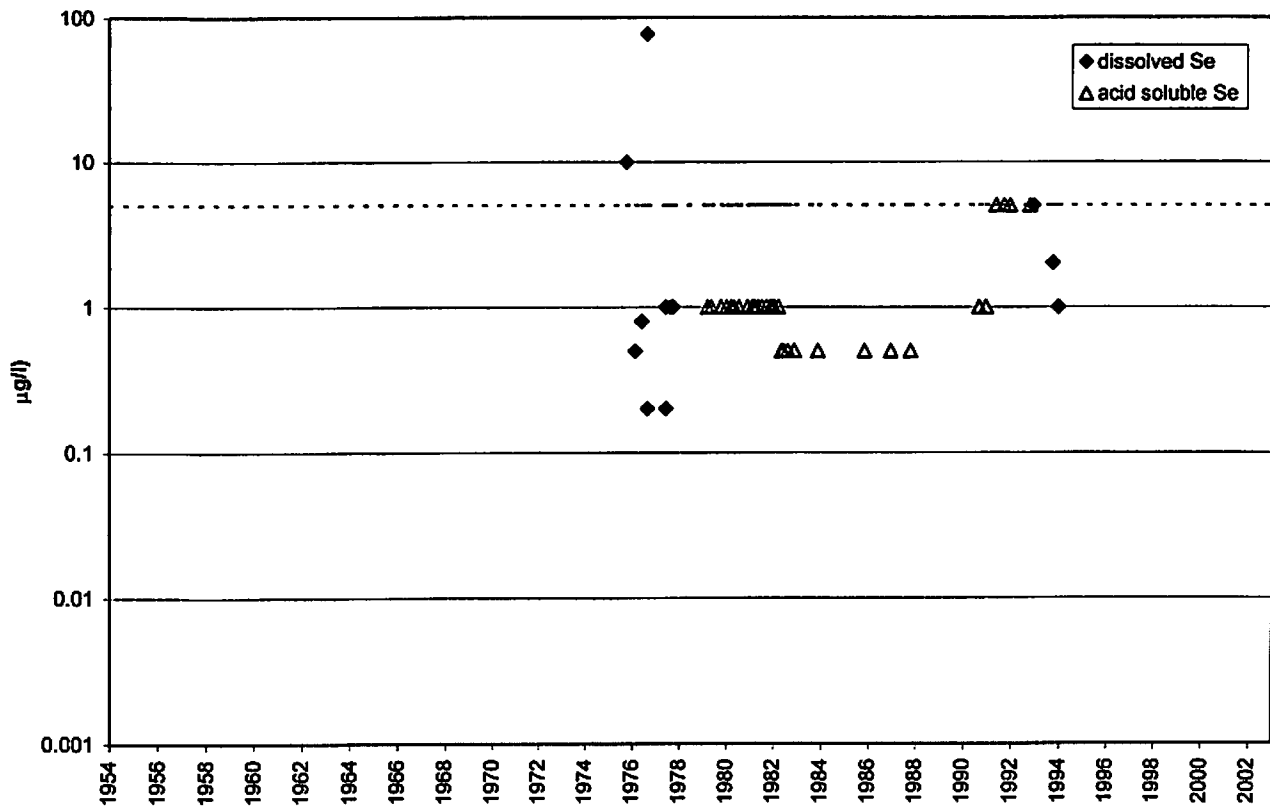
Numeric Criteria for Recreation and Aquatic Wildlife (UT) 0.05 mg/l.

Note: PtotalP optimized from P00665, P99891, P71886, P01070 and P00662.

