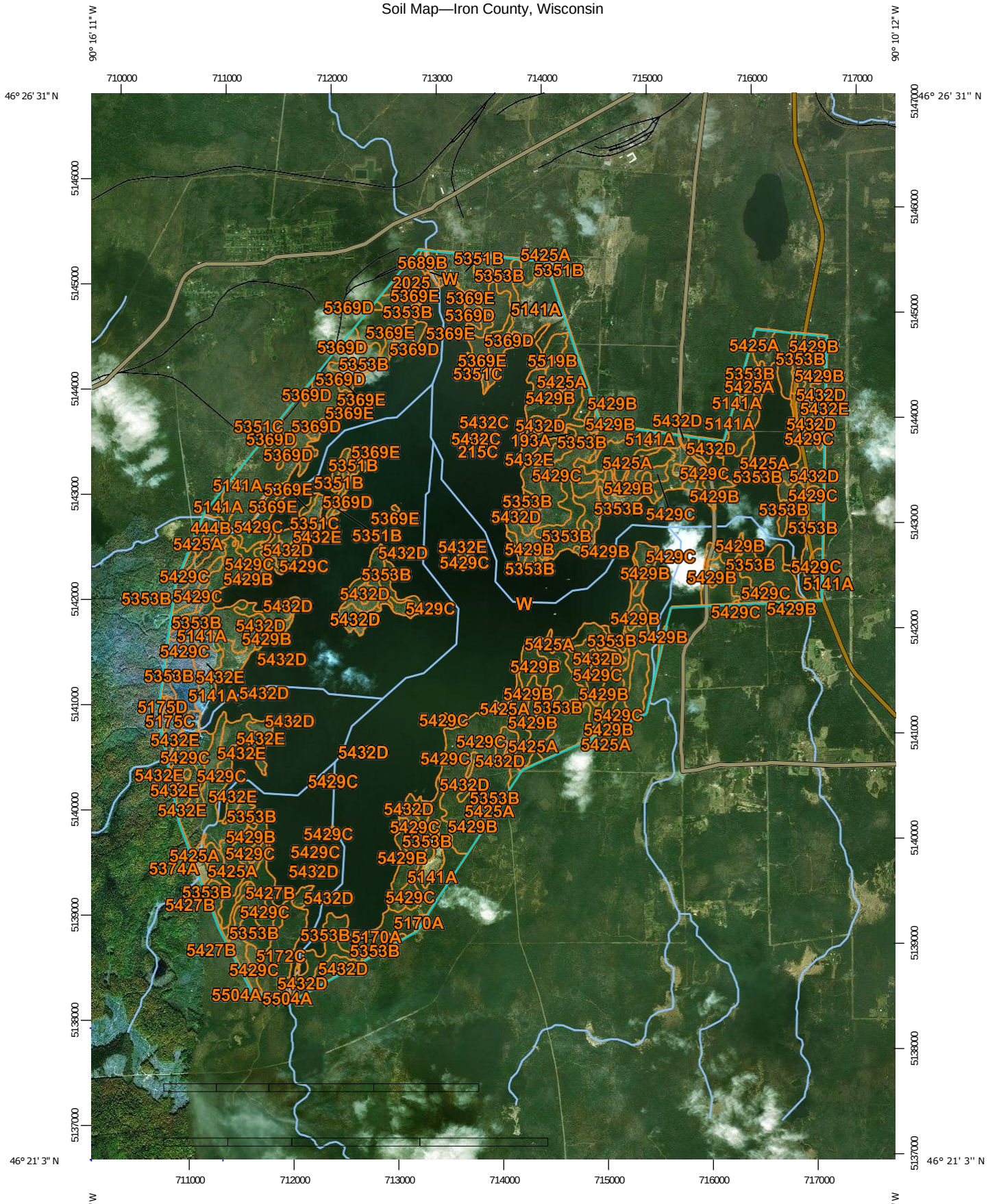
APPENDIX 4.2.2-1 **Gile Flowage Storage Reservoir Project Soils Report**

Soil Map—Iron County, Wisconsin



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Iron County, Wisconsin
Survey Area Data: Version 14, Sep 11, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 28, 2014—Jul 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
193A	Minocqua muck, 0 to 2 percent slopes	1.8	0.0%
215C	Pence sandy loam, 6 to 15 percent slopes	0.7	0.0%
444B	Gichigami-Oronto complex, 0 to 6 percent slopes	10.5	0.2%
2025	Pits and dumps, mine	14.0	0.2%
2030	Udorthents and Udipsamments, cut or fill	6.9	0.1%
5141A	Lupton-Pleine-Cathro complex, 0 to 1 percent slopes	167.7	2.6%
5170A	Minocqua-Pleine-Cathro complex, 0 to 2 percent slopes	11.2	0.2%
5172C	Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 18 percent slopes	54.2	0.8%
5175C	Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 18 percent slopes, rocky	15.4	0.2%
5175D	Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 35 percent slopes, rocky	2.4	0.0%
5351B	Gogebic silt loam, 2 to 6 percent slopes, very stony, rocky	59.3	0.9%
5351C	Gogebic silt loam, 6 to 18 percent slopes, very stony, rocky	236.8	3.7%
5353B	Tula-Gogebic complex, 0 to 6 percent slopes, stony	746.4	11.7%
5369D	Dishno-Gogebic-Peshekee-Rock outcrop complex, 18 to 35 percent slopes, very stony	44.4	0.7%
5369E	Michigamme-Schweitzer-Peshekee-Rock outcrop complex, 35 to 55 percent slopes, very stony	59.6	0.9%
5374A	Bowstring-Arnheim complex, 0 to 1 percent slopes, frequently flooded	7.7	0.1%
5425A	Foxpaw-Gay, stony complex, 0 to 2 percent slopes	160.2	2.5%
5427B	Gogebic fine sandy loam, 1 to 6 percent slopes, stony	23.9	0.4%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5429B	Gogebic-Peshekee complex, 2 to 6 percent slopes, very stony, very rocky	517.8	8.1%
5429C	Gogebic-Peshekee complex, 6 to 18 percent slopes, very stony, very rocky	657.4	10.3%
5432C	Gogebic-Michigamme-Rock outcrop complex, 6 to 18 percent slopes, very stony	1.6	0.0%
5432D	Gogebic-Michigamme-Rock outcrop complex, 6 to 35 percent slopes, very stony	206.8	3.2%
5432E	Schweitzer-Michigamme-Rock outcrop complex, very stony, 18 to 55 percent slopes	151.2	2.4%
5504A	Moquah-Arnheim complex, 0 to 3 percent slopes, frequently flooded	5.1	0.1%
5519B	Pence-Gogebic complex, 2 to 6 percent slopes, stony	13.0	0.2%
5689B	Chabeneau-Channing-Gogebic complex, 0 to 6 percent slopes, stony	9.4	0.1%
W	Water	3,220.9	50.3%
Totals for Area of Interest		**6,406.5**	**100.0%**

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- **Soil Erosion**
  - Conservation Planning
  - RUSLE2 Related Attributes

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    Options

    Include minor soils? ☐

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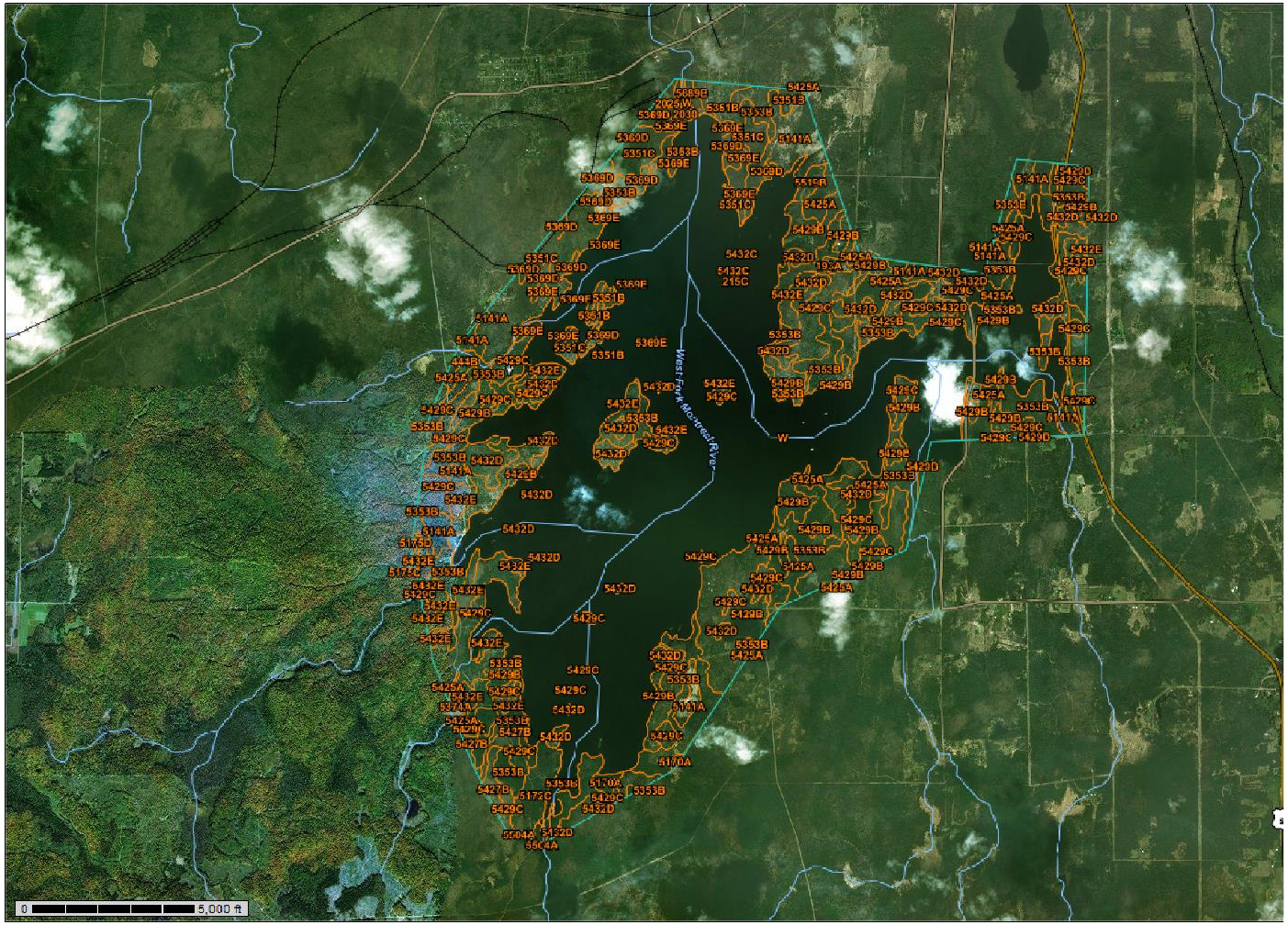
- Soil Health
- Soil Physical Properties
- Soil Qualities and Features
- Vegetative Productivity
- Waste Management
- Water Features
- Water Management

Soil Map

Scale (not to scale)



Report — RUSLE2 Related Attributes

Soil properties and interpretations for erosion runoff calculations. The surface mineral horizon properties are displayed. Organic surface horizons are not displayed.

Iron County, Wisconsin								
Map symbol and soil name	**Pct. of map unit**	**Slope length (ft)**	**Hydrologic group**	**Kf**	**T factor**	**Representative value**		
						% Sand	**% Silt**	**% Clay**
193A—Minocqua muck, 0 to 2 percent slopes								
Minocqua	80	249	B/D	—	3	5.0	90.0	5.0
215C—Pence sandy loam, 6 to 15 percent slopes								
Pence	83	151	A	.24	5	63.0	32.0	5.0
444B—Gichigami-Oronto complex, 0 to 6 percent slopes								
Gichigami	70	200	B/D	.32	5	34.3	51.7	14.0
Oronto	25	249	C/D	.28	5	17.5	51.5	31.0
5141A—Lupton-Pleine-Cathro complex, 0 to 1 percent slopes								
Pleine	23	426	B/D	.43	1	66.2	26.3	7.5
Cathro	15	426	B/D	.37	1	65.0	25.0	10.0
5170A—Minocqua-Pleine-Cathro complex, 0 to 2 percent slopes								
Minocqua	50	249	B/D	.49	3	30.5	56.0	13.5
Pleine	30	249	B/D	.43	1	66.2	26.3	7.5
Cathro	15	249	B/D	.37	1	65.0	25.0	10.0
5172C—Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 18 percent slopes								
Gogebic, sandy substratum	60	148	D	—	4	—	—	—
Cathro	15	249	B/D	.37	1	65.0	25.0	10.0
Pence, sandy substratum	15	98	A	—	2	—	—	—
5175C—Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 18 percent slopes, rocky								
Gogebic	55	98	C/D	—	4	—	—	0.0
Pence	20	98	A	.24	5	69.0	22.0	9.0
Cathro	15	249	B/D	.37	1	42.1	37.9	20.0
5175D—Gogebic, very stony-Pence, very stony-Cathro complex, 0 to 35 percent slopes, rocky								

Iron County, Wisconsin								
Pence	60	59	A	.24	5	69.0	22.0	9.0
Cathro	15	249	B/D	.37	1	42.1	37.9	20.0
Gogebic	15	59	C/D	—	4	—	—	0.0
5351B—Gogebic silt loam, 2 to 6 percent slopes, very stony, rocky								
Gogebic, rocky, very stony	85	295	D	—	4	5.0	90.0	5.0
5351C—Gogebic silt loam, 6 to 18 percent slopes, very stony, rocky								
Gogebic, rocky, very stony	85	148	D	—	4	5.0	90.0	5.0
5353B—Tula-Gogebic complex, 0 to 6 percent slopes, stony								
Tula	45	328	C/D	—	4	—	—	—
Gogebic, stony	40	295	D	—	4	—	—	—
5369D—Dishno-Gogebic-Peshekee-Rock outcrop complex, 18 to 35 percent slopes, very stony								
Dishno, very stony	35	98	C	—	3	5.0	90.0	5.0
Gogebic, very stony	30	98	D	—	4	5.0	90.0	5.0
Peshekee, very stony	15	98	D	—	1	5.0	90.0	5.0
Rock outcrop	15	—	—	—	—	—	—	—
5369E—Michigamme-Schweitzer-Peshekee-Rock outcrop complex, 35 to 55 percent slopes, very stony								
Michigamme, very stony	30	98	C	—	2	5.0	90.0	5.0
Schweitzer, very stony	25	98	C	.37	3	55.0	37.0	8.0
Peshekee, very stony	20	98	D	—	1	5.0	90.0	5.0
Rock outcrop	15	—	—	—	—	—	—	—
5374A—Bowstring-Arnheim complex, 0 to 1 percent slopes, frequently flooded								
Bowstring, frequently flooded	50	426	B/D	—	1	30.4	55.6	14.0
Arnheim, frequently flooded	40	426	B/D	.37	5	30.0	60.0	10.0
5425A—Foxpaw-Gay, stony complex, 0 to 2 percent slopes								
Foxpaw	45	426	B/D	—	5	—	—	—
Gay	40	1,551	B/D	.32	5	64.3	30.7	5.0

Iron County, Wisconsin								
5427B—Gogebic fine sandy loam, 1 to 6 percent slopes, stony								
Gogebic, stony	85	200	D	—	4	5.0	90.0	5.0
5429B—Gogebic-Peshekee complex, 2 to 6 percent slopes, very stony, very rocky								
Gogebic, very stony	79	295	D	—	4	—	—	—
Peshekee	15	98	D	—	1	—	—	—
5429C—Gogebic-Peshekee complex, 6 to 18 percent slopes, very stony, very rocky								
Gogebic, very stony	79	148	D	—	4	—	—	—
Peshekee	15	98	D	—	1	—	—	—
5432C—Gogebic-Michigamme-Rock outcrop complex, 6 to 18 percent slopes, very stony								
Gogebic, very stony	68	148	D	—	4	—	—	—
Michigamme	15	98	C	—	2	—	—	—
Rock outcrop	15	—	—	—	—	—	—	—
5432D—Gogebic-Michigamme-Rock outcrop complex, 6 to 35 percent slopes, very stony								
Gogebic, very stony	68	98	D	—	4	—	—	—
Michigamme	15	98	C	—	2	—	—	—
Rock outcrop	15	—	—	—	—	—	—	—
5432E—Schweitzer-Michigamme-Rock outcrop complex, very stony, 18 to 55 percent slopes								
Schweitzer	45	98	C	.28	3	55.0	37.0	8.0
Michigamme	20	98	C	—	2	—	—	—
Rock outcrop	20	—	—	—	—	—	—	—
5504A—Moquah-Arnheim complex, 0 to 3 percent slopes, frequently flooded								
Moquah, frequently flooded	55	295	A	.28	5	46.6	44.4	9.0
Arnheim, frequently flooded	30	426	B/D	.37	5	30.0	60.0	10.0
5519B—Pence-Gogebic complex, 2 to 6 percent slopes, stony								
Pence	60	200	A	.24	5	69.0	22.0	9.0

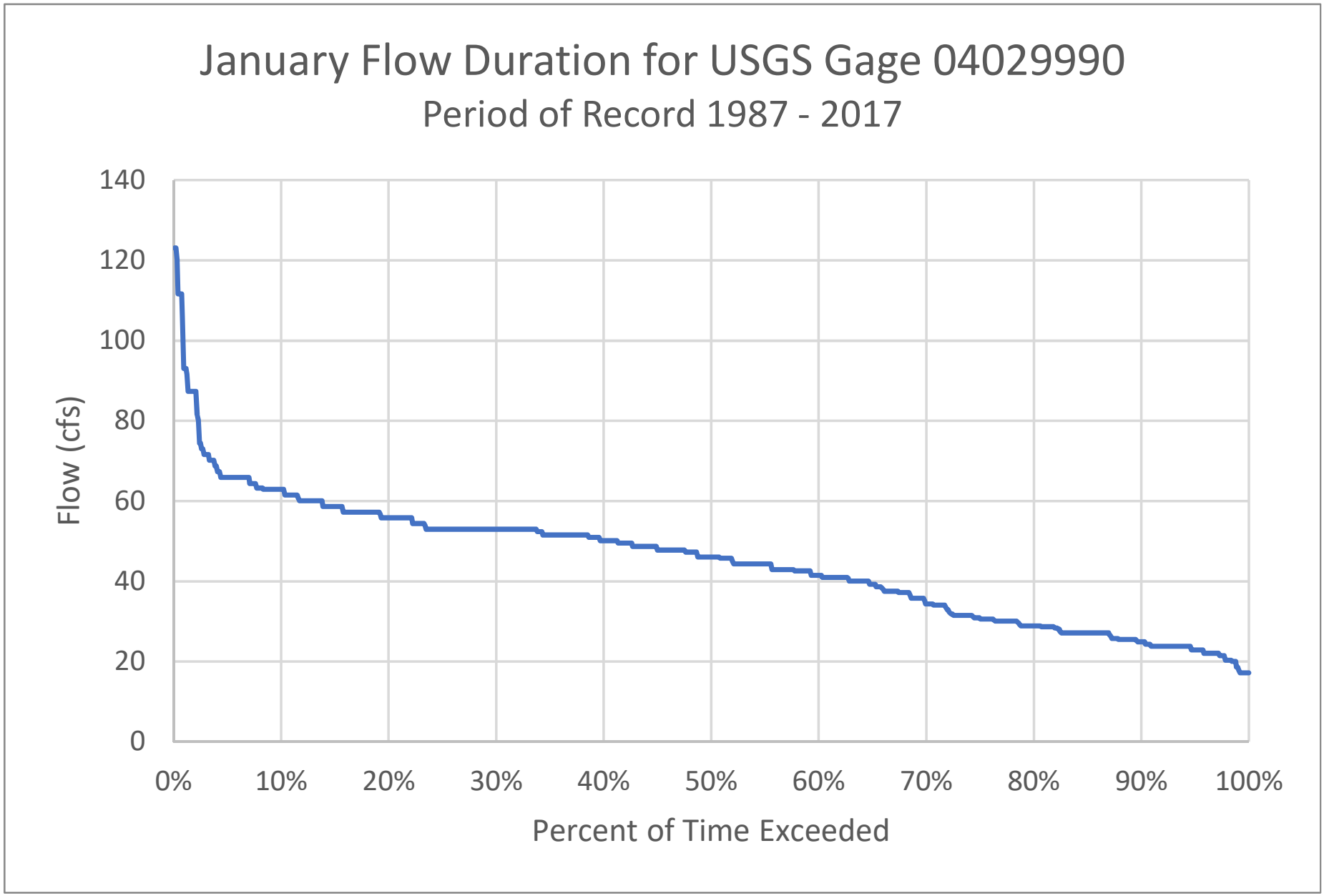
Iron County, Wisconsin								
Gogebic	25	200	C/D	—	4	—	—	0.0
5689B—Chabeneau-Channing-Gogebic complex, 0 to 6 percent slopes, stony								
Chabeneau	35	295	B/D	—	3	—	—	—
Channing	30	328	B/D	—	3	—	—	—
Gogebic, stony	25	295	D	—	4	—	—	—