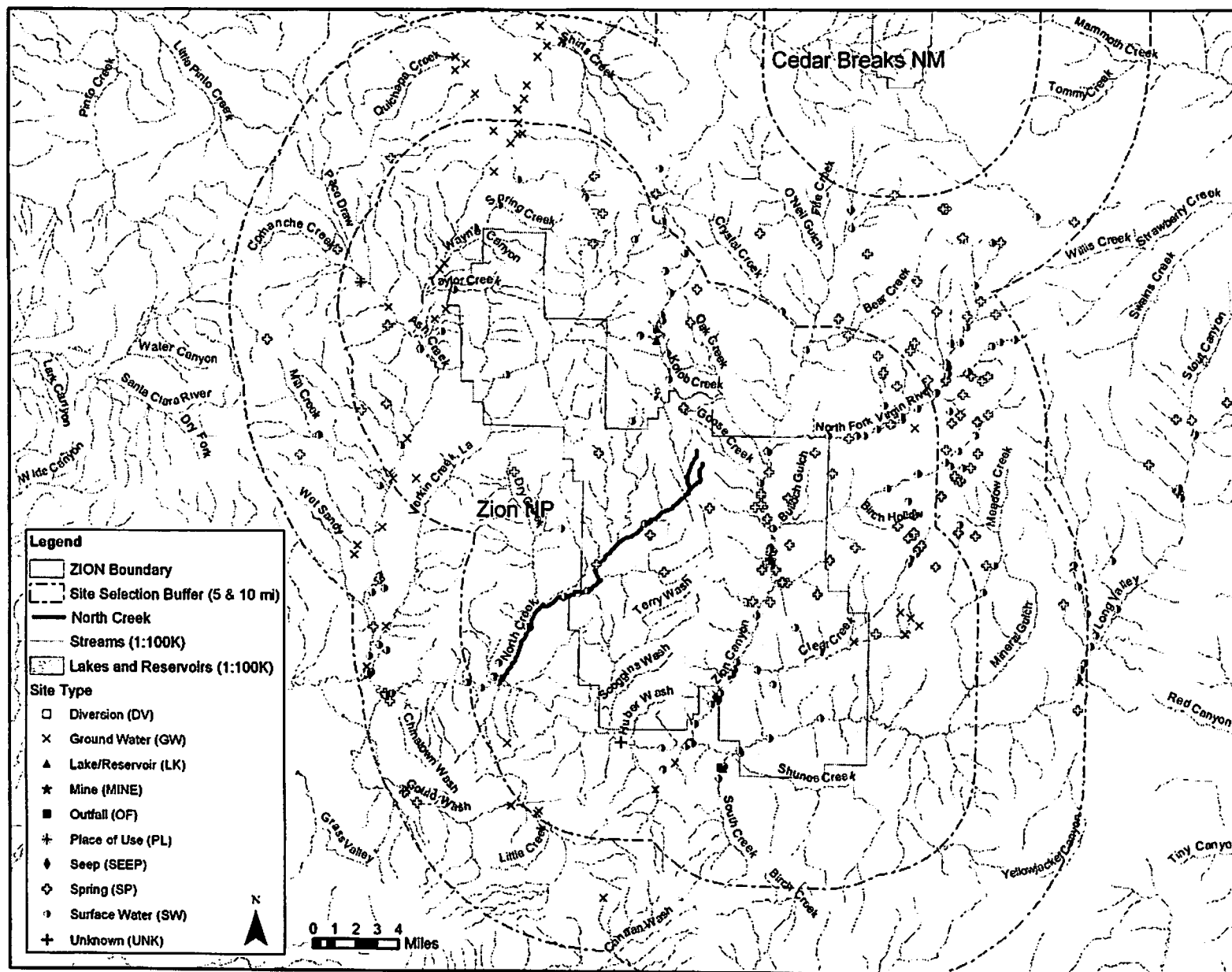


Selenium Results for Surface Water in Zion National Park (ZION)