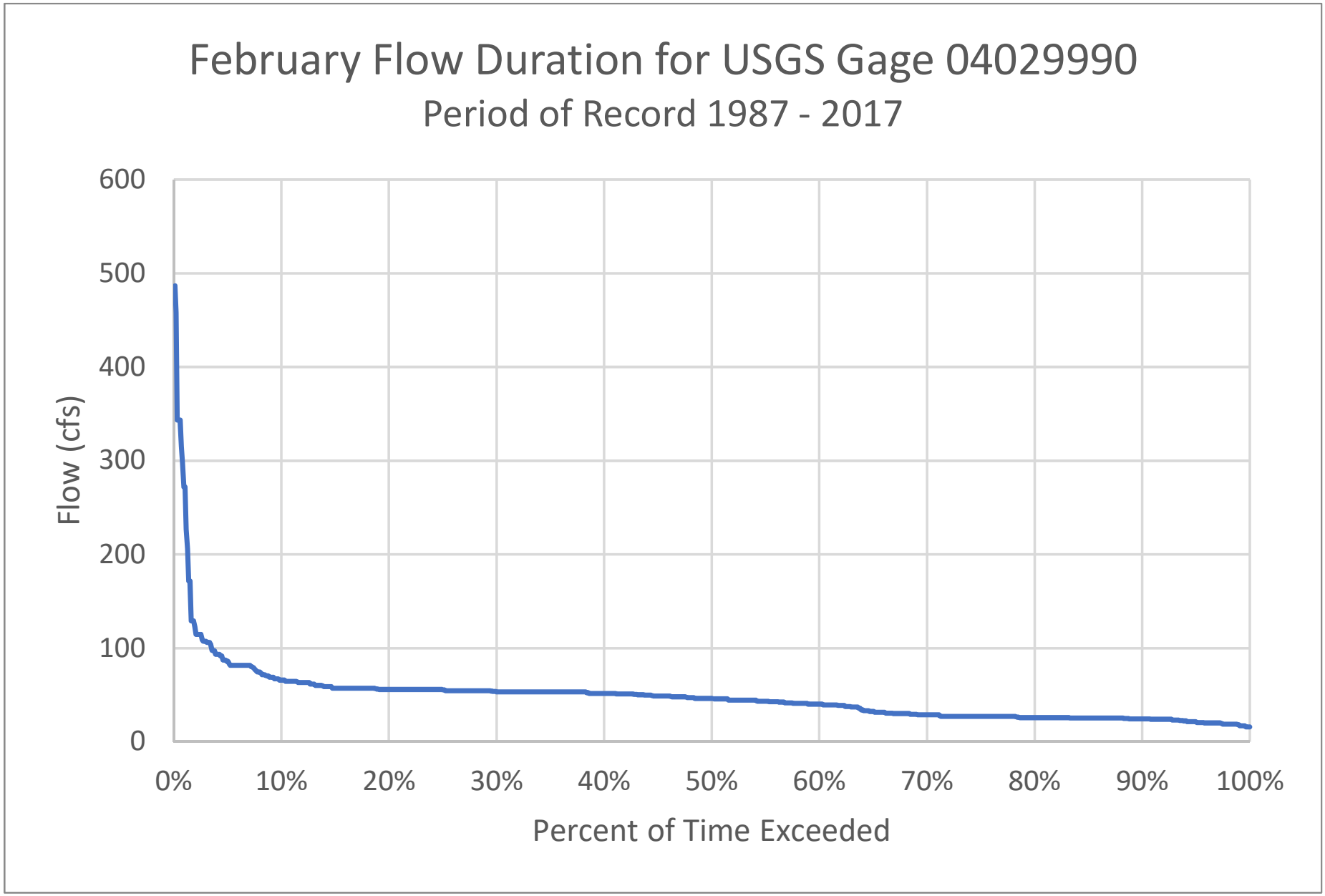
Description — RUSLE2 Related Attributes

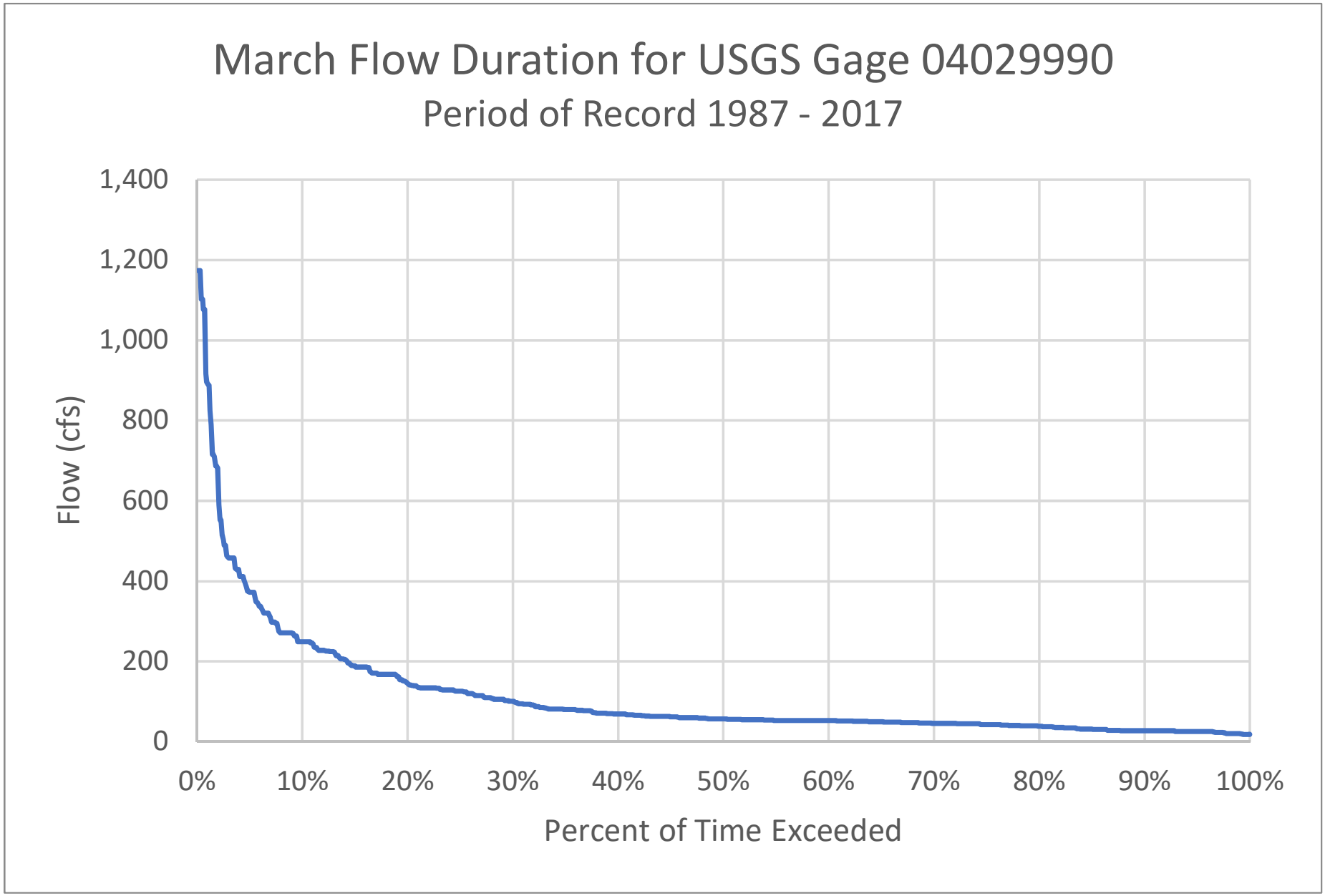
RUSLE2 Related Attributes

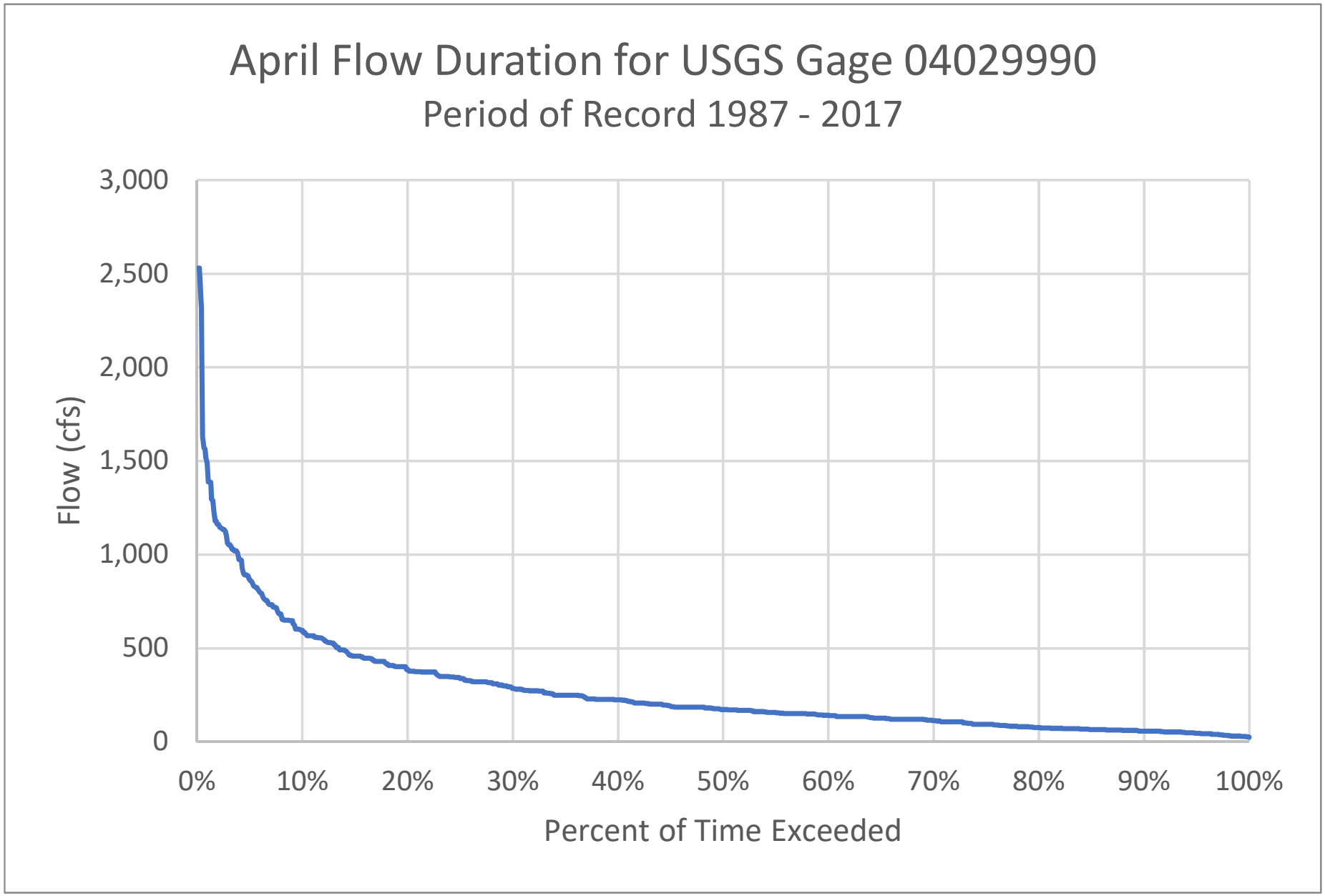
This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factors Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the mineral surface horizon. Missing surface data may indicate the presence of an organic surface layer. .

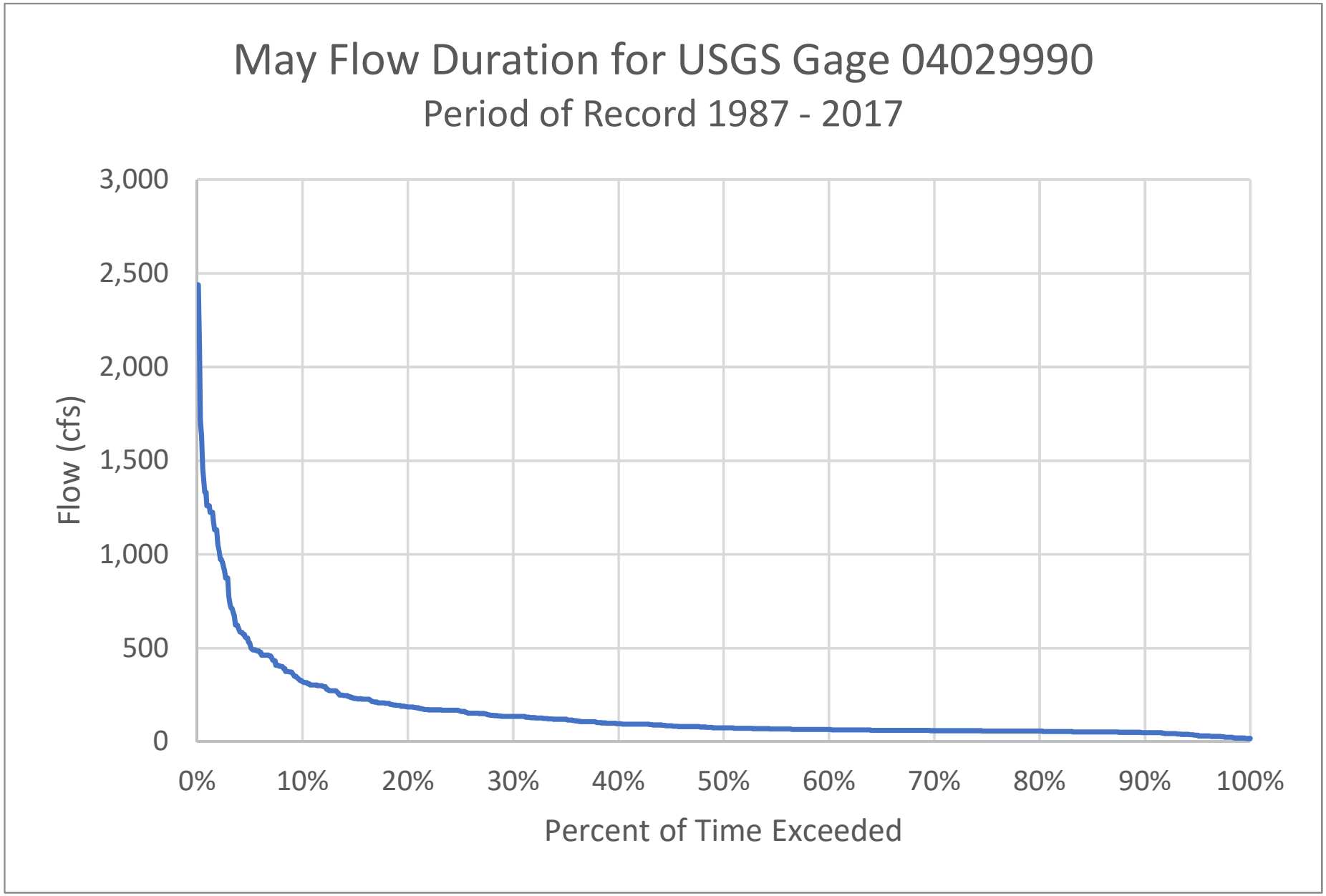
APPENDIX 4.3.2-1 **Flow Duration Curves and Exceedance Table**

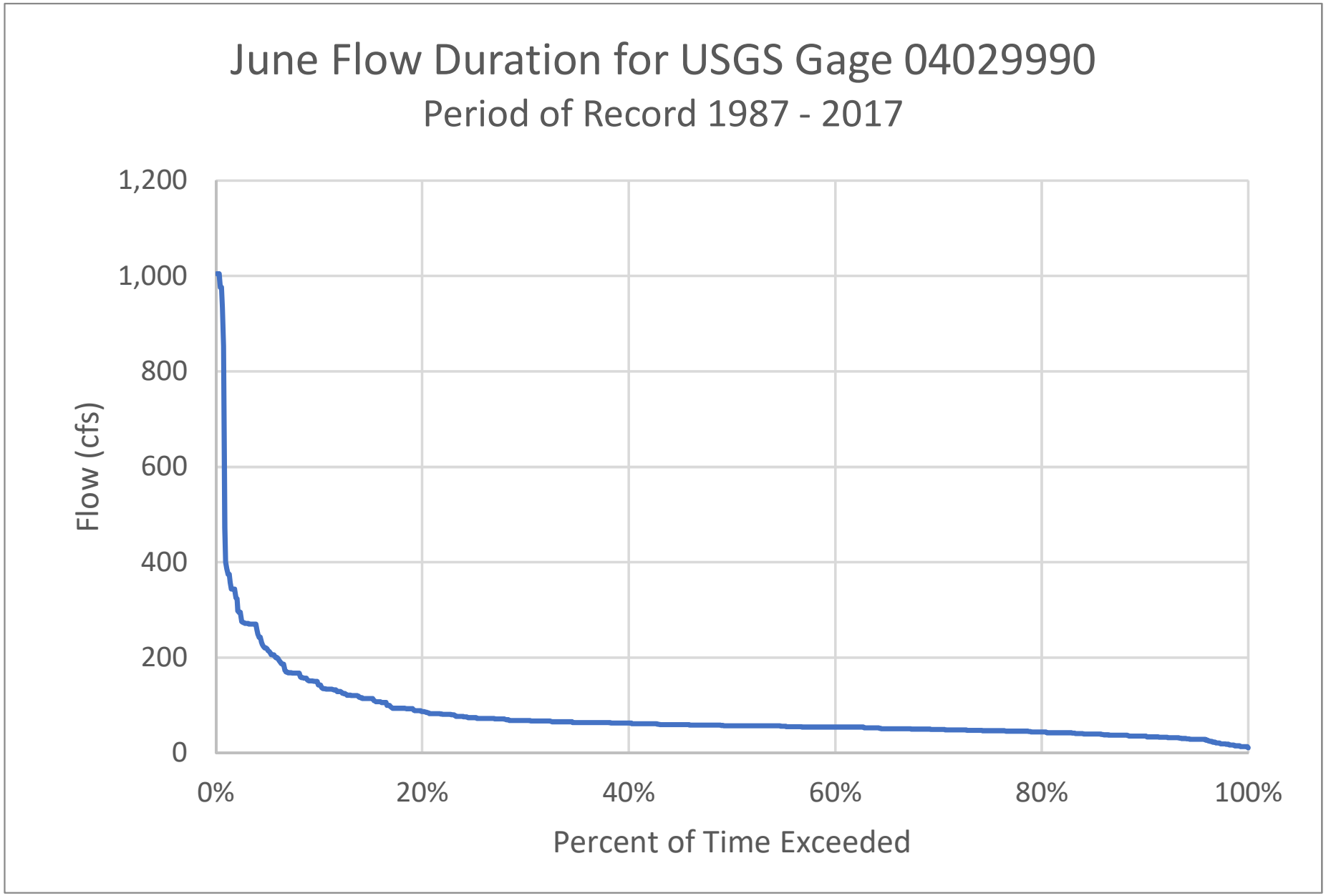

January Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
140
120
100
80
60
40
20
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

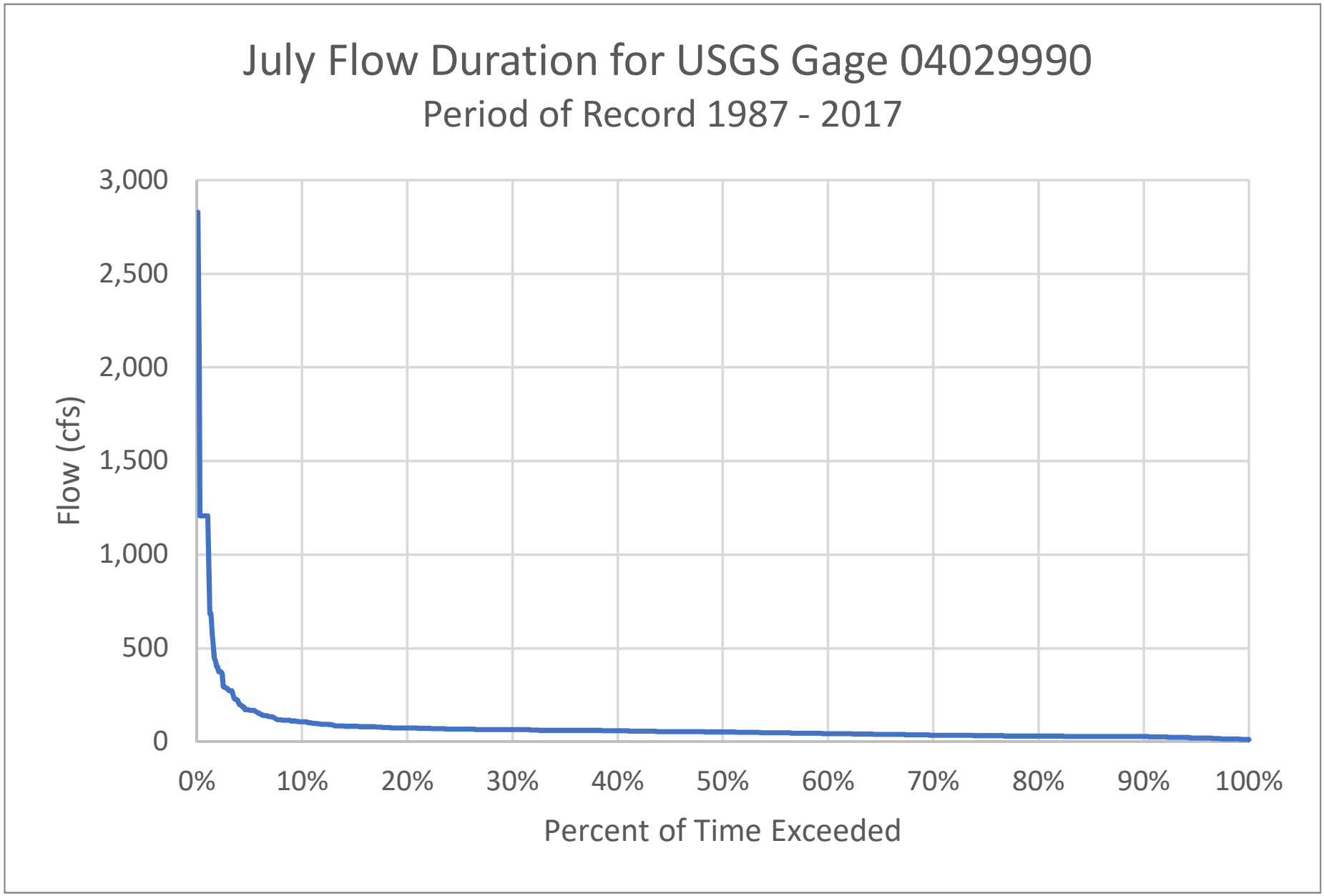

February Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
600
500
400
300
200
100
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

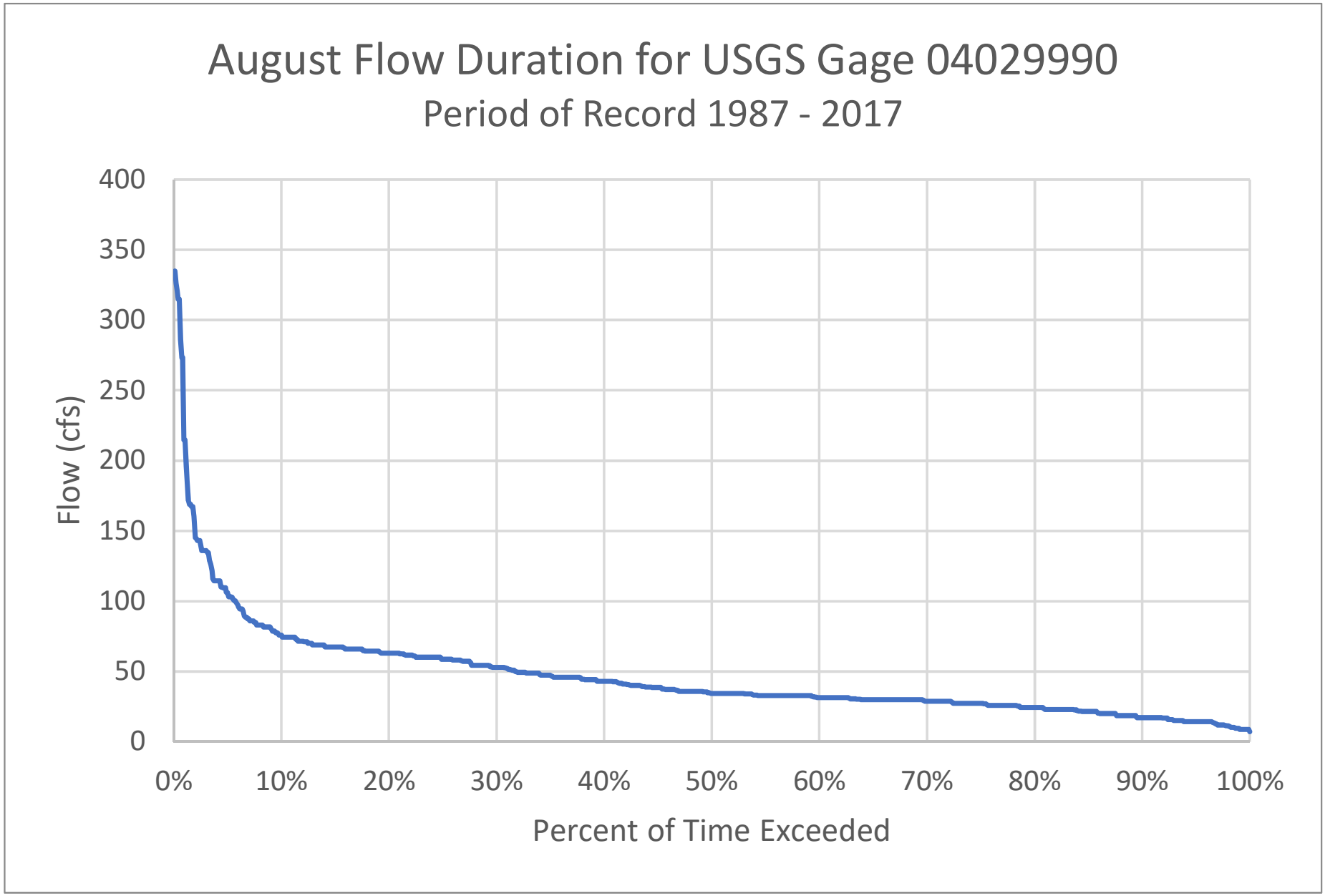

March Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
1,400
1,200
1,000
800
600
400
200
0
Flow (cfs)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

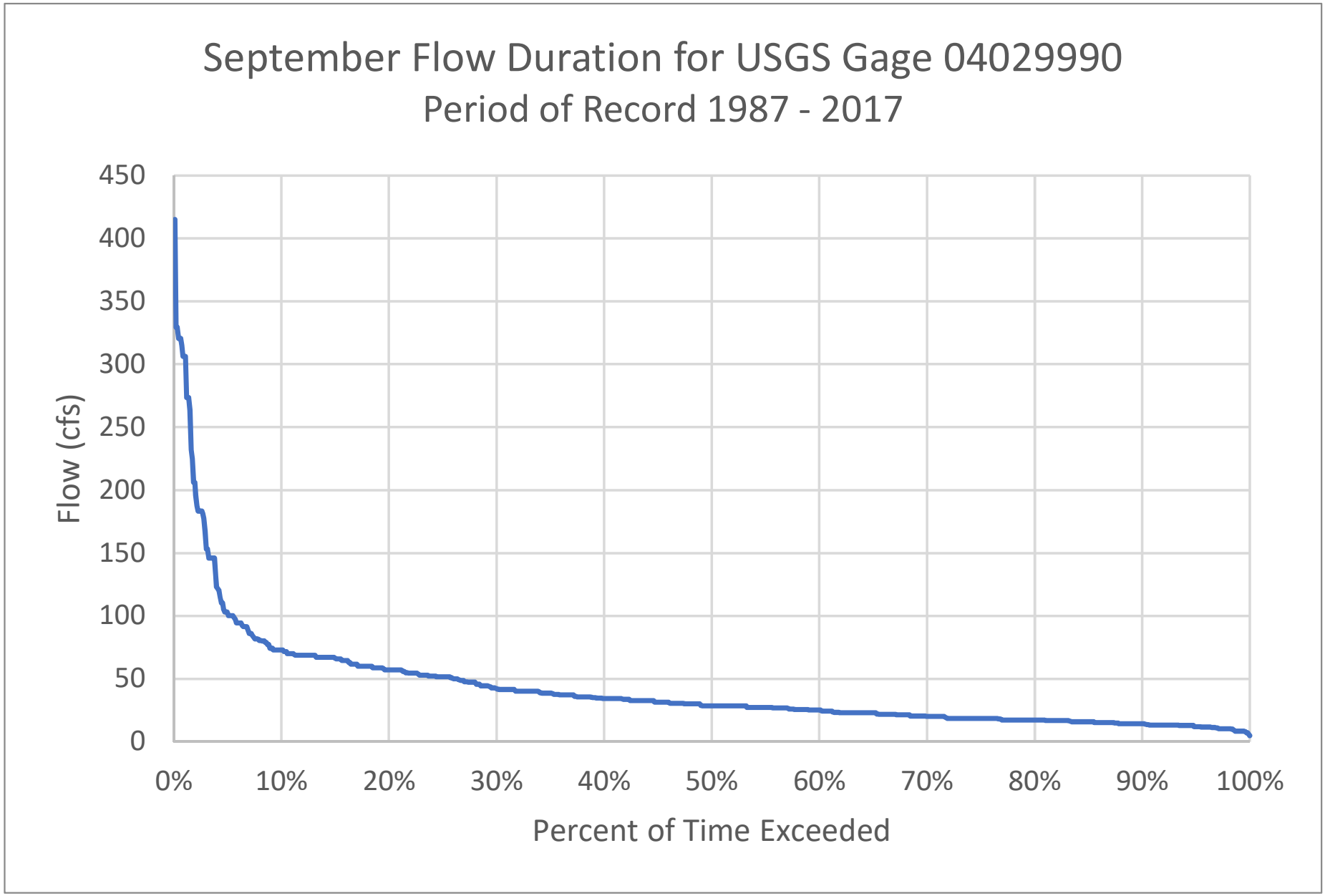

April Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
3,000
2,500
2,000
1,500
1,000
500
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

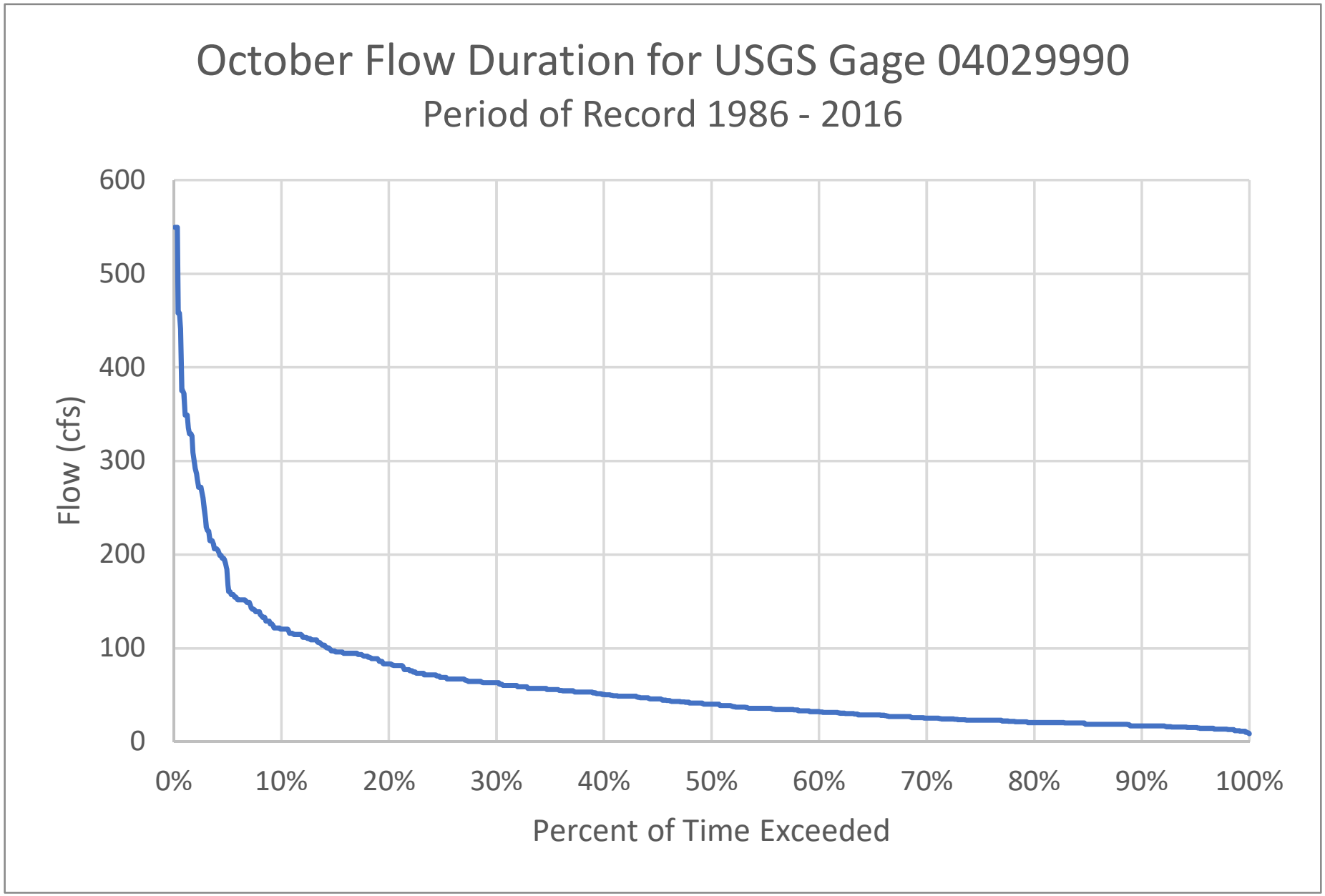

May Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
3,000
2,500
2,000
1,500
1,000
500
0
Flow (cfs)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

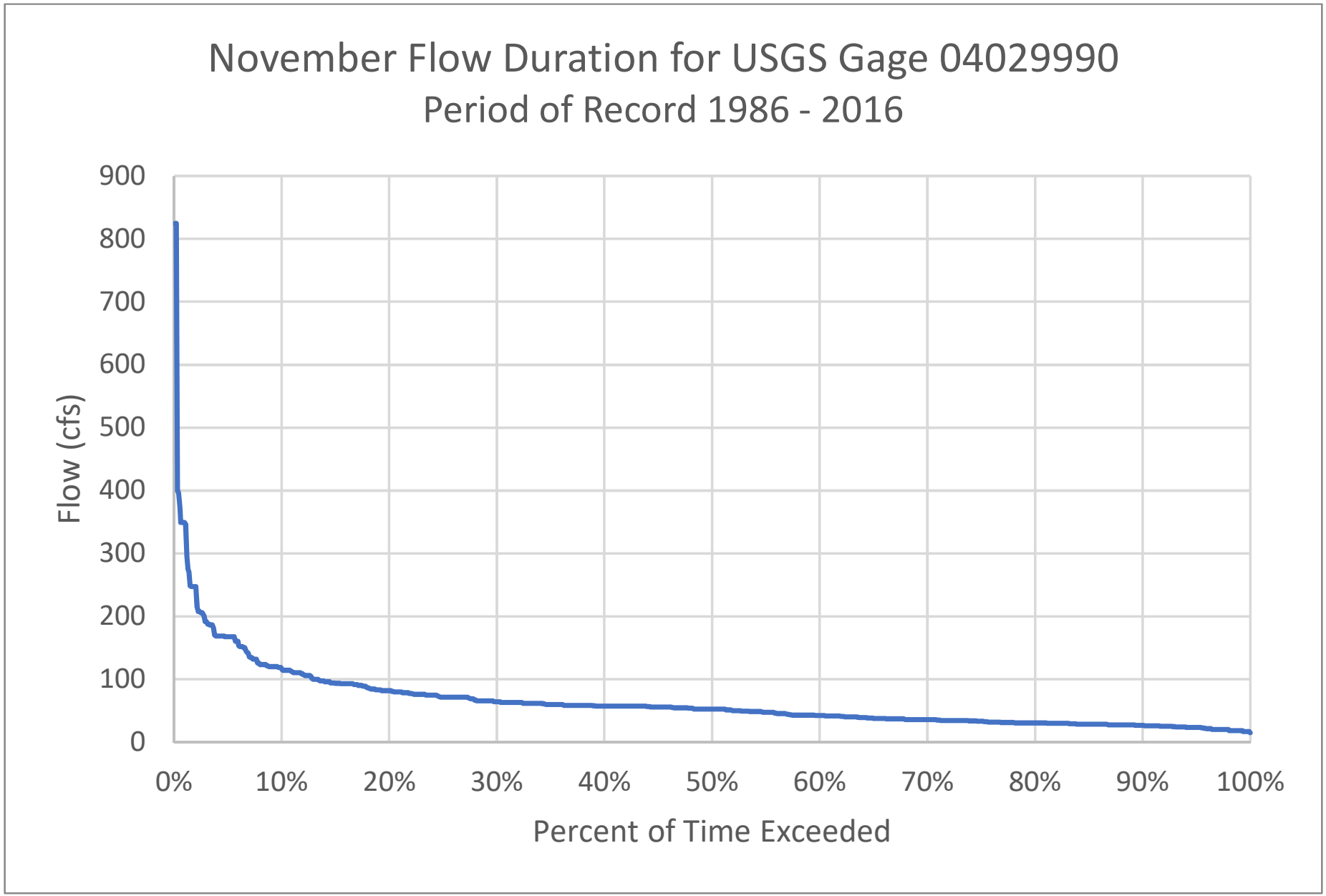

June Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
1,200
1,000
800
600
400
200
0
Flow (cfs)
0%
20%
40%
60%
80%
100%
Percent of Time Exceeded

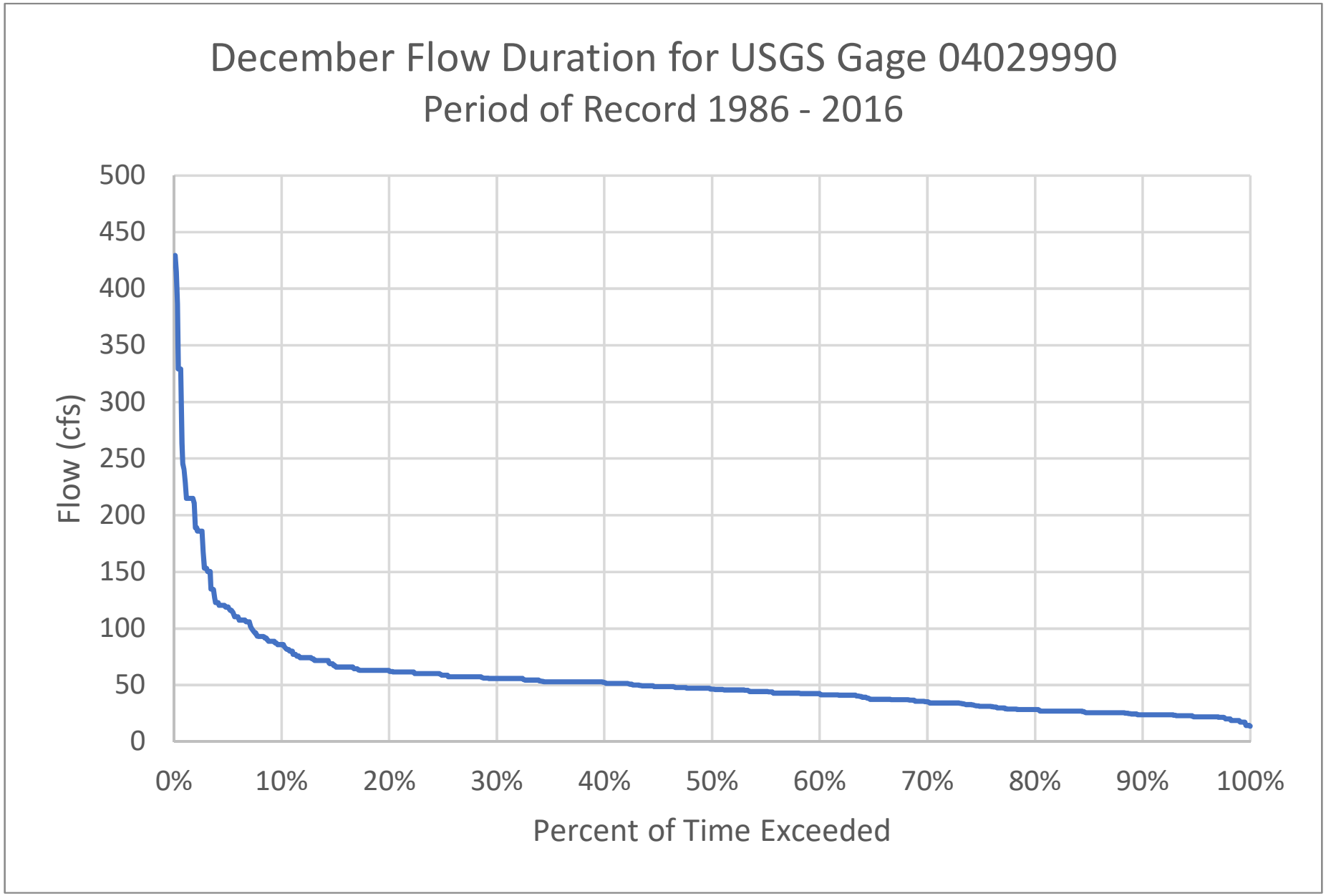

July Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
3,000
2,500
2,000
1,500
1,000
500
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded


August Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
400
350
300
250
200
150
100
50
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded


September Flow Duration for USGS Gage 04029990
Period of Record 1987 - 2017
Flow (cfs)
450
400
350
300
250
200
150
100
50
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded


October Flow Duration for USGS Gage 04029990
Period of Record 1986 - 2016
Flow (cfs)
600
500
400
300
200
100
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

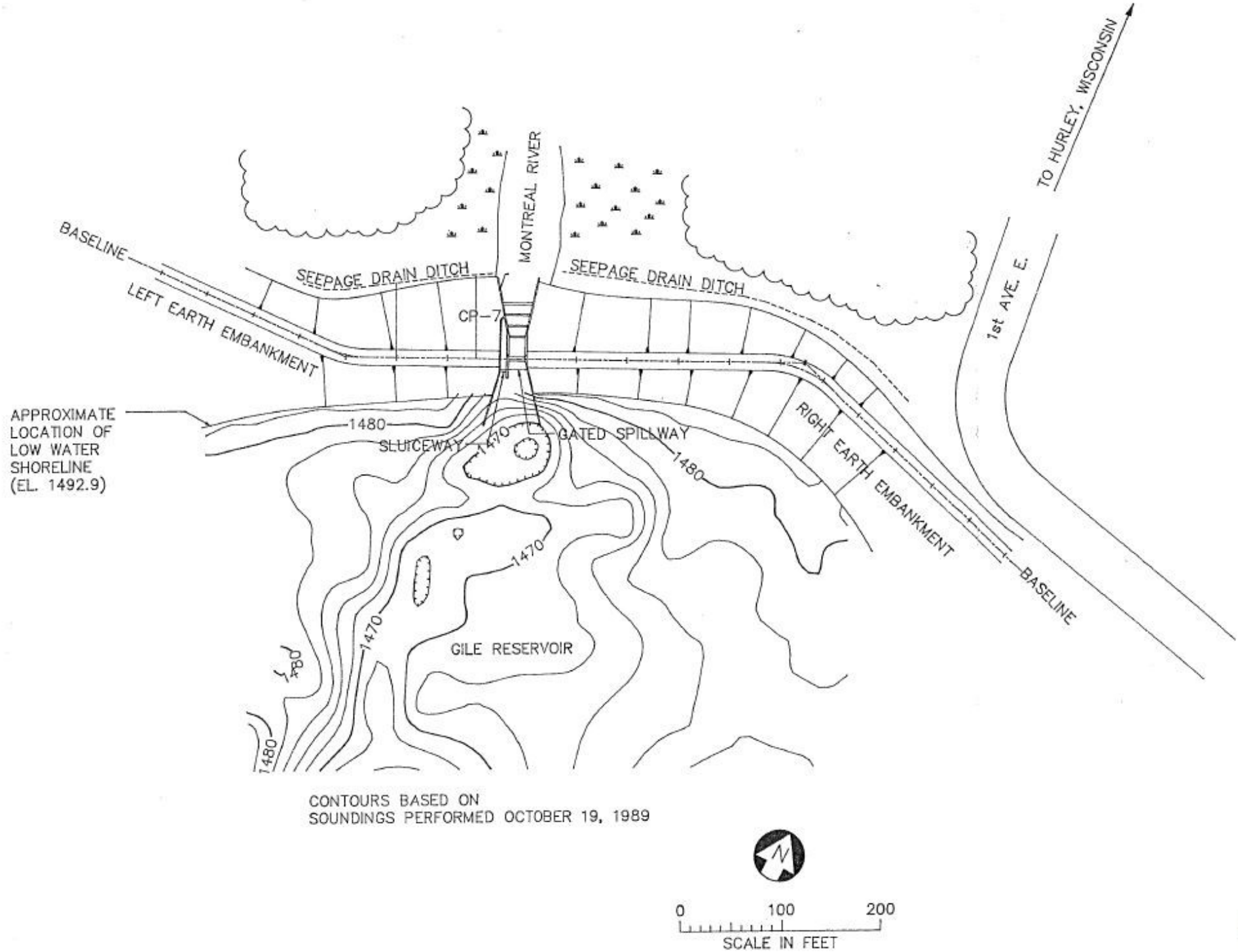

November Flow Duration for USGS Gage 04029990
Period of Record 1986 - 2016
Flow (cfs)
900
800
700
600
500
400
300
200
100
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded


December Flow Duration for USGS Gage 04029990
Period of Record 1986 - 2016
Flow (cfs)
500
450
400
350
300
250
200
150
100
50
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Exceeded

Flow Duration for USGS Gage 04029990 (Period of Record 1986 - 2017)

Percent of Time	January	February	March	April	May	June	July	August	September	October	November	December
95	23	21	25	46	34	29	20	14	12	15	23	22
90	25	24	27	57	49	36	27	17	14	17	27	24
85	27	25	31	65	53	40	29	21	16	19	29	26
80	29	26	39	77	56	44	30	24	17	20	30	28
75	31	27	43	93	57	47	33	27	19	23	33	31
70	34	29	46	113	59	49	36	29	20	25	36	35
65	39	32	50	126	62	52	40	30	23	29	38	38
60	42	40	53	142	64	54	44	31	25	32	42	42
55	44	43	53	156	67	57	47	33	27	36	48	44
50	46	46	57	172	74	57	52	34	29	40	53	46
45	48	49	62	192	86	60	54	39	31	46	56	49
40	50	52	69	225	96	63	59	43	34	50	57	53
35	52	53	80	249	120	64	62	47	39	56	60	53
30	53	54	100	285	135	69	64	53	43	63	64	56
25	53	56	126	338	163	74	67	59	52	69	72	59
20	56	56	146	386	186	87	74	63	57	83	82	63
15	59	57	189	458	230	115	82	67	66	97	93	67
10	63	66	249	595	321	143	107	76	73	120	119	86

APPENDIX 4.3.6-1 **Gile Flowage Storage Reservior Project Bathymetric Map**


TO HURLEY, WISCONSIN
MONTREAL RIVER
BASELINE
SEEPAGE DRAIN DITCH
SEEPAGE DRAIN DITCH
LEFT EARTH EMBANKMENT
CP-7
1st AVE. E.
APPROXIMATE LOCATION OF LOW WATER SHORELINE (EL. 1492.9)
1480
SLUICEWAY
1470
GATED SPILLWAY
1480
RIGHT EARTH EMBANKMENT
BASELINE
1470
1470
GILE RESERVOIR
1480
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APPENDIX 4.3.7.1-1 Chapter NR 102 Water Quality Standards

Chapter NR 102

WATER QUALITY STANDARDS FOR WISCONSIN SURFACE WATERS

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History: Chapter NR 102 as it existed on September 30, 1973 was repealed and a new chapter NR 102 was created, effective October 1, 1973. Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.