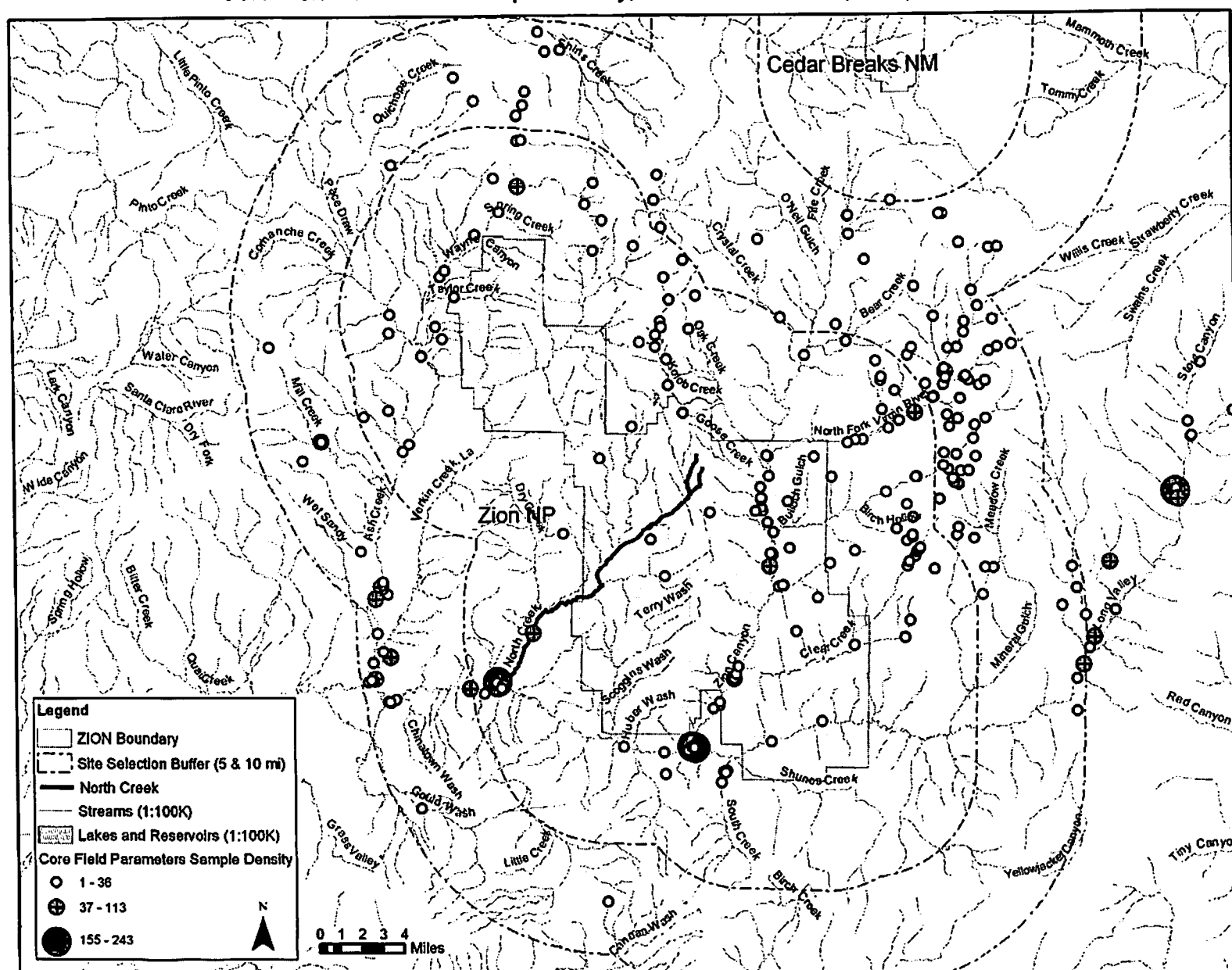
USEPA Numeric Criteria for Aquatic Wildlife = 5 µg/l