NR 102.01 Purpose. (1) The purpose of this chapter is to establish, in conjunction with chs. NR 103 to 105, water quality standards for surface waters of the state pursuant to s. 281.15 (2) (b), Stats. This chapter describes the designated use categories for such waters and the water quality criteria necessary to support these uses. This chapter and chs. NR 103 to 105 constitute the water quality standards for the surface waters of Wisconsin.

(2) Water quality standards shall protect the public interest, which includes the protection of public health and welfare and the present and prospective uses of all waters of the state for public and private water supplies, propagation of fish and other aquatic life and wild and domestic animals, domestic and recreational purposes, and agricultural, commercial, industrial, and other legitimate uses. In all cases where the potential uses are in conflict, water quality standards shall protect the general public interest.

(3) Water quality standards serve as a basis for developing and implementing control strategies to achieve legislative policies and goals. Water quality standards are the basis for deriving water quality based effluent limitations. Water quality standards also serve as a basis for decisions in other regulatory, permitting or funding activities that impact water quality.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.02 Applicability. The provisions of this chapter are applicable to surface waters of Wisconsin.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.03 Definitions. (1) "Mixing zone" means a region in which a discharge of different characteristics than the receiving water is in transit and progressively diluted from the source to the receiving system.

(2) "Natural conditions" means the normal daily and seasonal variations in climatic and atmospheric conditions, and the existing physical and chemical characteristics of a water or the course in which it flows.

(3) "Natural temperature" means the normal existing temperature of a surface water including daily and seasonal changes outside the zone of influence of any artificial inputs.

(4) "Resource management" means the application of control techniques to enhance or preserve a surface water in accordance with statutory provisions and in the general public interest.

(5) "Sanitary survey" means a thorough investigation and evaluation of a surface water including bacteriological sampling to determine the extent and cause of any bacterial contamination.

(6) "Surface waters" means all natural and artificial named and unnamed lakes and all naturally flowing streams within the boundaries of the state, but not including cooling lakes, farm ponds and facilities constructed for the treatment of wastewaters (the term waters as used in this chapter means surface waters).

(7) "Unauthorized concentrations of substances" means pollutants or other chemicals introduced into surface waters without prior permit or knowledge of the department, but not including accidental or unintentional spills.

(8) "Best practicable control technology" means that level of treatment established by the department under s. 283.13 (2) (a), Stats., for categories and classes of point sources to be achieved by not later than July 1, 1977.

(9) "Best available control technology" means that level of treatment established by the department under s. 283.13 (2) (b) 1., Stats., for categories and classes of point sources to be achieved by not later than July 1, 1983.

(10) Class I and Class II trout waters are as defined in s. NR 1.02 (7).

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; r. (1), renum. from NR 102.01, Register, February, 1989, No. 398, eff. 3−1−89; cr. (10), Register, May, 1993, No. 449, eff. 6−1−93.

NR 102.04 Categories of standards. (1) GENERAL. To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and the effluent channel meet the following conditions at all times and under all flow conditions:

(a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

(b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

(c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

(d) Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

(2) REVISED STANDARDS. It should be recognized that these standards will be revised as new information or advancing technology indicate that revisions are in the public interest. Water used for hydropower and commercial shipping depends mainly on quantity, depth and elevation; consequently, no specific quality standards for these uses have been prepared.

(3) FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a) to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in the federal water pollution control act amendments of 1972, P.L. 92−500; 33 USC 1251 et seq.

(a) *Cold water communities.* This subcategory includes surface waters capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species. This subcategory includes, but is not restricted to, surface waters identified as trout water by the department of natural resources (Wisconsin Trout Streams, publication 6−3600 (80)).

(b) *Warm water sport fish communities.* This subcategory includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning area for warm water sport fish.

(c) *Warm water forage fish communities.* This subcategory includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

(d) *Limited forage fish communities.* (Intermediate surface waters). This subcategory includes surface waters of limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of forage fish and other aquatic life.

(e) *Limited aquatic life.* (Marginal surface waters). This subcategory includes surface waters of severely limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of aquatic life.

(4) STANDARDS FOR FISH AND AQUATIC LIFE. Except for natural conditions, all waters classified for fish and aquatic life shall meet the following criteria:

(a) *Dissolved oxygen.* Except as provided in par. (e) and s. NR 104.02 (3), the dissolved oxygen content in surface waters may not be lowered to less than 5 mg/L at any time.

(b) *Temperature.* 1. There shall be no temperature changes that may adversely affect aquatic life.

2. Natural daily and seasonal temperature fluctuations shall be maintained.

3. The maximum temperature rise at the edge of the mixing zone above the existing natural temperature shall not exceed 5º F for streams and 3º F for lakes.

4. The temperature shall not exceed 89º F for warm water fish.

(c) *pH.* The pH shall be within the range of 6.0 to 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.

(d) *Other substances.* Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish or other aquatic life. Surface waters shall meet the acute and chronic criteria as set forth in or developed pursuant to ss. NR 105.05 and 105.06. Surface waters shall meet the criteria which correspond to the appropriate fish and aquatic life subcategory for the surface water, except as provided in s. NR 104.02 (3).

(e) *Temperature and dissolved oxygen for cold waters.* Streams classified as trout waters by the department of natural resources (Wisconsin Trout Streams, publication 6−3600 (80)) or as great lakes or cold water communities may not be altered from natural background temperature and dissolved oxygen levels to such an extent that trout populations are adversely affected.

1. There shall be no significant artificial increases in temperature where natural trout reproduction is to be protected.

2. Dissolved oxygen in classified trout streams shall not be artificially lowered to less than 6.0 mg/L at any time, nor shall the dissolved oxygen be lowered to less 7.0 mg/L during the spawning season.

3. The dissolved oxygen in great lakes tributaries used by stocked salmonids for spawning runs shall not be lowered below natural background during the period of habitation.

(5) STANDARDS FOR RECREATIONAL USE. A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion in determining the suitability of a surface water for recreational use.

(a) *Bacteriological guidelines.* The membrane filter fecal coliform count may not exceed 200 per 100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400 per 100 ml in more than 10% of all samples during any month.

(b) *Exceptions.* Whenever the department determines, in accordance with the procedures specified in s. NR 210.06, that wastewater disinfection is not required to protect recreational uses, the recreational use criteria and classifications as established in this subsection and in chs. NR 103 and 104 do not apply.

(6) STANDARDS FOR PUBLIC HEALTH AND WELFARE. All surface waters shall meet the human threshold and human cancer criteria specified in or developed pursuant to ss. NR 105.08 and 105.09, respectively. The applicable criteria vary depending on whether the surface water is used for public drinking water supplies and vary with the type of fish and other aquatic life subcategory. All surface waters providing public drinking water supplies or classified as cold water or warm water sport fish communities as described in sub. (3) shall meet the taste and odor criteria specified in or developed pursuant to s. NR 102.14.

(7) STANDARDS FOR WILDLIFE. All surface waters shall be classified for wildlife uses and meet the wildlife criteria specified in or developed pursuant to s. NR 105.07.

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; am. (3), Register, December, 1977, No. 264, eff. 1−1−78; renum. from NR 102.02, r. (3) (d) 1. to 3., and (5), renum. (3) (intro.) to (d) (intro.) and (e) and (4) to be (4) (intro.) to (e) and (5) and am. (4) (a), (d), (e) (intro.) and (5), cr. (6) and (7), Register, February, 1989, No. 398, eff. 3−1−89; am. (3) (intro.), (6), (7), r. (3) (a), renum. (3) (b) to (f) to be (3) (a) to (e) and am. (3) (a), Register, August, 1997, No. 500, eff. 9−1−97.

NR 102.05 Application of standards. (1) ANTIDEGRADATION. (a) No waters of the state shall be lowered in quality unless it has been affirmatively demonstrated to the department that such a change is justified as a result of necessary economic and social development, provided that no new or increased effluent interferes with or becomes injurious to any assigned uses made of or presently possible in such waters.

(b) *Classification system.* For the purposes of this subsection, all surface waters of the state, or portions thereof, shall be classified as one of the following:

1. Outstanding resource waters as listed in s. NR 102.10,
2. Exceptional resource waters as listed in s. NR 102.11,
3. Great Lakes system waters as listed in s. NR 102.12 (1),
4. Fish and aquatic life waters as described in s. NR 102.13, or
5. Waters listed in tables 3 through 8 in ss. NR 104.05 to 104.10.

(2) STREAMFLOW. Water quality standards will not be maintained under all natural occurrences of flow, temperature, or other water quality characteristics. The determination of water quality based effluent limitations or other management practices shall be based upon the following conditions except as provided in ch. NR 106 for toxic and organoleptic substances and whole effluent toxicity:

(a) The average minimum 7−day low streamflow which occurs once in 10 years (7−day Q_{10}); or,

(b) In the case of dissolved oxygen and wherever sufficient data on streamflow and temperature are available, by application of a 0.274% level of nonattainment. This is equivalent to an expected nonattainment of the dissolved oxygen criterion of one day per year.

(3) MIXING ZONES. Water quality standards shall be met at every point outside of a mixing zone. The size of the mixing zone cannot be uniformly prescribed, but shall be based on such factors as effluent quality and quantity, available dilution, temperature, current, type of outfall, channel configuration and restrictions to fish movement. For toxic and organoleptic substances with water quality criteria or secondary values specified in or developed pursuant to chs. NR 102 and 105, allowable dilution shall be determined as specified in ch. NR 106 in addition to the requirements

specified in this subsection. As a guide to the delineation of a mixing zone, the following shall be taken into consideration:

(a) Limiting mixing zones to as small an area as practicable, and conforming to the time exposure responses of aquatic life.

(b) Providing passageways in rivers for fish and other mobile aquatic organisms.

(c) Where possible, mixing zones being no larger than 25% of the cross−sectional area or volume of flow of the stream and not extending more than 50% of the width.

(d) Final acute criteria and secondary values specified in or developed pursuant to s. NR 105.05 for the fish and aquatic life subcategory for which the receiving water is classified not being exceeded at any point in the mixing zone.

(e) Mixing zones not exceeding 10% of a lake's total surface area.

(f) Mixing zones not interfering with spawning or nursery areas, migratory routes, nor mouths of tributary streams.

(g) Mixing zones not overlapping, but where they do, taking measures to prevent adverse synergistic effects.

(h) Restricting the pH to values greater than 4.0 s.u. and to values less than 11.0 s.u. at any point in the mixing zone for the protection of indigenous fish and fish food organisms.

(4) EXEMPTIONS. The thermal mixing zone provisions of this chapter are not applicable to municipal waste and water treatment plants, to vessels, or to discharges to enclosed harbors.

(5) RESOURCE MANAGEMENT EXEMPTIONS. Application of chemicals for water resource management purposes in accordance with statutory provisions is not subject to the requirements of the standards except in case of water used for public water supply.

(6) ANALYTICAL PROCEDURES. (a) The criteria in the Radiation Protection Code, s. HFS 157.44, shall apply to the disposal and permissible concentrations of radioactive substances.

(b) Methods used for analysis of samples shall be as set forth in ch. NR 219 unless alternative methods are specified by the department.

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; renum. (5) and (6) to be (6) and (7), cr. (5), Register, July, 1975, No. 235, eff. 8−1−75; r. and recr. (3), Register, August, 1981, No. 308, eff. 9−1−81; correction in (7) made under s. 13.93 (2m) (b) 7., Stats., cr. (4) (h), Register, September, 1984, No. 345, eff. 10−1−84; renum. from NR 102.03, r. (1), cr. (1) (b), renum. (2) to (7) to be (1) (a) to (6) and am. (2), (3) (intro.) and (d) and (6), Register, February, 1989, No. 398, eff. 3−1−89; am. (1) (b) 3., (3) (intro.) and (d), Register, August, 1997, No. 500, eff. 9−1−97; correction in (6) (a) made under s. 13.93 (2m) (b) 7., Stats. Register July 2006 No. 607, eff. 8−1−06.

NR 102.06 Phosphorus. In addition to the requirements established in ch. NR 217, any wastewater discharger, regardless of population, volume or type of waste discharge, or geographic location, may be required to remove excess amounts of phosphorus. Effluent limitations for total phosphorus based on surface water quality may be established where, in the best professional judgment of the department, such limitations will result in an improvement in water quality, or preserve the quality of surface waters where long−term discharges may result in impairment of water quality. Such limitations for phosphorus shall include an evaluation of the discharges from point sources, nonpoint sources, background sources, tributaries, and a consideration of a margin of safety.

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; am. Register, October, 1986, No. 370, eff. 11−1−86; renum. from NR 102.04, Register, February, 1989, No. 398, eff. 3−1−89; am. Register, November, 1992, No. 443, eff. 12−1−92.

NR 102.07 Lake Michigan and Lake Superior thermal standards. For Lake Michigan and Lake Superior the following thermal standards are established so as to minimize effects on the aquatic biota in the receiving waters.

(1) (a) Thermal discharges shall not raise the receiving water temperature more than 3ºF above the existing natural temperature at the boundary of mixing zones established in pars. (b) and (c).

(b) 1. The mixing zone for a shoreline thermal discharge shall be the area included within the perimeter of a rectangular figure extending 1,250 feet in both directions along the shoreline from the outfall and 1,250 feet into the lake.

2. The mixing zone for an offshore thermal discharge shall be the area within a 1,000−foot radius circle with its center at the point of discharge.

(c) The department may, upon request from the owner of a source of thermal discharge, adjust the boundaries of the mixing zone established in par. (b) for that source. In no case may any mixing zone so established include an area greater than 72 acres nor may it include more than 2,800 feet of shoreline.

(2) In addition to the limitation set forth in sub. (1), but excepting the Milwaukee Harbor, Port Washington Harbor and the mouth of the Fox River, thermal discharges to Lake Michigan shall not raise the temperature of the receiving waters at the boundary of the established mixing zone above the following limits:

January	45°F
February	45°
March	45°
April	55°
May	60°
June	70°
July	80°
August	80°
September	80°
October	65°
November	60°
December	50°

History: Cr. Register, September, 1973, No. 213, eff. 10−1−73; r. and recr. Register, July, 1975, No. 235, eff. 8−1−75; renum. from NR 102.05, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.08 Mississippi river thermal standards. In addition to the standards for fish and aquatic life, the monthly average of the maximum daily temperature in the Mississippi river outside the mixing zone shall not exceed the following limits:

January	40°F
February	40°
March	54°
April	65°
May	75°
June	84°
July	84°
August	84°
September	82°
October	73°
November	58°
December	48°

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; renum. from NR 102.06, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.09 Review of thermal standards. (1) Whenever the owner of any source of thermal discharges that existed on or before July 31, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(2) Any owner desiring a review pursuant to sub. (1) shall submit a demonstration to the department no later than June 30, 1976. The department shall reach a decision no later than December 31, 1976.

(3) In the event the owner fails to make a satisfactory demonstration pursuant to sub. (1), the department shall establish a compliance date for the thermal component to be achieved no later than July 1, 1979.

(4) Whenever the owner of any source of thermal discharges that commenced on or after August 1, 1975, in compliance with department guidelines and after opportunity for public hearing, can demonstrate to the satisfaction of the department that the mixing zone established pursuant to this chapter is more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the receiving water, the department may:

(a) Impose a mixing zone with respect to such thermal discharge that will assure the protection and propagation of such a population, or

(b) Exempt such thermal discharge from the thermal requirements of this chapter provided this exemption will not endanger the propagation of such a population.

(5) In the event an owner fails to make a satisfactory demonstration pursuant to sub. (4), the discharge shall be in compliance with the thermal requirements of this chapter upon commencement of the discharge.

(6) The department may require the reduction of thermal discharges or the size and configuration of a mixing zone if it finds that environmental damage is imminent or existent.

History: Cr. Register, July, 1975, No. 235, eff. 8−1−75; am. Register, February, 1977, No. 254, eff. 3−1−77; renum. from NR 102.07, Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.10 Outstanding resource waters. (1) The following surface waters are designated as outstanding resource waters:

(a) *National wild and scenic rivers.* All rivers designated under the national wild and scenic rivers act, as amended, 16 USC 1271 to 1287, except those portions flowing through Indian reservations, including:

1. St. Croix river between the northern boundary of the Hudson city limits and the St. Croix flowage dam in Douglas county except that the portion of the St. Croix river from the northern boundary of the St. Croix Falls city limits to a distance one mile below the STH 243 bridge at Osceola shall be classified exceptional resource waters under s. NR 102.11.

2. Namekagon river between its confluence with the St. Croix river and the outlet of Lake Namekagon in Bayfield county.

(b) *State wild and scenic rivers.* All state wild and scenic rivers designated under s. 30.26, Stats., including:

1. Pike river in Marinette county.

2. Pine river and its tributary Popple river in Florence and Forest counties.

(c) Wolf river upstream of the northern Menominee county line.

(d) The following Class I trout waters:

1. Adams county — Big Roche−a−Cri creek

2. Barron county — Yellow river

3. Bayfield county — Flag river, Sioux river

4. Burnett county — North Fork Clam river, South Fork Clam river

5. Chippewa county — Duncan creek, Elk creek, McCann creek

6. Dane county — Black Earth creek above the easternmost CTY KP crossing

7. Door county — Logan creek

8. Douglas county — Bois Brule river and its tributaries including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth

9. Dunn county — Elk creek

10. Florence county — Brule river including Montagne creek and Riley creek tributaries; tributaries to the Pine−Popple rivers including Chipmunk, Cody, Haley, Haymarsh, LaMontagne, Lepage, Lunds, Martin, Olson, Patten, Pine, Riley, Rock, Simpson, Seven Mile, Wakefield and Woods creeks; Little Popple river

11. Forest county — Brule river

13. Kewaunee county — Little Scarboro creek

14. Langlade county — Clearwater creek, Drew creek, Evergreen river, South Branch Oconto river

15. Lincoln county — Center fork New Wood creek, Little Pine creek, Prairie river

16. Marathon county — Holt creek, Spranger creek, Plover river

17. Marinette county — Cedarville creek, Otter creek, Holmes creek, East Thunder creek, North fork Thunder river, Eagle creek, Little Eagle creek, Plumadore creek, Meadow brook, Upper Middle Inlet creek, Middle Inlet creek, Wausaukee river, Little Wausaukee creek, Coldwater brook, Medicine brook, South Branch Miscauno river, Miscauno river, Swede John creek, South Branch Pemebonwon river, Spikehorn creek, Silver creek, Little Silver creek, Sullivan creek; tributaries to the Pike river including Little South Branch Pike river, Camp D creek, Camp F creek, Camp 9 creek, Cole creek, Glen creek, Harvey creek, North Branch Harvey creek, South Branch Harvey creek, Hemlock creek, Holloway creek, K.C. creek, Little Harvey creek, Lost creek, MacIntire creek, Phillips creek, Sackerson creek, Shinns creek, Sidney creek, Smeesters creek, Springdale brook, Whiskey creek

18. Marquette county — Chaffee creek, Lawrence creek, Tagatz creek

19. Monroe county — Rullands Coulee creek

20. Oconto county — First South Branch Oconto river, Second South Branch Oconto river, South Branch Oconto river, Hills Pond creek

21. Polk county — Clam river, McKenzie creek

22. Portage county — Emmons creek, Radley creek, Sannes creek, Tomorrow river, Trout creek

23. Richland county — Camp creek

24. Sheboygan county — Nichols creek

25. St. Croix county — Kinnickinnic river above STH "35"

26. Vernon county — Rullands Coulee creek, Spring Coulee creek, Timber Coulee creek

27. Vilas county — Deerskin river, Plum creek

28. Walworth county — Bluff creek, Potawatomi creek, Van Slyke creek

29. Waupaca county — Emmons creek, Griffin creek, Jackson creek, Leers creek, Peterson creek, Radley creek, Sannes creek, Spaulding creek, Trout creek, Whitcomb creek, North Branch Little Wolf river

30. Waushara county — Willow creek north of Redgranite, Mecan river north of Richford, Little Pine creek, West Branch White river

(e) The following Class II trout waters:

1. Barron county — Yellow river

2. Burnett county — North Fork Clam river

3. Forest county — Brule river, Peshtigo river

4. Grant county — Big Green river, Castle Rock creek
5. Marinette county — Peshtigo river
6. Polk county — McKenzie creek
7. Vilas county — Plum creek

(f) The following cold or warm water streams and rivers or portions thereof:

1d.	Ashland	Bad River	SEG 1: Origin to Outfall in Mellen at NW¼SW¼ S6 T44N R2W
		Brunsweiler River	SEG 1: Origin to Inlet of Spider Lake
			SEG 2: Outlet of Moquah Lake to Inlet of Mineral Lake
			SEG 3: Outlet of Mineral Lake to Inlet of Beaverdam Lake
			SEG 4: Outlet of Beaverdam Lake (at the dam) to the Bad River Indian Reservation Boundary
1h.	Ashland & Bayfield	Marengo River	SEG 1: Origin to Inlet of Marengo Lake
			SEG 2: Outlet of Marengo Lake to Bad River Indian Reservation Boundary
1p.	Ashland & Sawyer	E. Fork Chippewa River	SEG1: T42N R1E S17/18 Line to Ashland County Highway "N" in Glidden
			SEG 6: Outlet of Barker Lake to Confluence with Chippewa Flowage
			SEG 3: Outlet of Pelican Lake to Inlet of Blaisdell Lake
			SEG 4: Outlet of Blaisdell Lake to Inlet of Hunter Lake
			SEG 5: Outlet of Hunter Lake to Inlet of Barker Lake
1t.	Barron	Engle Creek	Class I & II Portions
		Hickey Creek	Class I & II Portions
		Red Cedar River	SEG 1: Outlet of Red Cedar Lake to Inlet of Rice Lake
		Rock Creek	SEG 2: All within Barron County
		Upper Pine Creek	Above Dallas Flowage
2.	Bayfield	Bark River	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth
		Big Brook	All
		Cranberry River & Tribs.	All−Class I Portion including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		East Fork Iron River & Tribs.	All−Class I Portion
		East Fork White River	All−Class I Portion
		Eighteen Mile Cr. & Tribs.	All−Class I Portion
		Fish Creek (Main)	All including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Long Lake Branch & Tribs.	From below Drummond Lake to White River
			All−Class I Portions
		No. Fork Fish Creek & Tribs.	All−Class I & II Portions
		Onion River & Tribs.	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Pikes Creek & Tribs.	All−Class I Portion including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.