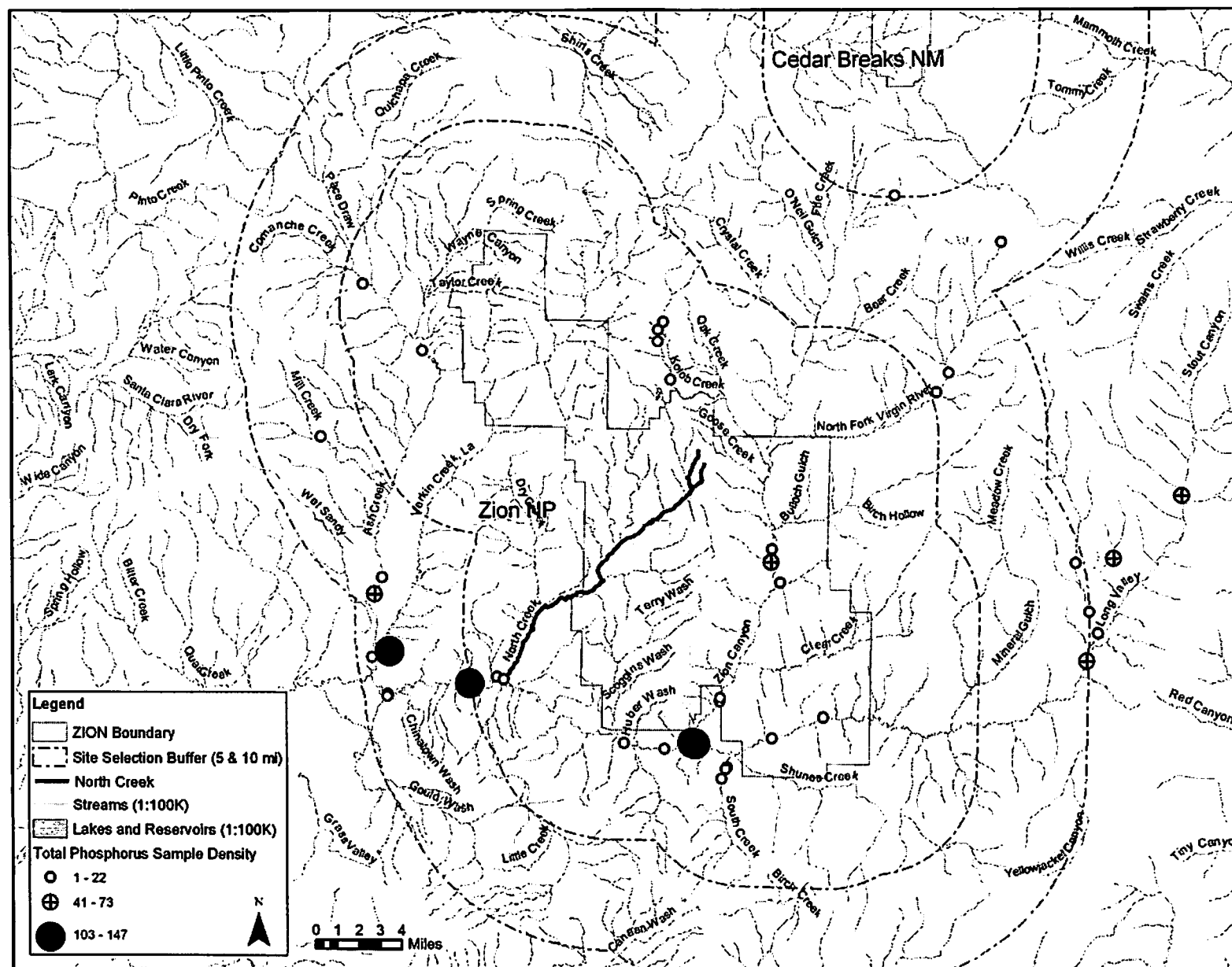
Historic Sample Site Locations by Site Type, Zion National Park (ZION), 1954-2002



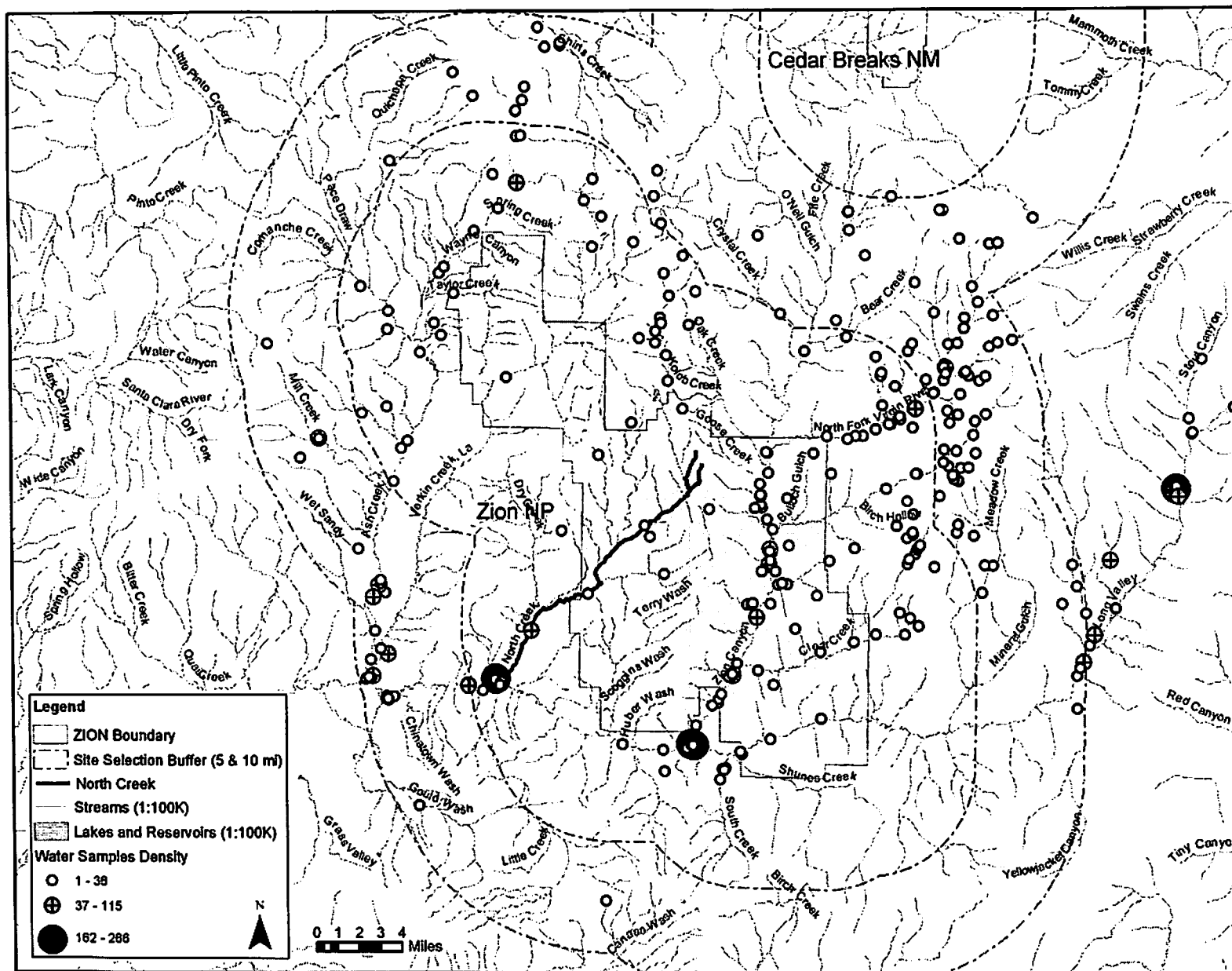
Core Field Parameters Sample Density, Zion National Park (ZION), 1954-2002