		Sioux River & Tribs.	All−Class I & II Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		So. Fork White River	All−Class I Portion
		Thompson Creek	All−Class I Portion
		Twenty Mile Creek	All−Class I & II Portions
		White River	All−Class I Portion
		Whittlesey Creek & Tribs.	All−Class I Portions including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
2d.	Bayfield & Ashland	Beartrap Creek	SEG 1: Origin to Bad River Indian Reservation Boundary
2h.	Bayfield, Ashland & Sawyer	West Fork Chippewa River	SEG 1: Origin (Outlet of Chippewa Lake) to Inlet of Day Lake
			SEG 2: Outlet of Day Lake to Inlet of Upper Clam Lake
			SEG 3: Outlet of Upper Clam Lake to Inlet of Lower Clam Lake
			SEG 4: Outlet of Lower Clam Lake to Inlet of Cattail Lake
			SEG 5: Outlet of Cattail Lake to Inlet of Meadow Lake
			SEG 6: Outlet of Meadow Lake to Inlet of Partridge Crop Lake
			SEG 7: Outlet of Partridge Crop Lake to Inlet of Moose Lake
			SEG 8: Outlet of Moose Lake to Sawyer County Highway “B”
2p.	Bayfield, Sawyer, Washburn, Douglas & Burnett	Totagatic River	SEG 1: Origin (Confluence of West Fork Totagatic River and East Fork Totagatic River) to Inlet of Nelson Lake
			SEG 2: Outlet of Totagatic Flowage to Inlet of Colton Flowage
			SEG 3: Outlet of Colton Flowage to Inlet of Minong Flowage
			SEG 4: Outlet of Minong Flowage to Confluence with Namekagon River
3.	Burnett	North Fork Clam River	County Highway “H” to Confluence with Clam River
		Tributaries to the N. & S. Forks of the Clam River	All−Class I & II Portions
4.	Dane	Mt. Vernon Creek	All−Class I Portion
5.	Door	Mink River	All
5m.	Douglas	Amnicon River	SEG 1: Origin (Outlet of Amnicon Lake) to Inlet of Lyman Lake
			SEG 2: Outlet of Lyman Lake to mouth at Lake Superior, including the waters of Lake Superior within a ¼ mile semi−circular arc centered at the middle of the river mouth.
		Moose River	All
		Spruce River	All
		St. Croix River	SEG 1: Outlet of Upper St. Croix Lake to Inlet of St. Croix Flowage
6.	Forest	Allen Creek	All
		Brule Creek	All
		Elvoy Creek	All
		Jones Creek	Class I & II portions
		North Otter Creek	All

Unofficial Text (See Printed Volume). Current through date and Register shown on Title Page.

6m.	Forest & Langlade	Swamp Creek	SEG 1: Outlet of Lake Lucerne to Mole Lake Indian Reservation Boundary
			SEG 3: All below Mole Lake Indian Reservation Boundary to Confluence of Wolf River
7.	Grant	Little Green River	All
7m.	Iron & Ashland	Tyler Forks	SEG 1: Origin in Iron County to Bad River Indian Reservation Eastern Boundary in Ashland County
			SEG 3: From Bad River Indian Reservation Southern Boundary to Confluence with Bad River
		Potato River	SEG 1: Origin to Bad River Indian Reservation Boundary
8.	Iron, Ashland & Price	Flambeau River	SEG 1: Turtle−Flambeau Flowage (Outlet @ Turtle−Flambeau Dam) to Inlet of Upper Park Falls Flowage
		No. Fork Flambeau River	From Turtle−Flambeau Flowage Dam downstream to Park Falls
9.	LaCrosse	Berge Coulee Creek	All
10.	Langlade	Elton Creek	Class I Portion
		Little Evergreen Creek	All
		Mayking Creek	All
		Michelson Creek	All
		Mid Branch Embarrass River	Class I Portion
10m.	Lincoln	New Wood River	Origin (T33N R4E S14) to Confluence with Wisconsin River
11.	Marathon	Falstad Creek	Class II Portion
		So. Branch Embarrass River	Class I Portion
12.	Marinette	No. Branch Beaver Creek	Entire River & tributaries
13.	Oneida	Noisy Creek	Class II Portion
		Squirrel River	Outlet of Squirrel Lake to Confluence with Tomahawk River
		Tomahawk River	SEG 2: Outlet of Willow Flowage Dam to Inlet of Lake Nokomis
14.	Pierce	Kinnickinnic River	From Powell Dam to St. Croix River
15.	Polk	Sand Creek & Tribs	All−Class I & II Portions
15e.	Polk & Burnett	Clam River	SEG 1: Outlet of Clam Falls Flowage to Inlet of Clam Lake
			SEG 2: Outlet of Lower Clam Lake to Section Line @ T39N R16W S21/22
15m.	Price	Elk River	SEG 1: Headwaters to Inlet of Musser Lake
	Price & Lincoln	Spirit River	Outlet of Spirit Lake to Inlet of Spirit River Flowage
16.	Price, Rusk & Sawyer	So. Fork Flambeau River	All−Round L. Dam downstream to Jxn with No. Fork Flambeau R.
17.	Richland	Elk Creek	All
18.	Rusk	Devils Creek	All−Class I & II Portions
		Soft Maple Creek	SEG 1: Origin to Rusk County Highway “F”
		So. Fork Main Creek	Class I & II Portions (T35N R3W S28 downstream to T34N R4W S11)
		Swift Creek	Outlet of Island Lake to Inlet of Fireside Lake
19.	Sauk	Otter Creek	From headwaters to southern section line of T11N R6E S33
		Parfrey’s Glen	From headwaters to CTH DL
20.	Sawyer	Benson Creek	All−Class I Portion

		Couderay River	SEG 1: Origin at Outlet of Billy Boy Flowage to Inlet of Grimh Flowage (Including Waters within Lac Courte Oreilles Indian Reservation)
		Eddy Creek	All−Class I Portion
		Grindstone Creek	All−Class I Portion
		Knuteson Creek	SEG 1: Outlet of Wise Lake to Inlet of Knuteson Lake
			SEG 2: Outlet of Knuteson Lake to Inlet of Lake Chetek
		Little Weirgor Creek & Tribs	All−Class I & II Portions
		McDermott Creek	All
		Mosquito Brook	All−Class I Portion
		Teal River	Outlet of Teal Lake to Confluence with West Fork Chippewa River
20m.	Sawyer & Rusk	Thornapple River	SEG 1: Origin to Rusk County Highway "J"
		Chippewa River	SEG 1: Dam at Chippewa Flowage to Inlet of Radisson Flowage (T38N R7W S13)
21.	Shawano	Middle Br. Embarrass R.	Origin to but not including Homme Pond
		No. Br. Embarrass R.	Origin to CTH J
		So. Br. Embarrass R.	Origin to but not including Tigerton Pond
21g.	Taylor & Chippewa	Yellow River	SEG 1: Confluence with South Fork Yellow River to Inlet of Chequamegon Waters Flowage
			SEG 2: Outlet of Chequamegon Waters Flowage (at Miller Dam) to State Highway 64/73
21r.	Taylor & Price	Silver Creek	SEG 1: Origin to Westboro Sanitary District Outfall
22.	Vilas	Allequash Springs	Class I & II Portions
		Brule Creek	All
		East Br. Blackjack Cr.	All
		Elvoy Creek & Springs	Class I & II Portions
		Manitowish River	SEG 1: Adjacent to Dam Road Downstream to Inlet of Boulder Lake
			SEG 2: Outlet of Boulder Lake to Inlet of Island Lake
		Mishonagon Creek	Class I & II Portions
		Siphon Creek	All
		Spring Meadow Creek	Class I Portion
		Tamarack Creek	All
		Trout River	SEG 1: Outlet of Trout Lake to Lac Du Flambeau Indian Reservation Eastern Boundary
22m.	Vilas & Oneida	Wisconsin River	SEG 1: Orgin (Outlet of Lac Vieux Desert) to Inlet of Watersmeet Lake
23.	Washburn	Beaver Brook	All−Class I Portion
		Sawyer Creek	All−Class I & II Portions
		So. Fork Bean Brook	All−Class I Portion
		Stuntz Brook	Origin to Confluence with Namekagon River
23m.	Washburn & Barron	Bear Creek	SEG 1: Outlet of Kekegama Lake to Inlet of Bear Lake
			SEG 2: Outlet of Bear Lake to Inlet at Stump Lake

(1m) The following lakes are designated as outstanding resource waters:

1.	Ashland	Bad River Slough
		Kakagon Slough
		Lake Superior within ¼ mile of the shoreline of the islands within the Apostle Island National Lakeshore
2.	Barron	Bear Lake (T36N R12W S2)
		Red Cedar Lake
		Sand Lake
		Silver Lake
3.	Bayfield	Bark Bay Slough
		Diamond Lake
		Lake Superior within ¼ mile of the shoreline of the islands within the Apostle Island National Lakeshore
		Middle Eau Claire Lake

		Namekagon Lake
		Owen Lake
		Pike Chain of Lakes (Pike, Millicent, Buskey Bay, Hart, Twin Bear, Eagle, Flynn and Hildur Lakes)
		Star Lake
		Upper Eau Claire Lake
4.	Burnett	Big Mckenzie Lake
		Big Sand Lake
		Sand Lake (T40N R15W S25)
5.	Columbia	Crystal Lake
6.	Douglas	Bond Lake
		Lower Eau Claire Lake
		Nebagamon Lake
		St. Croix (Gordon) Flowage
		Upper St. Croix Lake
		Whitefish Lake (Bardon)
7.	Florence	Edith Lake
		Keyes Lake
		Lost Lake
		Perch Lake
		Riley Lake, South
8.	Forest	Butternut Lake
		Franklin Lake
		Lucerne Lake (Stone)
		Metonga Lake
9.	Iron	Catherine Lake
		Cedar Lake
		Gile Flowage
		Hewitt Lake
		Owl Lake
		Trude Lake
		Turtle−Flambeau Flowage
9m.	Marinette	Caldron Falls Flowage
10.	Oconto	Archibald Lake
		Bass Lake (T32N R15E S9)
		Bear Paw Lake
		Boot Lake
		Chain Lake
11.	Oneida	Big Carr Lake
		Clear Lake (T39N R7E S16)
		Little Tomahawk Lake
		Tomahawk Lake
		Two Sisters Lake
		Willow Flowage
12.	Polk	Pipe Lake
13.	Price	Cochram Lake
		Tucker Lake
14.	Rusk	Bass Lake (T34N R9W S16)
		Fish Lake
		Island Chains of Lakes (Chain, Clear, McMann, and Island Lakes)
		Three Lakes No. 1 (T36N R9W S25)
15.	St. Croix	Bass Lake (T30N R19W S23)
		Perch Lake
16.	Sauk	Devils Lake
17.	Sawyer	Barker Lake
		Blaisdell Lake
		Camp Smith Lake
		Evergreen Lake
		Grindstone Lake
		Lac Court Oreilles
		Lake Chippewa (Chippewa Flowage)
		Nelson Lake
		Osgood Lake
		Perch Lake (T42N R6W S25)
		Round Lake (Big Round)
		Sand Lake
		Spider Lake
		Teal Lake
		Whitefish Lake
18.	Vilas	Black Oak Lake
		Crab Lake
		Crystal Lake (T41N R7E S27)
		Lac Vieux Desert
		North Twin Lake
		Pallette Lake (Clear)
		Partridge Lake
		Plum Lake
		South Twin Lake
		Star Lake
		Stormy Lake
		Trout Lake
		White Sand Lake (T24N R7E S26)
19.	Walworth	Lulu Lake
20.	Washburn	Bass Lake (T40N R10W S17)
		Long Lake
		Middle McKenzie Lake
		Shell Lake
		Stone Lake (T39N R10W S24)
21.	Waukesha	Spring Lake (T5N R18E S9)
22.	Waupaca	Graham Lake (Nelson)
		North Lake
23.	Waushara	Gilbert Lake
		Lucerne Lake (Egans)
		Norwegian Lake
		Pine Lake (Springwater)

(2) The waters in sub. (1) and (1m) may not be lowered in quality.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the outstanding resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (1) (d), cr. (1) (e), Register, July, 1989, No. 403, eff. 8−1−89; cr. (1) (f) and (1m), am. (2), Register, May, 1993, No. 449, eff. 6−1−93; am. (1m) 6., 9. and 11., cr. (1m) 9m., Register, February, 1998, No. 506, eff. 3−1−98; CR 05−089: am. (1) (d) 8., (f) 2., (1m) 1. and 3. Register July 2006 No. 607, eff. 8−1−06; CR 05−105: renum. (1) (f) 1. to be 1t. and am., cr. (1) (f) 1d., 1h., 1p., 2d., 2h., 2p., 5m., 6m.,. 7m., 10m., 15e., 15m., 15s., 20m., 21g., 21r., 22m., and 23m., am. (1) (f) 3., 8. 13., 18., 20., 22., and 23., Register November 2006 No. 611, eff. 12−1−06; **reprinted to correct error in (1) (d) 6. Register March 2008 No. 627.**

NR 102.11 Exceptional resource waters. (1) Surface waters which provide valuable fisheries, hydrologically or geologically unique features, outstanding recreational opportunities, unique environmental settings, and which are not significantly impacted by human activities may be classified as exceptional resource waters. All the following surface waters are designated as exceptional resource waters:

(a) Class I trout waters listed in Wisconsin Trout Streams publication 6−3600 (80) that are not listed in s. NR 102.10.

(b) Other Class I trout waters:

1. Abraham Coulee creek in section 29, township 20 north, range 8 west from its headwaters to the Abraham Coulee road bridge in Trempealeau county.

2. Bear creek originating in section 3, township 20 north, range 7 west in Trempealeau county.

3. Biser creek originating in section 19, township 12 north, range 3 west in Sauk county.

4. Bostwick creek from CTH M upstream 6.2 miles to the headwaters in LaCrosse county.

5. Bufton Hollow creek originating in section 23, township 12 north, range 2 west in Richland county.

6. Columbus creek originating in section 29, township 20 north, range 6 west in Jackson county.

7. Dutch creek originating in section 12, township 19 north, range 8 west in Trempealeau county.

8. Joe Coulee creek originating in section 1, township 20 north, range 7 west in Trempealeau county.

9. Little creek originating in section 21, township 20 north, range 6 west in Jackson county.

10. Marble creek originating in section 30, township 10 north, range 3 east in Sauk county.

11. Marshall creek originating in section 4, township 11 north, range 1 west in Richland county.

12. Martin creek originating in section 22, township 6 north, range 2 east in Iowa county.

13. South Bear creek originating in section 2, township 12 north, range 2 west in Richland county.

14. Spring brook downstream from CTH Y south of Antigo to its confluence with the Eau Claire river in Marathon county.

15. Spring Coulee creek from the headwaters to SE 1/4, SE 1/4, section 33, township 16 north, range 1 east in Monroe county.

16. Unnamed creek 2−12 originating in section 36, township 20 north, range 7 west of Trempealeau county.

17. Unnamed creek 4−9 originating in section 4, township 11 north, range 1 west in Richland county.

18. Unnamed creek 5−6 originating in section 6, township 19 north, range 8 west in Trempealeau county.

19. Unnamed creek 7−4 originating in section 6, township 20 north, range 7 west in Trempealeau county.

20. Unnamed creek 8−9 originating in section 5, township 20 north, range 7 west in Trempealeau county.

21. Unnamed creek 8−14 originating in section 1, township 20 north, range 8 west in Trempealeau county.

22. Unnamed creek 9−13 originating in section 4, township 20 north, range 6 west in Jackson county.

23. Unnamed creek 10−8 originating in section 10, township 11 north, range 1 west in Richland county.

24. Unnamed creek 10−10 originating in section 14, township 20 north, range 6 west in Jackson county.

25. Unnamed creek 11−4 originating in section 1, township 20 north, range 7 west in Trempealeau county.

26. Unnamed creek 11−7 originating in section 2, township 20 north, range 7 west in Trempealeau county.

27. Unnamed creek 13−3a originating in section 19, township 20 north, range 6 west in Trempealeau county.

28. Unnamed creek 13−3b originating in section 6, township 20 north, range 6 west in Trempealeau county.

29. Unnamed creek 15−13 originating in section 1, township 20 north, range 8 west in Trempealeau county.

30. Unnamed creek 15−4 originating in section 3, township 20 north, range 6 west in Trempealeau county.

31. Unnamed creek 16−2 originating in section 22, township 20 north, range 6 west in Jackson county.

32. Unnamed creek 17−5 originating in SE 1/4, section 5, township 20 north, range 6 west in Jackson county.

33. Unnamed creek 24−3a originating in section 24, township 11 north, range 1 west in Richland county.

34. Unnamed creek 26−7 originating in section 2, township 20 north, range 6 west in Jackson county.

35. Unnamed creek 34−2 originating in section 17, township 20 north, range 8 west in Trempealeau county.

36. Unnamed creek 34−15 originating in section 27, township 20 north, range 7 west in Trempealeau county.

37. Unnamed stream originating in section 29, township 10 north, range 3 east in Sauk county.

38. Washington Coulee creek originating in section 29, township 20 north, range 6 west in Jackson county.

(c) The following Class II trout waters:

1. Ashland county — White river above the Bad River Indian reservation

2. Bayfield county — White river

3. Dane county — Mt. Vernon creek

4. Forest county — North Branch Oconto river

5. Grant county — Blue river

6. Iowa county — Blue river

7. Langlade county — Prairie river, South Branch Oconto river

8. Lincoln county — Prairie river

9. Marquette county — Mecan river

10. Oconto county — North Branch Oconto river, South Branch Oconto river

11. Pierce county — Rush river

12. Portage county — Tomorrow river

13. Richland county — Willow creek

14. St. Croix county — Willow river, Race Branch

15. Waushara county — Mecan river

(d) The following cold or warm water streams and rivers or portions thereof:

1g.	Ashland	Bad River	SEG 2: Outfall in Mellen at NE¼SW¼ S6 T44N R2W to Bad River Indian Reservation Boundary
1r.	Ashland & Sawyer	East Fork Chippewa River	SEG 2: Ashland County Highway ”N” to Confluence of Rocky Run Creek (Includes Glidden POTW)
1t.	Barron	Brill River	All−Class II Portion
2.	Crawford	Copper Creek	All
		Plum Creek	All

		Sugar Creek	From headwaters to T10N R6W S10
		Tainter Creek	From Vernon County Line to CTH B
3.	Dane	Blue Mounds Branch	All
		Deer Creek	All
		Dunlap Creek	All
		Elvers Creek (Bohn Cr.)	All
		Flynn Creek	All
		Fryes Feeder Creek	All
		Garfoot Creek	All
		Milum Creek	All
		Rutland Branch	All
		Ryan Creek	All
		Schalpbach Creek	All
		Sixmile Creek	All
		Spring Creek (Lodi)	All
4.	Dane, Sauk, Iowa, Grant, Richland, Crawford	Wisconsin River	From below Prairie du Sac to Prairie du Chien
5.	Dane & Green	Little Sugar River	Above New Glarus
		Story Creek (Tipperary)	All, originating in T5N R8E S36
		Sugar Creek	All
6.	Dunn	Sand Creek	From Chippewa County Line to mouth
7.	Eau Claire	Lowes Creek	From Hwy 37 & 85 upstream to headwaters
8.	Fond du Lac	Feldner's Creek	From headquarters to Mischo's Millpond
		Lake Fifteen Creek	Entire Creek above & below Lake Fifteen
9.	Forest	Armstrong Creek	All
		Middle Br. Peshtigo R.	All
		North Br. Peshtigo R.	All
		North Br. Popple R.	All
		West Br. Armstrong Creek	Class II Portion
10.	Grant	Doc Smith Branch	All
		Little Platte River	From Arthur downstream to Platte River
11.	Grant & Iowa	Big Spring Branch	From Springhead to Blue River
12.	Green	Burgy Creek	All
		Gill Creek	All
		Hefty Creek, North Branch	All
		Hefty Cr., Center Branch	All
		Liberty Creek	All
		Norwegian Creek	All
		Richland Creek	All
		Ross Crossing	All
		Sylvester Creek	All
		Spring Valley Creek	All
		Ward Creek	All
13.	Green & Rock	Allen Creek	Below Evansville
14.	Iowa	Harker−Lee−Martin System	From headwaters to T6N R2ES10
15.	Iron	Maintowish River	All
15m.	Iron & Ashland	Vaughn Creek	SEG 1: Origin to Bad River Indian Reservation Boundary
16.	Jackson	Trempealeau River	From STH 95 at Hixton to CTHP at Taylor
17.	Jefferson	Allen Creek	All
18.	Kewaunee	Casco Creek	From T24N R24E S19 downstream of Rock Ledge to Kewaunee River
19.	La Crosse	Bostwick Creek	From headwaters to County Hwy 'O'
		Coon Creek	All
		Dutch Creek	From headwaters to Russian Coulee Road (section 8)
20.	Lafayette	Galena River	From headwaters to Buncombe Road
21.	Langlade	East Br. Eau Claire R.	From STH 64 upstream to firelane crossing in T33N R11E S35 SW1/4
		Hunting River	From Fitzgerald Dam Road downstream to T33N R11E S1
22.	Lincoln	North Br. Prairie River	From headwaters to CTHJ to T33N R8E
		Silver Creek	All
23.	Manitowoc	Branch River	All
24.	Monroe	Big Creek	From headwaters to Acorn Rd (S7)
		Farmers Valley Creek & Tribs	From headwaters to I−90 (S19)

		Soper Creek	All
25.	Oneida	Bearskin Creek	From Tomahawk River to Little Bearskin Lake
25m.	Oneida & Lincoln	Wisconsin River	SEG 2: Hat Rapids Dam to Lincoln County A crossing
			SEG 4: Grandfather Dam to Inlet of Alexander Lake
26.	Pierce	Big River	Class I Portion
		Cady Creek	From CTH P upstream
		Trimbelle River	All
26c.	Polk & Burnett	Clam River	SEG 3: Section Line @ T39N R16W S21/22 to Inlet of Clam River Flowage
			SEG 4: Outlet of Clam River Flowage to Confluence with St. Croix River
26g.	Price	North Fork Jump River	SEG 1: Origin (outlet of Cranberry Lake) to Inlet of Spring Creek Flowage
			SEG 2: Outlet of Spring Creek Flowage to Confluence with South Fork Jump River
26n.	Price, Rusk & Taylor	Jump River	SEG 1: Confluence of the North Fork Jump River and South Fork Jump River to the Village of Jump River
26r.	Price, Sawyer, Rusk	Flambeau River	SEG 2: Crowley Dam to Inlet of Big Falls Flowage
26w.	Price & Taylor	South Fork Jump River	Origin to Confluence with North Fork Jump River
27.	Richland	Babb Hollow	All−Trib to Mill Creek
		Hanzel Creek (Hansell)	All−Trib to Melancthon Cr.
		Melancthon Creek	Class II Section
		Coulter Hollow Creek	All−Trib to Mill Creek
		E. Branch Mill Creek	All
		Happy Hollow Creek	All−Trib to Willow Creek
		Higgins Creek	All−Trib to Mill Creek
		Hood Hollow Creek	All−Trib to Mill Creek
		Jacquish Hollow Creek	All−Trib to Willow Creek
		Kepler Branch	All−Trib to Mill Creek
		Mill Creek	From headwaters to above Boaz
		Miller Branch	All−Trib to Mill Creek
		Pine Valley Creek	All−Trib to Mill Creek
		Ryan Hollow	All−Trib to West Branch Mill Creek
		Wheat Hollow Creek	All
		W. Branch Mill Creek	All
28.	Rock	Bass Creek	All
		East Fork Raccoon Cr.	All
		Little Turtle Creek	All
		Raccoon Creek	All
		Spring Brook	All
		Turtle Creek	All
		Unnamed Creek T2N R14E S31	All
29.	Rusk	Big Weirgor Creek	All−Class III Portion
		Main Creek	Rusk County Highway P to Inlet of Holcombe Flowage
		Soft Maple Creek	SEG 2: Rusk County Highway “F” to Confluence with Chippewa River
30.	Rusk, Taylor & Chippewa	Jump River	From Village of Jump River downstream to Holcombe Flowage
31.	Sauk	Beaver Creek (Trib to Dell Creek)	All
		Camels Creek (Trib to Dell Creek)	All
		Dell Creek	All
31m.	Sawyer	Couderay River	SEG 2: Dam at Grimh Flowage to Confluence with Chippewa River
32.	Shawano	Kroenke Creek	Class II Portion
		Red River	From Lower Red Lake Dam to Wolf River
		West Br. Red River	Class II Portion

33.	Sheboygan	Ben Nutt Creek	Class II Portion to Junction with Mill Creek
34.	St. Croix	Apple River	From NSP plant below CTH I to Mouth
		Cady Creek	All
		Willow River	Extend Class II Portion into Delta in Lake Mallileau
35.	St. Croix & Pierce	St. Croix River	From No. Boundary of Hudson City limits to the river mouth in Pierce Co.
35m.	Taylor & Price	Silver Creek	SEG 2: Westboro Sanitary District Outfall to Confluence with South Fork Jump River
36.	Trempealeau	Buffalo River	From Hwy 53 to Strum Pond
37.	Vernon	Bishop Branch	All
		Cheyenne Valley Creek	All
		Coon Creek	From La Crosse county line to Chaseburg
		Frohock Valley Creek	All
		Hornby Creek	All
		Reads Creek	All
		Tainter Creek	All
38.	Vilas	Manitowish River	From Rest Lake Dam downstream to Iron County line
38m.	Vilas & Oneida	Wisconsin River	SEG 2: State Highway 70 to Inlet at Rainbow Flowage (Oneida County Line)
			SEG 3: Outlet of Rainbow Flowage (Oneida County Highway "D" to Inlet of Rhinelander Flowage (T37N R8E S8 SE¼NE¼)
39.	Washington	E. Branch Milwaukee R.	From Long Lake outlet to STH 28
40.	Waukesha	Genesee Creek	Above STH 59
		Mukwonago River	From Eagle Springs Lake to Upper Phantom Lake
		Oconomowoc River	From below North Lake to Okauchee Lake
41.	Waupaca	Blake Brook & Branches	Class II Portion
		Little Wolf River	From junction with Wolf River upstream to Manawa Dam
		Waupaca River	Class II portion
42.	Waupaca & Shawano	Embarrass River	From Wolf River upstream to dam at Pella
43.	Waushara	Lower Pine River	From below Wild Rose Mill pond to dam at Poy Sippi

(2) The waters identified in sub. (1) may not be lowered in quality except as provided in ch. NR 207.

(3) Surface waters, or portions thereof, may be added to, or deleted from, the exceptional resource waters designation through the rule making process under the provisions of ch. 227, Stats., and s. NR 2.03.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; cr. (1) (c), Register, July, 1989, No. 403, eff. 8−1−89; cr. (1) (d), Register, May, 1993, No. 449, eff. 6−1−93;CR 05−105: renum. (1) (d) 1. to be 1t., cr. 1g., 1r., 15m., 25m., 26c., 26n., 26r., 26w., 31m., 35m., and 38m., am. 29., Register November 2006 No. 611, eff. 12−1−06.

NR 102.12 Great Lakes system. (1) The Great Lakes system includes all the surface waters within the drainage basin of the Great Lakes.

(2) For the purpose of administering ch. NR 207 and consistent with chs. NR 105 and 106, the waters identified in sub. (1) are to be protected from the impacts of persistent, bioaccumulating toxic substances by avoiding or limiting to the maximum extent practicable increases in these substances.

(3) The waters of the Lake Superior basin shall be managed to prevent any new or increased discharges of the following pollutants: DDT, DDE and metabolites, chlordane, toxaphene, hexachlorobenzene, 2,3,7,8 TCDD, octachlorostyrene, mercury and PCB's. For purposes of administering ch. NR 207, new or increased discharges of these pollutants shall be prohibited unless the applicant certifies at time of application, that the new or increased discharge is necessary after utilization of best technology in process or control using waste minimization, pollution prevention, municipal pretreatment programs, material substitution or other means of commercially available technologies which have demonstrated capability for similar applications.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; r. and recr. (1), am. (2), Register, August, 1997, No. 500, eff. 9−1−97; CR 05−089: cr. (3) Register July 2006 No. 607, eff. 8−1−06.

NR 102.13 Fish and aquatic life waters. All surface waters not included in s. NR 102.05 (1) (b) 1., 2., 3. or 5. are fish and aquatic life waters.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.

NR 102.14 Taste and odor criteria. (1) At certain concentrations, substances may not be toxic to humans, but may impart undesirable taste or odor to water or aquatic organisms ingested by humans. The taste and odor criterion is derived to prevent substances from concentrating in surface waters or accumulating in aquatic organisms to a level which results in undesirable tastes or odors to human consumers.

(2) The taste and odor criterion is derived as follows:

(a) For substances which impart tastes and odors to waters, the taste and odor criterion shall equal that threshold concentration (TC_w) below which objectionable tastes or odors to human con-

sumers do not occur. Threshold concentrations for substances imparting tastes and odors to water are listed in Table 1.

Table 1
Threshold Concentrations (TC_w) for Substances Causing Taste and Odor in Water

Substance	Threshold Concentration (ug/L)1
Acenaphthene	20
Chlorobenzene	20
2−Chlorophenol	0.1
3−Chlorophenol	0.1
4−Chlorophenol	0.1
Copper	1000
2,3−Dichlorophenol	0.04
2,4−Dichlorophenol	0.3
2,5−Dichlorophenol	0.5
2,6−Dichlorophenol	0.2
3,4−Dichlorophenol	0.3
2,4−Dimethylphenol	400
Hexachlorocyclopentadiene	1
2−Methyl−4−Chlorophenol	1800
3−Methyl−4−Chlorophenol	3000
3−Methyl−6−Chlorophenol	20
Nitrobenzene	30
Pentachlorophenol	30
Phenol	300
2,3,4,6−Tetrachlorophenol	1
2,4,5−Trichlorophenol	1
2,4,6−Trichlorophenol	2
Zinc	5000

[1] A threshold concentration expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the threshold concentration by 1000.

(b) For substances which impart tastes or odors to aquatic organisms, the taste and odor criterion shall be calculated as follows:

$$TOC = \frac{TC^1}{BAF}$$

Where:
- TOC = Taste and odor criterion in milligrams per liter (mg/L).
- TC = Threshold concentration in milligrams of substance per kilogram of wet tissue weight (mg/kg) of the aquatic organism being consumed below which undesirable taste and odor is not detectable to human consumers as derived in par. (d).
- BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(c) The lower of the taste and odor criteria derived as specified in pars. (a) and (b) is applicable to surface waters classified as public water supplies. The taste and odor criteria derived as specified in par. (b) are applicable to cold water and warm water sport fish communities.

(d) Threshold concentrations for substances imparting tastes or odors to water (TC_w) other than those listed in Table 1 and threshold concentrations for substances imparting tastes or odors to aquatic organisms (TC_f) shall be selected by the department using its best professional judgment.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (2) (b) and (c), Register, August, 1997, No. 500, eff. 9−1−97.

APPENDIX 4.3.7.1-2 Chapter NR 105 Surface Water Quality Criteria and Secondary Values for Toxic Substances

Chapter NR 105

SURFACE WATER QUALITY CRITERIA AND SECONDARY VALUES FOR TOXIC SUBSTANCES

NR 105.01 Purpose.
NR 105.02 Applicability.
NR 105.03 Definitions.
NR 105.04 Determination of adverse effects.
NR 105.05 Acute toxicity criteria and secondary acute values for aquatic life.
NR 105.06 Chronic toxicity criteria and secondary chronic values for fish and aquatic life.
NR 105.07 Wildlife criteria.
NR 105.08 Human threshold criteria.
NR 105.09 Human cancer criteria.
NR 105.10 Bioaccumulation factor.
NR 105.11 Final plant values.

NR 105.01 Purpose. The purpose of this chapter is to establish water quality criteria, and methods for developing criteria and secondary values for toxic substances to protect public health and welfare, the present and prospective use of all surface waters for public and private water supplies, and the propagation of fish and aquatic life and wildlife. This chapter also establishes how bioaccumulation factors used in deriving water quality criteria and secondary values for toxic and organoleptic substances shall be determined. Water quality criteria are a component of surface water quality standards. This chapter and chs. NR 102 to 104 constitute quality standards for the surface waters of Wisconsin.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89.; am. Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.02 Applicability. The provisions of this chapter are applicable to surface waters of Wisconsin as specified in chs. NR 102 to 104 and in this chapter.

(1) SITE SPECIFIC CRITERIA AND SECONDARY VALUES. A criterion contained within this chapter or a secondary value calculated pursuant to this chapter may be modified for a particular surface water segment or body. A criterion or secondary value may be modified if specific information is provided which shows that the data used to derive the criterion or secondary value do not apply and if additional information is provided to derive a site−specific criterion or secondary value. Site−specific criteria are intended to be applicable to a specific surface water segment. Criteria may be modified for site−specific considerations according to the USEPA "Water Quality Standards Handbook" Second Edition, revised 1994. Any criterion modified for site−specific conditions shall be promulgated in ch. NR 104 before it can be applied on a site−specific basis. Site−specific modifications of criteria and secondary values shall be consistent with the procedures described in 40 CFR Part 132, Appendix F, Procedure 1: Site−specific modifications to criteria and values. 40 CFR Part 132, Appendix F, Procedure 1 as stated on September 1, 1997 is incorporated by reference.

Note: Copies of 40 CFR Part 132 Appendix F, Proc. 1 are available for inspection in the offices of the department of natural resources, secretary of state and the legislative reference bureau, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) STATEWIDE CRITERIA. (a) The department may promulgate a less stringent criterion or remove a criterion from this chapter when the department determines that the previously promulgated criterion is more stringent than necessary, or unnecessary for the protection of humans, fish and other aquatic life or wildlife. The modification shall assure that the designated uses are protected and water quality standards continue to be attained.

(b) The department may promulgate a more stringent criterion in this chapter when the department determines that the previously promulgated criterion is inadequate for the protection of humans, fish and other aquatic life or wildlife.

(3) DETERMINATION OF SECONDARY VALUES FOR EFFLUENT LIMITATIONS. If a discharge contains a toxic substance, and if data to calculate a water quality criterion for that substance are not available, then, on a case−by−case basis, the department may calculate a secondary value as defined in this chapter and establish an effluent limitation for the toxic substance if the conditions contained in s. NR 106.05 (1) (b) are met.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (1) and (2), cr. (3), Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.03 Definitions. (1) "Acute toxicity" means the ability of a substance to cause mortality or an adverse effect in an organism which results from a single or short−term exposure to the substance.

(2) "Acute toxicity criterion" or "ATC" means the maximum daily concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the acute toxicity of that substance and will adequately protect the designated fish and aquatic life use of the surface water if not exceeded more than once every 3 years. If the available data indicate that one or more life stages of a particular species are more sensitive to a substance than other life stages of the same species, the ATC shall represent the acute toxicity of the most sensitive life stage.

(3) "Adequate protection" means a level of protection which ensures survival of a sufficient number of healthy individuals in a population of aquatic species to provide for the continuation of an unreduced population of these species.

(4) "Adverse effect" means any effect resulting in a functional impairment or a pathological lesion, or both, which may affect the performance of the whole organism, or which contributes to a reduced ability to respond to an additional challenge. Adverse effects include toxicant−induced mutagenic, teratogenic, or carcinogenic effects or impaired, developmental, immunological or reproductive effects.

(5) "Baseline BAF" means for organic chemicals, a bioaccumulation factor normalized to 100% lipid that is based on the concentration of a freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism. For inorganic chemicals, a bioaccumulation factor is based on the wet weight of the tissue.

(6) "Baseline BCF" means for organic chemicals, a bioconcentration factor normalized to 100% lipid that is based on the concentration of freely dissolved chemical in the ambient water and takes into account the partitioning of the chemical within the organism. For inorganic chemicals, a bioconcentration factor is based on the wet weight of the tissue.

(7) "Bioaccumulation" means the net accumulation of a substance by an organism as a result of uptake from all environmental sources.

(8) "Bioaccumulation factor" or "BAF" means the ratio (in L/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where both the organism and its food are exposed to the substance and where the ratio does not change substantially over time.

(9) "Bioaccumulative chemical of concern" or "BCC" means any substance that has the potential to cause adverse effects which, upon entering the surface waters, accumulates in aquatic organisms by a human health or wildlife bioaccumulation factor greater than 1000.

(10) "Bioconcentration" means the net accumulation of a substance by an aquatic organism as a result of uptake directly from the ambient water through its gill membranes or other external body surfaces.

(11) "Bioconcentration factor" or "BCF" means the ratio (in L/kg) of a substance's concentration in the tissue of an aquatic organism to its concentration in the ambient water, in situations where the organism is exposed through the water only and where the ratio does not change substantially over time.

(12) "Biota−sediment accumulation factor" or "BSAF" means the ratio (in kg of organic carbon/kg of lipid) of a substance's lipid−normalized concentration in the tissue of an aquatic organism to its organic carbon−normalized concentration in surface sediment, in situations where the ratio does not change substantially over time, both the organism and its food are exposed, and where the surface sediment is representative of the average surface sediment in the vicinity of the organism.

(13) "Carcinogen" means any substance listed in Table 9 or a substance for which the induction of benign or malignant neoplasms has been demonstrated in:

(a) Humans; or

(b) Two mammalian species; or

(c) One mammalian species, independently reproduced; or

(d) One mammalian species, to an unusual degree with respect to increased incidence, shortened latency period, variety of site, tumor type, or decreased age at onset; or

(e) One mammalian species, supported by reproducible positive results in at least 3 different types of short−term tests which are indicative of potential oncogenic activity.

(14) "Chronic toxicity" means the ability of a substance to cause an adverse effect in an organism which results from exposure to the substance for a time period representing that substantial portion of the natural life expectancy of that organism.

(15) "Chronic toxicity criterion" or "CTC" means the maximum 4−day concentration of a substance which ensures adequate protection of sensitive species of aquatic life from the chronic toxicity of that substance and will adequately protect the designated fish and aquatic use of the surface water if not exceeded more than once every 3 years.

(16) "Depuration" means the loss of a substance from an organism as a result of any active or passive process.

(17) "EC_{50}" means a concentration of a toxic substance which causes an adverse effect including mortality in 50% of the exposed organisms in a given time period.

(18) "Food−chain multiplier" or "FCM" means the ratio of a BAF to an appropriate BCF.

(19) "LC_{50}" means a concentration of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

(20) "LD_{50}" means a dose of a toxic substance which is lethal to 50% of the exposed organisms in a given time period.

(21) "Lipid−soluble substance" means a substance which is soluble in nonpolar organic solvents and which tends to accumulate in the fatty tissues of an organism exposed to the substance.

(22) "Lowest observable adverse effect level" or "LOAEL" means the lowest tested concentration that caused an adverse effect in comparison with a control when all higher test concentrations caused the same effect.

(23) "No observable adverse effect level" or "NOAEL" means the highest tested concentration that did not cause an adverse effect in comparison with a control when no lower test concentration caused an adverse effect.

(24) "Octanol/water partition coefficient" or "K_{OW}" means the ratio of the concentration of a substance in the octanol phase to its concentration in the aqueous phase in an equilibrated 2−phase octanol−water system. For log K_{OW}, the log of the octanol−water partition coefficient is a base 10 logarithm.

(25) "Secondary value" means a temporary value that represents the concentration of a substance which ensures adequate protection of sensitive species of aquatic life, wildlife or human health from the toxicity of that substance and will adequately protect the designated use of the surface water until database requirements are fulfilled to calculate a water quality criterion.

(26) "Steady state" means that an equilibrium condition in the body burden of a substance in an organism has been achieved and is assumed when the rate of depuration of a substance matches its rate of uptake.

(27) "Toxic substance" means a substance or mixture of substances which through sufficient exposure, or ingestion, inhalation or assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will cause death, disease, behavioral or immunological abnormalities, cancer, genetic mutations, or developmental or physiological malfunctions, including malfunctions in reproduction or physical deformations, in such organisms or their offspring.

(28) "Trophic level" means a functional classification of taxa within a community that is based on feeding relationships (e.g., aquatic plants comprise the first trophic level, herbivores comprise the second, small fish comprise the third, predatory fish the fourth, etc.).

(29) "Uptake" means the acquisition of a substance from the environment by an organism as a result of any active or passive process.

(30) "Water quality parameter" means one of the indicators available for describing the distinctive quality of water including, but not limited to, hardness, pH, or temperature.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; renum. (5) to (19) to be (11), (13) to (15), (17), (19) to (24), (26), (27) and (30), cr. (5) to (7), (9), (10), (12), (16), (18), (25), (28) and (29) and am. (8), (11) and (24), Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.04 Determination of adverse effects. **(1)** Substances may not be present in surface waters at concentrations which adversely affect public health or welfare, present or prospective uses of surface waters for public or private water supplies, or the protection or propagation of fish or other aquatic life or wild or domestic animal life.

(2) A substance shall be deemed to have adverse effects on fish or other aquatic life if it exceeds any of the following more than once every 3 years:

(a) The acute toxicity criterion as specified in s. NR 105.05, or

(b) The chronic toxicity criterion as specified in s. NR 105.06.

(c) The acute and chronic toxicity criteria for ammonia nitrogen shall be determined on a case−by−case basis by the department for the appropriate aquatic life use category.

(3) A substance shall be deemed to have adverse effects on wildlife if it exceeds the wildlife criterion as specified in s. NR 105.07.

(4) A substance shall be deemed to have adverse effects on public health and welfare if it exceeds any of the following:

(a) The human threshold criterion as specified in s. NR 105.08; or

(b) The human cancer criterion as specified in s. NR 105.09; or

(c) The taste and odor criterion as specified in s. NR 102.14.

(5) A substance shall be deemed to have adverse effects or the reasonable potential to have adverse effects on aquatic life, wildlife or human health, if it exceeds a secondary value determined according to the procedures in ss. NR 105.05 to 105.08.

(6) The determination of the criteria or secondary values for substances as calculated under ss. NR 105.05 to 105.09 shall be based upon the available scientific data base. References to be used in obtaining scientific data may include, but are not limited to:

(a) "Water Quality Criteria 1972", EPA−R3−73−033, National Academy of Sciences, National Academy of Engineering, United States Government Printing Office, Washington, D.C., 1974.

(b) "Quality Criteria for Water", EPA−440/9−76−003, United States Environmental Protection Agency, Washington, D.C., 1976.

(c) October 1980 and January 1985 U.S. Environmental Protection Agency (EPA) ambient water quality criteria documents.

(d) "Public Health Related Groundwater Standards: Summary of Scientific Support Documentation for NR 140.10", Wisconsin Department of Health and Social Services, Division of Health, September 1985.

(e) "Public Health Related Groundwater Standards − 1986: Summary of Scientific Support Documentation for NR 140.10", Wisconsin Department of Health and Social Services, Division of Health, June 1986.

(f) Health advisories published on March 31, 1987 by EPA, Office of Drinking Water.

(g) Any other reports, documents or information published by EPA or any other federal agency.

(h) Any other reports, documents or information that the department, deems to be reliable.

(7) When reviewing any of the references in sub. (6) to determine the effect of a substance, the department:

(a) Shall use scientific studies on the toxicity of a substance to fish and other aquatic life and wild and domestic animals, indigenous to the state;

(b) May use scientific studies on the toxicity of a substance to fish or other aquatic life, plant, mammalian, avian, and reptilian species not indigenous to the state; and

(c) May consider biomonitoring information to determine the aquatic life toxicity of complex mixtures of toxic substances in addition to the chemical specific criteria specified in this chapter.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (3), renum. (5) and (6) to be (7) and am. (6) (intro.) and (7) (intro.), cr. (5), Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.05 Acute toxicity criteria and secondary acute values for aquatic life. (1) MINIMUM DATABASE FOR ACUTE CRITERION DEVELOPMENT. (a) To derive an acute toxicity criterion for aquatic life, the minimum information required shall be the results of acceptable acute toxicity tests with one or more species of freshwater animal in at least 8 different families provided that of the 8 species:

1. At least one is a salmonid fish in the family Salmonidae in the class Osteichthyes,

2. At least one is a non−salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species,

3. At least one is a planktonic crustacean (e.g., cladoceran, copepod),

4. At least one is a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish),

5. At least one is an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge),

6. At least one is a fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions.

7. At least one is an organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca), and

8. At least one is an organism from a family in any order of insect or any other phylum not already represented in subds. 1. to 7.

9. If all 8 of the families in subds. 1. to 8. are represented, an acute toxicity criterion may be developed for surface waters classified as cold water using information on all of those families. If an acute toxicity criterion is developed for surface waters classified as cold water, acute toxicity criteria may also be developed for any of the surface water classifications in s. NR 102.04 (3) (b) to (e) using the procedure in sub. (2) or (3) and data on families in subds. 1. to 8. which are representative of the aquatic life communities associated with those classifications. For each substance, in no case may the criterion for a lower quality fish and aquatic life subcategory as defined in s. NR 102.04 be less than the criterion for a higher quality fish and aquatic life subcategory.

10. For a substance, if all of the families in subds. 1. to 8. are not represented, an acute toxicity criterion may not be developed for that substance. Instead, any available data may be used to develop a secondary acute value (SAV) for that substance according to s. NR 105.02 (3) and sub.(4).

(b) The acceptability of acute toxicity test results shall be judged according to the guidelines in section IV of the United States environmental protection agency's 1985 "Guidelines for Deriving National Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" or 40 CFR Part 132, Appendix A. II, IV and V, as stated on September 1, 1997, is incorporated by reference.

Note: Copies of 40 CFR Part 132, Appendix A Sections II, IV and V are available for inspection in the offices of the department of natural resources, secretary of state and the legislative reference bureau, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) ACUTE TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY UNRELATED TO WATER QUALITY PARAMETERS. If the acute toxicity of a substance has not been adequately shown to be related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the acute toxicity criterion (ATC) is calculated using the procedures specified in this subsection.