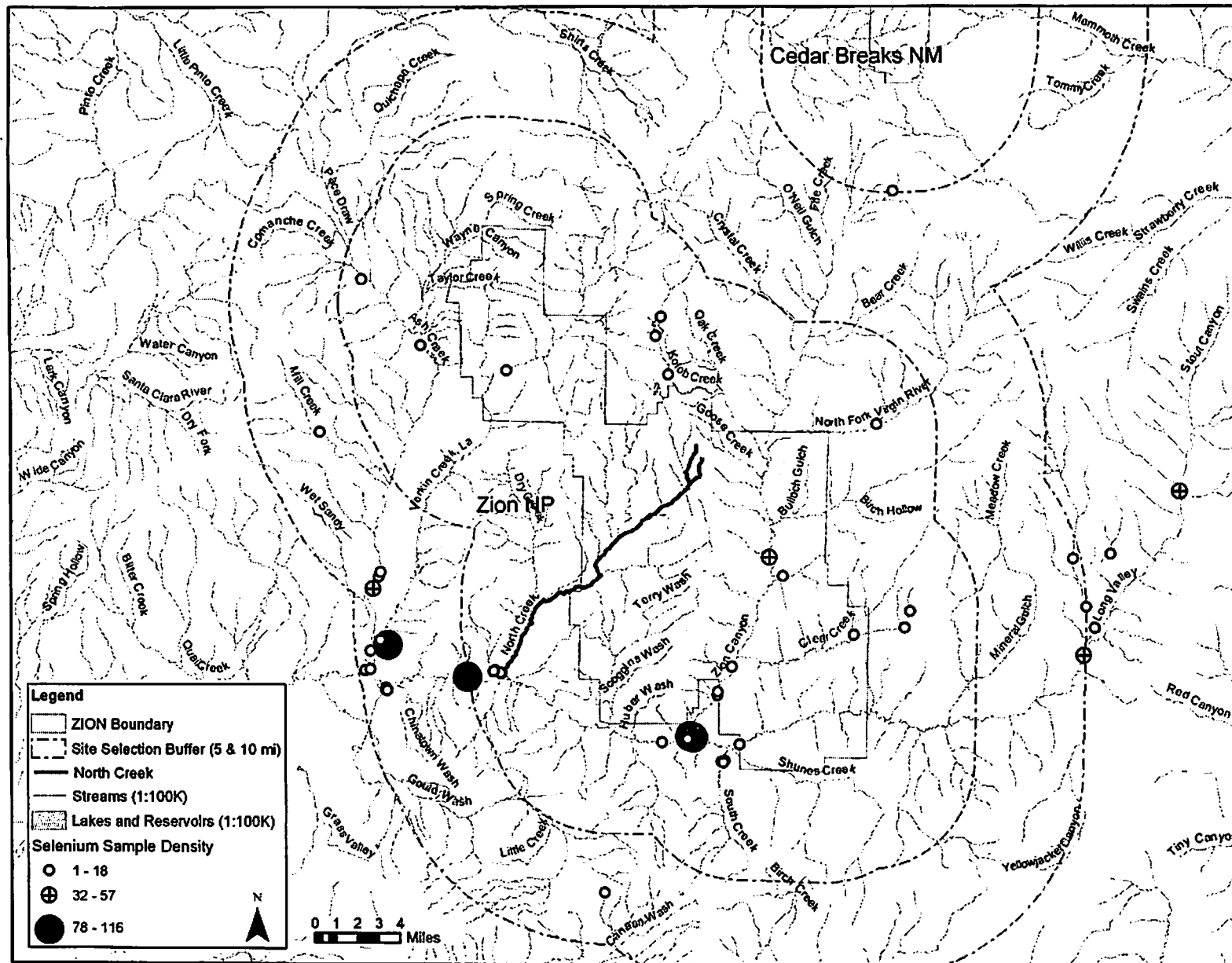
Total Phosphorus Water Sample Density, Zion National Park (ZION), 1976-2002



Water Sample Density, Zion National Park (ZION), 1954-2002



Total and Dissolved Selenium Water Sample Density, Zion National Park (ZION), 1954-2002



NCPN Database Summary of Recent Data

Table of sample counts for water and sediment samples inside park units by category from 1/1/1990 to 1/1/2003.

NPS Park Code	Algae	Carbon, Water	Field Parameters	Isotope and Radiological, Water	Macro-invertebrates	Major Ions, Water	Microorganisms	Miscellaneous, Water	Nutrients, Water	Organics, Water	Pesticides, Water	Trace Elements, Water
ARCH		1	229	27		221	8	210	182			170
BLCA		57	203			78	37	199	109			71
BRCA			45			34		21	20			13
CANY		7	481	5		454	10	429	437		3	404
CARE			2976		19	383	1187	3048	358			176
CEBR							3					
COLM			25	4		25	15	25	24			25
CURE	335	1	1021	1		189	714	278	800	1	1	104
DINO		11	501	1	14	271	25	388	263	4	3	306
FOBU			1			1		1				1
HOVE		1	21			20		21	20			20
NABR			69			69	5	64	68			56
PISP			433	8		17		17	14			17
TICA			103	19		103						42
ZION		34	301	1	13	21	229	265	44	34	1	13

NPS Park Code	Carbon, Bed Sediment	Carbon, Suspended Sediment	Isotope and Radiological, Suspended Sediment	Miscellaneous, Bed Sediment	Miscellaneous, Sediment	Miscellaneous, Suspended Sediment	Nutrients, Bed Sediment	Organics, Bed Sediment	Pesticides, Bed Sediment	Pesticides, Suspended Sediment	Trace Elements, Bed Sediment	Volatile Organics, Bed Sediment
ARCH												
BLCA	1	54		1		48	1	1	1		1	1
BRCA												
CANY												
CARE												
CEBR												
COLM						5						
CURE						33						
DINO				14	80	114				3		
FOBU												
HOVE												
NABR												
PISP			2									
TICA												
ZION												