(a) 1. For each species for which at least one acute value is available, the species mean acute value (SMAV) is calculated as the geometric mean of all acceptable acute toxicity tests using the guidelines in sub. (1) (b).

2. For each genus for which one or more SMAVs are available, the genus mean acute value (GMAV) is calculated as the geometric mean of the SMAVs available for the genus.

(b) The GMAVs are ordered from high to low.

(c) Ranks (R) are assigned to the GMAVs from 1 for the lowest to N for the highest. If 2 or more GMAVs are identical, successive ranks are arbitrarily assigned.

(d) The cumulative probability (P) is calculated for each GMAVs as $P=R/(N + 1)$.

(e) The 4 GMAVs are selected which have P closest to 0.05. If there are less than 59 GMAVs, these will always be the lowest GMAVs.

(f) Using the selected GMAVs and Ps, the ATC is calculated using the following:

1. Let EV = sum of the 4 ln GMAVs,
   EW = sum of the 4 squares of the ln GMAVs,
   EP = sum of the 4 P values,
   EPR = sum of the 4 square roots of P, and
   JR = square root of 0.05.
2. $S = ((EW - (EV)^2/4)/(EP-(EPR)^2/4))^{0.5.}$
3. $L = (EV - S(EPR))/4.$
4. $A = (JR)(S) + L.$
5. Final Acute Value (FAV)= e^A.
6. ATC = FAV/2.

(g) If, for a commercially, recreationally or ecologically important species, the geometric mean of the acute values from flow−through tests in which the concentration of test material was measured is lower than the calculated ATC [FAV], then that geometric mean is used as the ATC [FAV] instead of the calculated one.

(h) Table 1 contains the acute toxicity criteria for fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1) (a).

(3) ACUTE TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY RELATED TO WATER QUALITY PARAMETERS. If data are available on a substance to show that acute toxicity to 2 or more species is similarly related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the acute toxicity criterion (ATC) is calculated using the procedures specified in this subsection.

(a) For each species for which acceptable acute toxicity tests using the guidelines in sub. (1) (b) are available at 2 or more different values of the water quality parameter, a least squares regression of the acute toxicity values on the corresponding values of the water quality parameter is performed to obtain the slope of the curve that best describes the relationship. Because the most commonly documented relationship is that between hardness and acute toxicity of metals and a log−log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this subsection to illustrate this method. For relationships based on other water quality parameters, no transformation or a different transformation might fit the data better, and appropriate changes shall be made as necessary throughout this subsection.

(b) For each species, the geometric mean of the available acute values (W) is calculated and then each of those acute values is divided by the mean for that species. This normalizes the acute values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

(c) For each species, the geometric mean of the available corresponding water quality parameter values (X) is calculated and then each of those water quality parameter values is divided by the mean for that species. This normalizes the water quality parameter values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

(d) A least squares regression of all the normalized acute values on the corresponding normalized values of the water quality parameter is performed to obtain the pooled acute slope (V). If the coefficient of determination, or r value, calculated from that regression is found not to be significant based on a standard F−test at a 0.05 level, then the pooled acute slope shall be set equal to zero.

(e) For each species the logarithmic intercept (Y) is calculated using the equation: $Y = \ln W - V(\ln X)$.

(f) 1. For each species the species mean acute intercept (SMAI) is calculated as e^Y.

2. For each genus for which one or more SMAIs are available, the genus mean acute intercept (GMAI) is calculated as the geometric mean of the SMAIs available for the genus.

(g) The GMAIs are ordered from high to low.

(h) Ranks (R) are assigned to the GMAIs from 1 for the lowest to N for the highest. If 2 or more GMAIs are identical, successive ranks are arbitrarily assigned.

(i) The cumulative probability (P) is calculated for each GMAI as P=R/(N+1).

(j) The 4 GMAIs are selected which have P closest to 0.05. If there are less than 59 GMAIs, these will always be the lowest GMAIs.

(k) Using the selected GMAIs and Ps, the ATC is calculated using the following:

1. Let EV = sum of the 4 ln GMAIs,
   EW = sum of the 4 squares of the ln GMAIs,
   EP = sum of the 4 P values,
   EPR = sum of the 4 square roots of P, and
   JR = square root of 0.05.
2. $S = ((EW - (EV)^2/4) / (EP-(EPR)^2/4))^{0.5.}$
3. $L = (EV - S(EPR))/4$.
4. $A = (JR)(S) + L$.
5. Final Acute Intercept (FAI) = e^A.
6. Acute Criterion Intercept (ACI) = FAI/2.

(L) The acute toxicity equation (ATE) is written as:

$ATC = {}_e(V \ln(\text{water quality parameter}) + \ln ACI)$.

The ATE shall be applicable only over the range of water quality parameters equivalent to the mean plus or minus 2 standard deviations using the entire fresh water acute toxicity data base and the water quality parameter transformation employed in par. (a). If the value at a specific location is outside of that range, the endpoint of the range nearest to that value shall be used to determine the criterion. Additional information may be used to modify those ranges. The final acute value (FAV) equals 2 times the ATC (acute toxicity criterion) calculated using the formula in this paragraph.

(m) If, for a commercially, recreationally or ecologically important species, the SMAI is lower than the calculated ACI, then that SMAI is used as the ACI instead of the calculated one.

(n) Table 2 contains the acute toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1) (a). Table 2A contains the water quality parameter ranges calculated in par. (L).

(4) SECONDARY ACUTE VALUES. If all 8 minimum data requirements for calculating acute toxicity criteria in sub. (1) (a) are not met, secondary acute values (SAVs) shall be determined using the procedure in this subsection.

(a) In order to calculate a SAV, the database shall contain, at a minimum, a genus mean acute value (GMAV) for one of the following 3 genera in the family Daphnidae − *Ceriodaphnia sp.*, *Daphnia sp.*, or *Simocephalus sp.* To calculate a SAV, the lowest GMAV in the database is divided by the Secondary Acute Factor (SAF). The SAF is an adjustment factor corresponding to the number of satisfied minimum data requirements, listed in sub. (1) (a). SAFs are listed in Table 2B.

(b) Whenever appropriate, the effects of variable water quality parameters shall be considered when calculating a SAV, consistent with the procedures described in sub. (3).

(c) Whenever, for a commercially, recreationally or ecologically important species, the SMAV is lower than the calculated SAV, that SMAV shall be used as the SAV instead of the calculated SAV.

(5) ACUTE TOXICITY CRITERIA EXPRESSED IN THE DISSOLVED FORM. Acute water quality criteria may be expressed as a dissolved concentration. The conversion of an acute water quality criterion expressed as a total recoverable concentration, to an acute water quality criterion expressed as a dissolved concentration, the portion of the substance which will pass through a 0.45 um filter, shall be done using the equations in pars. (a) and (b). Substances which may have criteria expressed as a dissolved concentration are listed in par. (a) with corresponding conversion factors.

(a) The conversion of the water quality criterion expressed as total recoverable ($WQC_{Total\ R.}$) to the water quality criterion expressed as dissolved (WQC_D) shall be performed as follows:

$WQC_D = (CF)(WQC_{Total\ R.})$

Where: $WQC_{Total\ R.}$ = Criteria from NR 105, Table 1 or 2.
CF = Conversion factor for total recoverable to dissolved.

Conversion factors are as follows:

Arsenic	1.000
Cadmium	0.850
Chromium (III)	0.316
Chromium (VI)	0.982
Copper	0.960
Lead	0.875
Mercury	0.850
Nickel	0.998
Selenium	0.922
Silver	0.850
Zinc	0.978

(b) The translation of the WQC_D into the water quality criterion which accounts for site−specific conditions (WQC_{TRAN}) shall be performed as follows:

$WQC_{TRAN} = (Translator)(WQC_D)$

Where: Translator (unitless) = $((M_P)(TSS) + M_D)/M_D$

M_P = Particle−bound concentration of the pollutant (ug/g) in receiving water.

M_D = Dissolved concentration of the pollutant in receiving water (ug/L).

TSS = Total Suspended Solids (g/L) concentration in receiving water.

(c) The procedures in pars. (a) and (b) may also be used for the conversion of secondary values from total recoverable to dissolved.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (1) (a) 1. to 5., (1) (b), (2) (a) to (f), (3) (a) and (f) to (L), r. and recr. (1) (a) 6., cr. (1) (a) 7. to 10., (4) and (5), Register, August, 1997, No. 500, eff. 9−1−97; CR 03−050: am. (3) (L) and (m) Register February 2004 No. 578, eff. 3−1−04.

NR 105.06 Chronic toxicity criteria and secondary chronic values for fish and aquatic life. (1) MINIMUM DATABASE FOR CHRONIC CRITERION DEVELOPMENT. (a) To derive a chronic toxicity criterion for aquatic life, the minimum information required shall be results of acceptable chronic toxicity tests with one or more species of freshwater animal in at least 8 different families provided that of the 8 species:

1. At least one is a salmonid fish, in the family Salmonidae in the class Osteichthyes,

2. At least one is a non−salmonid fish, from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species,

3. At least one is a planktonic crustacean (e.g., cladoceran, copepod),

4. At least one is a benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish),

5. At least one is an insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge),

6. At least one is a fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions,

7. At least one is an organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca), and

8. At least one is an organism from a family in any order of insect or any other phylum not already represented in subds. 1. to 7.

9. If all 8 of the families in subds. 1. to 8. are represented, a chronic toxicity criterion may be developed for surface waters classified as cold water using information on all of those families. If a chronic toxicity criterion is developed for surface waters classified as cold water, chronic toxicity criteria may also be developed for any of the surface water classifications in s. NR 102.04 (3) (b) to (e) using the procedure in sub. (2) or (3) and data on families in subds. 1. to 8. which are representative of the aquatic life communities associated with those classifications. For each substance, in no case may the criterion for a lower quality fish and aquatic life subcategory as defined in s. NR 102.04 be less than the criterion for a higher quality fish and aquatic life subcategory.

10. For a substance, if all the families in subds. 1. to 8. are not represented, acute−chronic ratios as calculated in sub. (5) may be used to generate the chronic toxicity values necessary to calculate a chronic toxicity criterion.

11. For a substance, if all of the families in subds. 1. to 8. are not represented, a chronic toxicity criterion may not be developed for that substance except as provided in subd. 10. Instead, any available data may be used to develop a secondary acute value (SAV) for that substance according to sub. (4).

(b) The acceptability of chronic toxicity test results shall be judged according to the guidelines in section VI of the United States environmental protection agency's 1985 "Guidelines for Deriving National Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" or 40 CFR Part 132 Appendix A, sections VI and VII as stated on September 1, 1997, is incorporated by reference.

Note: Copies of 40 CFR Part 132, Appendix A, Sections VI and VII are available for inspection in the offices of the department of natural resources, secretary of state and the legislative reference bureau, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

(2) CALCULATION OF A CHRONIC CONCENTRATION. A chronic concentration is obtained by calculating the geometric mean of the chronic lowest observable adverse effect level and the chronic no observable adverse effect level.

(3) CHRONIC TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY UNRELATED TO WATER QUALITY PARAMETERS. If the chronic toxicity of a substance has not been adequately shown to be related to a water quality parameter, i.e., hardness, pH, temperature, etc., the chronic toxicity criterion (CTC) is calculated using the procedures specified in this subsection.

(a) 1. For each species for which at least one chronic value is available, the species mean chronic value (SMCV) is calculated as the geometric mean of all acceptable chronic toxicity tests using the guidelines in sub. (1) (b).

2. For each genus for which one or more SMCVs are available, the genus mean chronic value (GMCV) is calculated as the geometric mean of the SMCVs available for the genus.

(b) The GMCVs are ordered from high to low.

(c) Ranks (R) are assigned to the GMCVs from 1 for the lowest to N for the highest. If 2 or more GMCVs are identical, successive ranks are arbitrarily assigned.

(d) The cumulative probability (P) is calculated for each GMCVs as P=R/(N + 1).

(e) The 4 GMCVs are selected which have P closest to 0.05. If there are less than 59 GMCVs, these will always be the lowest GMCVs.

(f) Using the selected GMCVs and Ps, the final chronic value (FCV) is calculated using the following:

1. Let EV = sum of the 4 ln GMCVs,
EW = sum of the 4 squares of the ln GMCVs,
EP = sum of the 4 P values,
EPR = sum of the 4 square roots of P, and
JR = square root of 0.05.
2. $S = ((EW - (EV)^2/4)/(EP-(EPR)^2/4))^{0.5}$
3. $L = (EV - S(EPR))/4$.
4. $A = (JR)(S) + L$.

5. FCV = e^A.

(g) If, for a commercially, recreationally or ecologically important species, the geometric mean of the chronic values is lower than the calculated FCV then that geometric mean is used as the FCV instead of the calculated one.

(h) The chronic toxicity criterion (CTC) equals the lower of the FCV and the final plant value calculated using the procedure in s. NR 105.11.

(i) Table 3 contains the chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1).

(4) CHRONIC TOXICITY CRITERIA FOR SUBSTANCES WITH TOXICITY RELATED TO WATER QUALITY PARAMETERS. (a) If data are available on a substance to show that chronic toxicity to 2 or more species is similarly related to a water quality parameter (i.e., hardness, pH, temperature, etc.), the chronic toxicity criterion (CTC) is calculated using the procedures specified in this paragraph.

1. For each species for which acceptable chronic toxicity tests using the guidelines in sub. (1) (b) are available at 2 or more different values of the water quality parameter, a least squares regression of the chronic toxicity values on the corresponding values of the water quality parameter is performed to obtain the slope of the curve that best describes the relationship. Because the most commonly documented relationship is that between hardness and the chronic toxicity of metals and a log−log relationship fits these data, geometric means and natural logarithms of both toxicity and water quality are used in the rest of this subsection to illustrate this method. For relationships based on other water quality parameters, no transformation or a different transformation might fit the data better, and appropriate changes shall be made as necessary throughout this subsection.

2. For each species, the geometric mean of the available chronic values (W) is calculated and then each of the chronic values is divided by the mean for that species. This normalizes the chronic values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

3. For each species, the geometric mean of the available corresponding water quality parameter values (X) is calculated and then each of the water quality parameter values is divided by the mean for that species. This normalizes the water quality parameter values so that the geometric mean of the normalized values for each species individually and for any combination of species is 1.0.

4. A least squares regression of all the normalized chronic values on the corresponding normalized values of the water quality parameter is performed to obtain the pooled chronic slope (V). If the coefficient of determination, or r value, calculated from that regression is found not to be significant based on a standard F−test at a 0.05 level, then the pooled chronic slope shall be set equal to zero.

5. For each species the logarithmic intercept (Y) is calculated using the equation: Y = ln W − V(ln X).

6. a. For each species the species mean chronic intercept (SMCI) is calculated as e^Y.

b. For each genus for which one or more SMCIs are available, the genus mean chronic intercept (GMCI) is calculated as the geometric mean of the SMCIs available for the genus.

7. The GMCIs are ordered from high to low.

8. Ranks (R) are assigned to the GMCIs from 1 for the lowest to N for the highest. If 2 or more GMCIs are identical, successive ranks are arbitrarily assigned.

9. The cumulative probability (P) is calculated for each GMCI as P=R/(N + 1).

10. The 4 GMCIs are selected which have P closest to 0.05. If there are less than 59 GMCIs, these will always be the lowest GMCIs.

11. Using the selected GMCIs and Ps, the final chronic value (FCV) is calculated using the following:

a. Let EV = sum of the 4 ln GMCIs,
EW = sum of the 4 squares of the ln GMCIs,
EP = sum of the 4 P values,
EPR = sum of the 4 square roots of P, and
JR = square root of 0.05.

b. $S = ((EW-(EV)^2/4)/(EP-(EPR)^2/4))^{0.5}$

c. L = (EV − S(EPR))/4.

d. A = (JR)(S) + L.

e. Final Chronic Intercept (FCI) = e^A.

12. The final chronic equation (FCE) is written as:

FCV = $_e$(V ln(water quality parameter) + ln FCI).

The FCE shall be applicable only over the range of water quality parameters equivalent to the mean ± 2 standard deviations using the entire freshwater chronic toxicity data base and the water quality parameter transformation employed in subd. 1. If the value at a specific location is outside of that range, the endpoint of the range nearest to that value shall be used to determine the criterion. Additional information may be used to modify those ranges.

13. If, for a commercially, recreationally or ecologically important species, the SMCI is lower than the calculated FCI, then that SMCI is used as the FCI instead of the calculated one.

(b) At a value of the water quality parameter, the chronic toxicity criterion (CTC) equals the lower of the FCV and the final plant value calculated using the procedure in s. NR 105.11.

(c) Table 4 contains the chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using the procedures described in this subsection for substances meeting the database requirements indicated in sub. (1). Table 4A contains the water quality parameter ranges calculated in par. (a) 1.

(5) ACUTE−CHRONIC RATIOS. (a) The acute−chronic ratio is used to estimate the chronic toxicity of a substance to fish or other aquatic species when the database of sub. (1) (a) is not satisfied.

(b) The acute−chronic ratio for a species equals the acute concentration from data considered under s. NR 105.05 (1) divided by the chronic concentration from data calculated under sub. (1), subject to the following conditions:

1. If the acute toxicity of a substance is related to any water quality parameter, the acute−chronic ratio shall be based on acute and chronic toxicity data obtained from organisms exposed to test water with similar, if not identical, values of those water quality parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference in order to increase the likelihood of comparable test conditions.

2. If the acute and chronic toxicity data indicate that the acute−chronic ratio varies with changes in the values of the water quality parameters, the acute−chronic ratio used at specified values of the water quality parameters shall be based on the ratios at values closest to that specified.

3. If the acute toxicity of a substance is unrelated to water quality parameters, the acute−chronic ratio may be derived from any acute and chronic test on a species regardless of the similarity in values of those parameters. Preference under this paragraph shall be given to data from acute and chronic tests done by the same author or reference to increase the likelihood of comparable test conditions.

(c) A final chronic value shall be calculated for a substance under this subsection only if at least one acute−chronic ratio is available for at least one species of aquatic animal in at least 3 different families, provided that of the 3 species, one is a fish, one is an invertebrate, and the third is a relatively sensitive freshwater

species on an acute toxicity basis. The other 2 may be saltwater species.

(d) The geometric mean acute−chronic ratio is calculated for each species using the available acute−chronic ratios for that species. That mean ratio shall be called the species mean acute−chronic ratio (SMACR).

(e) For a given substance, if the SMACR appears to increase or decrease as the species or genus mean acute values (SMAVs or GMAVs) calculated for that substance using the procedure described in s. NR 105.05 increase, the final acute−chronic ratio (FACR) shall be equal to the geometric mean of the SMACRs for species with SMAVs closest to the final acute value.

(f) For a given substance, if no trend is apparent regarding changes in SMACRs and GMAVs, the FACR shall be equal to the geometric mean of all SMACRs available for that substance.

(g) For a given substance, the final chronic value (FCV) shall be equal to the final acute value (FAV) divided by the final acute−chronic ratio (FACR). The chronic toxicity criterion shall be equal to the lower of the FCV and the final plant value as calculated using the procedure in s. NR 105.11, if available.

(h) Chronic toxicity criteria for the fish and aquatic life subcategories listed in s. NR 102.04 (3) that are calculated using acute−chronic ratios are listed in Table 5 for substances with acute toxicity unrelated to water quality parameters and in Table 6 for substances with acute toxicity related to water quality parameters. Equations listed in Table 6 are applicable over the same range of water quality parameters as contained in Table 2A.

(6) SECONDARY CHRONIC VALUES. If all 8 minimum data requirements for calculating FCVs in sub. (1) (a) are not met for a substance, secondary chronic values (SCVs) shall be calculated for that substance using the procedure in this subsection.

(a) If any one of the combinations of information in subds. 1. to 3. is available, a SCV may be calculated. To calculate a SCV for a substance, the acute value from subds. 1. to 3. is divided by the applicable acute−chronic ratio in the same subdivision.

1. Calculate a FAV using the procedure in s. NR 105.05 (2) and divide it by a secondary acute−chronic ratio (SACR) using the procedure in sub. (7).

2. Calculate a SAV using the procedure in s. NR 105.05 (4) and divide it by a final acute−chronic ratio (FACR) using the procedure in sub. (5).

3. Calculate a SAV using the procedure in s. NR 105.05 (4) and divide it by a SACR using the procedure in sub. (7).

(b) If appropriate, the SCV shall be made a function of a water quality characteristic in a manner similar to that described in sub. (4) (a).

(c) If, for a commercially, recreationally or ecologically important species, the SMCV is lower than the calculated SCV, that SMCV shall be used as the SCV instead of the calculated SCV.

(d) If there is an FPV available using the procedure in s. NR 105.11 which is lower than the calculated SCV, that FPV shall be used as the SCV instead of the calculated SCV.

(7) SECONDARY ACUTE−CHRONIC RATIOS. (a) If a FACR cannot be calculated using the procedure in sub. (5) because SMACRs are not available for a fish, an invertebrate or an acutely sensitive freshwater species, a secondary acute−chronic ratio (SACR) may be calculated using the procedure in this subsection.

(b) The SACR shall be equal to the geometric mean of 3 acute−chronic ratios. Those ratios consist of the SMACRs available for the species in sub. (5) (c). When SMACRs are not available for the species in par. (a), the default acute−chronic ratio to be used is 18. Use of a SACR will result in the calculation of a secondary chronic value.

(8) CHRONIC TOXICITY CRITERIA EXPRESSED IN THE DISSOLVED FORM. Chronic water quality criteria may be expressed as a dissolved concentration. The conversion of a chronic water quality criterion expressed as a total recoverable concentration to a chronic water quality criterion expressed as a dissolved concentration, the portion of the substance which will pass through a 0.45 um filter, shall be done using the equations in pars. (a) and (b). Substances which may have criteria expressed as a dissolved concentration are listed in par. (a) with corresponding conversion factors.

(a) The conversion of the water quality criterion expressed as total recoverable ($WQC_{Total\ R.}$) to the water quality criterion expressed as dissolved (WQC_D) shall be performed as follows:

$$WQC_D = (CF)(WQC_{Total\ R.})$$

Where: $WQC_{Total\ R.}$ = Criteria from NR 105, Table 5 or 6.
CF = Conversion factor for total recoverable to dissolved.

Conversion factors are as follows:

Arsenic	1.000
Cadmium	0.850
Chromium (III)	0.860
Chromium (VI)	0.962
Copper	0.960
Lead	0.792
Nickel	0.997
Selenium	0.922
Zinc	0.986

(b) The translation of the WQC_D into the water quality criterion which accounts for site−specific conditions (WQC_{TRAN}) shall be performed as follows:

$$WQC_{TRAN} = (Translator)(WQC_D)$$

Where: $Translator\ (unitless) = ((M_P)(TSS) + M_D)/M_D$

M_P = Particle−bound concentration of the pollutant (ug/g) in receiving water.

M_D = Dissolved concentration of the pollutant in receiving water (ug/L).

TSS = Total Suspended Solids (g/L) concentration in receiving water.

(c) The procedures in pars. (a) and (b) may also be used for the conversion of secondary values from total recoverable to dissolved.

Table 1
Acute Toxicity Criteria for Substances With Toxicity Unrelated to Water Quality
(in ug/L except where indicated)

Substance	Cold Water	Warm Water Sportfish, Warm Water Forage, and Limited Forage Fish	Limited Aquatic Life
Arsenic (+3)*	339.8	339.8	339.8
Chromium (+6)*	16.02	16.02	16.02
Mercury (+2)*	0.83	0.83	0.83
Cyanide, free	22.4	45.8	45.8
Chloride	757,000	757,000	757,000
Chlorine*	19.03	19.03	19.03
Gamma − BHC	0.96	0.96	0.96
Dieldrin	0.24	0.24	0.24
Endrin	0.086	0.086	0.12
Toxaphene	0.73	0.73	0.73
Chlorpyrifos	0.041	0.041	0.041
Parathion	0.057	0.057	0.057

Note: * − Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 2
Acute Toxicity Criteria for Substances With Toxicity Related to Water Quality
(all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$)					
	$ATC=e^{(V \text{ in hardness}) + \ln ACI)}$		ATC at Various Hardness (ppm) Levels		
Substance	V	ln ACI	50	100	200
Total Recoverable Cadmium:					
Cold Water	1.147	−3.8104	1.97	4.36	9.65
Warm Water Sportfish, Warm Water Forage and Limited Forage Fish	1.147	−2.9493	4.65	10.31	22.83
Limited Aquatic Life	1.147	−1.9195	13.03	28.87	63.92
Total Recoverable Chromium (+3):					
All Surface Waters	0.819	3.7256	1022	1803	3181
Total Recoverable Copper:					
All Surface Waters	0.9436	−1.6036	8.07	15.51	29.84
Total Recoverable Lead:					
All Surface Waters	0.9662	0.2226	54.73	106.92	208.90
Total Recoverable Nickel:					
All Surface Waters	0.846	2.255	261	469	843
Total Recoverable Zinc:					
All Surface Waters	0.8745	0.7634	65.66	120.4	220.7
Water Quality Parameter: pH					
	$ATC = e^{(V(pH) + \ln ACI)}$				
Substance	V	ln ACI	6.5	7.8	8.8
Pentachlorophenol:					
All Surface Waters	1.0054	−4.877	5.25	19.40	53.01

Table 2A
Water Quality Parameter Ranges for Substances With Acute Toxicity Related to Water Quality

Substance	Parameter	Applicable Range
Cadmium	Hardness (ppm)	6 − 457
Chromium (+3)	Hardness (ppm)	13 − 301
Copper	Hardness (ppm)	13 − 495
Lead	Hardness (ppm)	12 − 356
Nickel	Hardness (ppm)	13 − 268
Zinc	Hardness (ppm)	12 − 333
Pentachlorophenol	pH (s.u.)	6.6 − 8.8

Table 2B
Secondary Acute Factors

Number of minimum data requirements satisfied	Adjustment factor
1	21.9
2	13.0
3	8.0
4	7.0
5	6.1
6	5.2
7	4.3

Table 2C
Acute Toxicity Criteria for Ammonia With Toxicity Related to Water Quality(all in mg/L)

Cold Water (CW) Categories 1−5 are applicable only to ammonia criteria.[1]

Water Quality Parameter: pH

ATC (in mg/L) = $[A / (1 + 10^{(7.204 - pH)})] + [B /(1 + 10^{(pH - 7.204)})]$

Substance	**A**	**B**	**7.5**	**8.0**	**8.5**
Ammonia (as N) in mg/L:					
CW Category 1 & 4	0.275	39.0	13.28	5.62	2.14
CW Category 2 & 3	0.343	48.7	16.59	7.01	2.67
CW Category 5, Warm Water Sport Fish, Warm Water Forage, and Limited Forage Fish	0.411	58.4	19.89	8.41	3.20
Limited Aquatic Life	0.633	90.0	30.64	12.95	4.93

[1] For ammonia, along with data on all warm water fish species and invertebrates, the cold water criteria are calculated using data on all cold water fish species with the following exceptions:

CW Category 1 = Default category of cold water classification. This category includes all fish. [Note: CW Category 1 is always applicable in Lake Superior, Lake Michigan, and Green Bay north of 44° 32' 30" north latitude.]

CW Category 2 = Inland lakes with populations of cisco, lake trout, brook trout or brown trout, but no other trout or salmonid species. This category excludes data on genus *Onchorhynchus*.

CW Category 3 = Inland lakes with populations of cisco, but no trout or salmonid species. This category excludes data on genera *Onchorhynchus*, *Salmo*, and *Salvelinus*.

CW Category 4 = Inland trout waters with brook, brown, or rainbow trout, but no whitefish or cisco. This category excludes data on genus *Prosopium*.

CW Category 5 = Inland trout waters with brook and brown trout, but no whitefish, cisco, or other trout or salmonid species. This category excludes data on genera *Prosopium* and *Onchorhynchus*.

Table 3
Chronic Toxicity Criteria for Substances With Toxicity Unrelated to Water Quality(all in ug/L)

Substance	Cold Water	Warm Water Sportfish, Warm Water Forage and Limited Forage Fish	Limited Aquatic Life

(Reserved)

Note: This table is reserved for criteria that USEPA has indicated may be available in the near future.

Table 4
Chronic Toxicity Criteria for Substances With Toxicity Related to Water Quality (all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$

$CTC = e^{(V \ln(hardness) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various Hardness (ppm) Levels 50	100	175
Total Recoverable Cadmium:					
All Surface Waters	0.7852	−2.7150	1.43	2.46	3.82

Table 4A
Water Quality Parameter Ranges for Substances With Chronic Toxicity Related to Water Quality

Substance	Parameter	Applicable Range
Cadmium	Hardness (ppm)	18−175

Table 4B
Chronic Toxicity Criteria for Ammonia with Toxicity Related to Water Quality (all in mg/L)

Substance: Ammonia (as N)
Water Quality Parameters: Temperature in degrees Celsius, pH

30−Day CTC:

$CTC = E \times ((0.0676/(1 + 10^{(7.688 - pH)})) + (2.912/(1 + 10^{(pH - 7.688)}))) \times C$

4−Day CTC = 30−Day CTC X 2.5

Cold Water (all periods), Warm Water Sport Fish and Warm Water Forage Fish (periods with Early Life Stages Present):

C = minimum of (2.85) or $(1.45 \times 10^{(0.028 \times (25 - T))})$

T = Temperature in degrees Celsius

$E = 0.854$

Warm Water Sport Fish and Warm Water Forage Fish (periods with Early Life Stages Absent):

$C = (1.45 \times 10^{(0.028 \times (25 - T))})$

T = Maximum of (actual temperature in degrees Celsius) and (7)

$E = 0.854$

Limited Forage Fish (periods with Early Life Stages Present):

C = minimum of (3.09) or $(3.73 \times 10^{(0.028 \times (25 - T))})$

T = temperature in degrees Celsius

$E = 1$

Limited Forage Fish (periods with Early Life Stages Absent):

$C = (3.73 \times 10^{(0.028 \times (25 - T))})$

T = Maximum of (actual temperature in degrees Celsius) and (7)

$E = 1$

Limited Aquatic Life (all periods):

$C = (8.09 \times 10^{(0.028 \times (25 - T))})$

T = temperature in degrees Celsius

$E = 1$

	30−day CTC in mg/L @ pH of:		
	7.5	8.0	8.5
Cold Water, Warm Water Sport Fish (Early Life States Present), and Warm Water Forage Fish (Early Life Stages Present):			
@ 25 degrees Celsius	2.22	1.24	0.55
@ 14.5 degrees Celsius or less	4.36	2.43	1.09
Warm Water Sport Fish (Early Life Stages Present), and Warm Water Forage Fish (Early Life Stages Absent):			
@ 25 degrees Celsius	2.22	1.24	0.55
@ 7 degrees Celsius or less	7.09	3.95	1.77
Limited Forage Fish (Early Life Stages Present):			
@ 27 degrees Celsius or less	5.54	3.09	1.38
Limited Forage Fish (Early Life Stages Absent):			
@ 25 degrees Celsius	6.69	3.73	1.67
@ 7 degrees Celsius or less	21.34	11.90	5.33
Limited Aquatic Life:			
@ 25 degrees Celsius	14.50	8.09	3.62
@ 7 degrees Celsius or less	46.29	25.82	11.56

Note: The terms “early life stage present” and “early life stage absent” are defined in subch. III of ch. NR 106.

Table 5

Chronic Toxicity Criteria Using Acute−Chronic Ratios for Substances with Toxicity Unrelated to Water Quality (all in ug/L)

Substance	Cold Water	Warm Water Sportfish and Warm Water Forage	Limited Forage Fish and Limited Aquatic Life
Arsenic (+3)*	148	152.2	152.2
Chromium (+6)*	10.98	10.98	10.98
Mercury (+2)*	0.44	0.44	0.44
Cyanide, free	5.22	11.47	11.47
Chloride	395,000	395,000	395,000
Selenium	5.0	5.0	46.5
Chlorine[1]	7.28	7.28	7.28
Dieldrin	0.055	0.077	0.077
Endrin	0.036	0.050	0.050
Parathion	0.011	0.011	0.011

Note: [1]Criterion listed is applicable to the "total recoverable" form except for chlorine which is applicable to the "total residual" form.

Table 6

Chronic Toxicity Criteria Using Acute−Chronic Ratios for Substances With Toxicity Related to Water Quality (all in ug/L)

Water Quality Parameter: Hardness (in ppm as $CaCO_3$)

$CTC=e^{(V \ln(hardness) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various Hardness (ppm) Levels 50	100	200
Total Recoverable Chromium (+3):					
Cold Water	0.819	0.6851	48.86	86.21	152.1
Warm Water Sportfish	0.819	1.112	74.88	132.1	233.1
All others	0.819	1.112	74.88	132.1	233.1
Total Recoverable Copper:					
All Surface Waters	0.8557	−1.6036	5.72	10.35	18.73
Total Recoverable Lead:					
All Surface Waters	0.9662	−1.1171	14.33	28.01	54.71
Total Recoverable Nickel:					
Cold Water, Warm Water Sportfish, Warm Water Forage, and Limited Forage Fish	0.846	0.059	29.0	52.2	93.8
Limited Aquatic Life	0.846	0.4004	40.8	73.4	132.0
Total Recoverable Zinc					
All Surface Waters	0.8745	0.7634	65.66	120.4	220.7

Water Quality Parameter: pH

$CTC=e^{(V(pH) + \ln CCI)}$

Substance	V	ln CCI	CTC at Various pH (s.u.) Levels 6.5	7.8	8.8
Pentachlorophenol:					
Cold Water	1.0054	−5.1468	4.43	14.81	40.48
All Other Surface Waters	1.0054	−4.9617	5.33	17.82	48.70

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. (5) (f) and Tables 2, 2a, 4, 4a and 6, Register, July, 1995, No. 475, eff. 8−1−95; am. (1) (a) 1., 2., 4., and 5., (1) (b), (3) (intro.), (a) to (g), (4) (a) 1., 7. to 13., (5) (c), renum. (1) (a) 6. to be (1) (a) 10. , (3) (h) to be (3) (i) and am. (1) (a) 10, (4) (a) 6. to be (4) (a) 6. a., (4) (b) to be (4) (c), (5) (e) to (i) to be (5) (d) to (h) and am. (5) (e) to (g), cr. (3) (h), (4) (a) 6. b., (4) (b), (5) (b) 3., (6) to (8), r. and recr., Tables 1 to 2a, 3 to 6, r. (5) (d)**;** am. Tables 1 and 5, Register, January, 2000, No. 529, eff. 2−1−00**;** CR 03−050: am. Tables 2 and 6, cr. Tables 2C and 4B Register February 2004 No. 578, eff. 3−1−04; **CR 07−110: am Tables 2, 2A, 5 and 6 Register November 2008 No. 635, eff. 12−1−08**.

NR 105.07 Wildlife criteria. (1) The wildlife criterion is the concentration of a substance which if not exceeded protects Wisconsin's wildlife from adverse effects resulting from ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state.

(a) For any substance not shown in Table 7, the wildlife criterion (WC) is the lower of the available mammalian or avian wildlife values (WVs) calculated pursuant to sub. (2). A wildlife criterion protective of Wisconsin's reptile fauna may be calculated pursuant to sub. (2) whenever data specific to reptiles are available.

(b) Table 7 contains the wildlife criteria calculated according to the procedures of this chapter.

Table 7
Wildlife Criteria

Substance	Criteria (in ng/L, except where indicated)
DDT & Metabolites	0.011
Mercury	1.3
Polychlorinated Biphenyls	0.12
2,3,7,8 − TCDD	0.003 (pg/L)

(2) (a) Mammalian and avian wildlife values shall be calculated as follows using information available from scientifically acceptable studies of animal species exposed repeatedly to the substance via oral routes including gavage:

$$WV = \frac{NOAEL \times Wt_A \times SSF}{W + \Sigma[F_{TLi} \times BAF_{TLi}]}$$

Where:
- WV= Wildlife value in milligrams per liter (mg/L).
- NOAEL= No observed adverse effect level in milligrams of substance per kilogram of body weight per day (mg/kg−d) as derived from subchronic or chronic mammalian or avian studies or as specified in subs. (3) to (5).
- Wt= Average weight in kilograms (kg) of the representative species.
- W= Average daily volume of water in liters consumed per day (L/d) by the representative species or as specified in sub. (6).
- SSF= Species sensitivity factor, ranging between 0.01 and 1 to account for interspecies differences in sensitivity.
- F_{TLJ}= Average daily amount of food consumed from trophic level i by the representative species in kilograms per day (kg/d) or as specified in sub. (6).
- BAF_{TLJ}= Bioaccumulation factor for wildlife food in trophic level i with units of liter per kilogram (L/kg) as derived in s. NR 105.10. For consumption of piscivorous birds by other birds (e.g., herring gull by eagles), the BAF is derived by multiplying the trophic level 3 BAF for fish by a biomagnification factor to account for the biomagnification from fish to the consumed birds.

(b) The selection of the species sensitivity factor (SSF) shall be based on the available toxicological data base and available physicochemical and toxicokinetic properties of the substance and the amount and quality of available data.

(c) The bald eagle, kingfisher, herring gull, mink and otter are representative of avian and mammalian species to be protected by wildlife criteria. A NOAEL specific to each taxonomic class is used to calculate WVs for each of the 5 representative species. The avian WV is the geometric mean of the WVs calculated for the 3 representative avian species. The mammalian WV is the geometric mean of the WVs calculated for the 2 representative mammalian species.

(d) In those cases in which more than one NOAEL is available, the following shall apply:

1. If more than one NOAEL is available within a taxonomic class, based on the same endpoint of toxicity, the NOAEL from the most sensitive species shall be used.

2. If more than one NOAEL is available for a given species, based on the same enpoint of toxicity, the NOAEL for that species shall be calculated using the geometric mean of those NOAELs.

(e) Because wildlife consume fish from both trophic levels 3 and 4, baseline BAFs shall be available for both trophic levels 3 and 4 to calculate either a criterion or secondary value for a chemical. When appropriate, ingestion through consumption of invertebrates, plants, mammals and birds in the diet of wildlife species to be protected shall be included.

(3) In those cases in which a no observed adverse effect level (NOAEL) is available from studies of mammalian or avian species exposed repeatedly to the substance via oral routes including gavage, but is available in units other than mg/kg−d as specified in sub. (2), the following procedures shall be used to express the NOAEL prior to calculating the wildlife value:

(a) If the NOAEL is given in milligrams of toxicant per liter of water consumed (mg/L), the NOAEL shall be multiplied by the daily average volume of water consumed by the test animals in liters per day (L/d) and divided by the average weight of the test animals in kilograms (kg).

(b) If the NOAEL is given in milligrams of toxicant per kilogram of food consumed (mg/kg), the NOAEL shall be multiplied by the average amount of food in kilograms consumed daily by the test animals (kg/d) and divided by the average weight of the test animals in kilograms (kg).

(4) In those cases in which a NOAEL is unavailable and a lowest observed adverse effect level (LOAEL) is available from studies of animal species exposed repeatedly to the substance via oral routes including gavage, the LOAEL may be substituted with proper adjustment to estimate the NOAEL. An uncertainty factor of between one and 10 may be applied to the LOAEL, depending on the sensitivity of the adverse effect, to reduce the LOAEL into the range of a NOAEL. If the LOAEL is available in units other than mg/kg−d, the LOAEL shall be expressed in the same manner as that specified for the NOAEL in sub. (3).

(5) In instances where a NOAEL is based on subchronic data, an uncertainty factor may be applied to extrapolate from subchronic to chronic levels. The value of the uncertainty factor may not be less than 0.1 and may not exceed 1.0. This factor is to be used when assessing highly bioaccumulative substances where toxicokinetic considerations suggest that a bioassay of limited length underestimates chronic effects.

(6) If drinking or feeding rates are not available for representative species, drinking (W) and feeding rates (F_{TLi}) shall be calculated for representative mammalian or avian species by using the allometric equations given in pars. (a) and (b).

(a) For mammalian species the allometric equations are as follows:

1. $F_{TLi}=0.0687 \times (Wt)^{0.82}$

Where: F_{TLi} = Feeding rate of mammalian species in kilograms per day (kg/d).

Wt = Average weight in kilograms (kg) of the test animals.

2. $W=0.099 \times (Wt)^{0.90}$

Where: W = Drinking rate of mammalian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

(b) For avian species the allometric equations are as follows:

1. $F_{TLi} = 0.0582\ (Wt)^{0.65}$

Where: F_{TLi} = Feeding rate of avian species in kilograms per day (kg/d).

Wt = Average weight in kilograms (kg) of the test animals.

2. $W= 0.059 \times (Wt)^{0.67}$

Where: W = Drinking rate of avian species in liters per day (L/d).

Wt = Average weight in kilograms (kg) of the test animals.

Note: Criteria to protect domestic animals will be considered on an as needed basis using a model that accounts for domestic animal exposure through drinking water. Because domestic animals do not regularly consume aquatic organisms, the wildlife exposure model is not appropriate.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. table 7, Register, July, 1991, No. 427, eff. 8−1−91; am. (1), (2) (a), (b), (3) (intro.), (6) (intro.), r. and recr. (2) (c), (5), cr. (2) (d), (e), r. (6) (a), renum. (6) (b) and (c) to be (6) (a) and (b) and am., Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.08 Human threshold criteria. (1) The human threshold criterion (HTC) is the maximum concentration of a substance established to protect humans from adverse effects resulting from contact with or ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state. Human threshold criteria are derived for those toxic substances for which a threshold dosage or concentration can be estimated below which no adverse effect or response is likely to occur.

(2) For noncarcinogenic components of mixtures in effluents, interactions among substances may be additive, antagonistic or synergistic and may be accounted for by a model that is supported by credible scientific evidence. The risks are assumed to be additive when substances are members of the same structural class and cause potential adverse effects via the same mechanism of action, influencing the same kind of endpoint, and shall be accounted for by a model that is supported by credible scientific evidence.

(3) Human threshold criteria are listed in Table 8. Criteria for the same substance may be different depending on the surface water classification, due to the lipid value of representative fish, a component of the BAF, and whether or not the water may be a source of drinking water. Further application of these criteria to protect drinking water and downstream uses in the Great Lakes system shall be according to s. NR 106.06 (1)

(4) To derive human threshold criteria for substances not included in Table 8 the following methods shall be used:

(a) The human threshold criterion shall be calculated as follows:

$$HTC = \frac{ADE \times 70\ kg \times RSC}{W_H + (F_H \times BAF)}$$

Where: HTC = Human threshold criterion in milligrams per liter (mg/L).

ADE = Acceptable daily exposure in milligrams toxicant per kilogram body weight per day (mg/kg−d) as specified in sub. (5).

70 kg = Average weight of an adult male in kilograms (kg).

RSC = Relative source contribution factor used to account for routes of exposure other than consumption of contaminated water and aquatic organisms. In the absence of sufficient data on alternate sources of exposure, including but not limited to non−fish diet and inhalation, the relative source contribution factor shall be set equal to 0.8.

W_H = Average per capita daily water consumption of 2 liters per day (L/d) for surface waters classified as public water supplies or, for all other surface waters, 0.01 liters per day (L/d) for exposure through body contact or ingestion of small volumes of water during swimming or other recreational activities.

F_H = Average per capita daily consumption of sport−caught fish by Wisconsin anglers equal to 0.02 kilograms per day (kg/d).

BAF = Aquatic organism bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

Table 8
Human Threshold Criteria
(ug/L unless specified otherwise)

		Public Water Supply		Non−Public Water Supply		
	Substance	Warm Water Sport Fish Communities	Cold Water[4] Communities	Warm Water Forage, Limited Forage, and Warm Water Sport Fish Communities	Cold Water Communities	Limited Aquatic Life
1.	Acrolein	7.2	3.4	15	4.4	2,800
2.	Antimony[2]	5.6	5.6	373	373	1,120
3.	Benzene[2]	5	5	610	260	4,000
4.	Bis(2−chloroisopropyl) ether	1,100	1,100	55,000	34,000	220,000
5.	Cadmium[2]	4.4	4.4	370	370	880
6.	*Chlordane (ng/L)	2.4	0.70	2.4	0.70	310,000
7.	Chlorobenzene[2]	100	100	1,210	400	28,000
8.	Chromium, total[2]	100	100			
9.	Chromium (+3)	41,750	41,750	3,818,000	3,818,000	8,400,000
10.	Chromium (+6)	83.5	83.5	7,636	7,636	16,800
11.	Cyanide, Total[2]	138.6	138.6	9,300	9,300	28,000
12.	*4.4'−DDT (ng/L)	3.0	0.88	3.0	0.88	2800000
13.	1,2−Dichlorobenzene[2]	446	273	1,509	481	126,000
14.	1,3−Dichlorobenzene	1,400	710	3,300	1,000	500,000
15.	cis−1,2−Dichloroethene[2]	70	70	14,000	9,000	56,000
16.	trans−1,2−Dichloroethene[2]	100	100	24,000	13,000	110,000
17.	Dichloromethane[2] (methylene chloride)	5	5	95,000	72,000	328,000
18.	2,4−Dichlorophenol	74	58	580	180	17,000
19.	Dichloropropenes[3] (1,3−Dichloropropene)	8.3	8.2	420	260	1,700
20.	*Dieldrin (ng/L)	0.59	0.17	0.59	0.17	280,000
21.	2,4−Dimethylphenol	450	430	11,000	4,500	94,000
22.	Diethyl phthalate[2]	5,000	5,000	68,000	21,000	4,500,000
23.	Dimethyl phthalate (mg/L)	241	184	1,680	530	56,000
24.	4,6−Dinitro−o−cresol	100	96	1,800	640	22,000
25.	Dinitrophenols[3] (2,4−Dinitrophenol)	55	55	2,800	1,800	11,000
26.	2,4−Dinitrotoluene	0.51	0.48	13	5.3	110
27.	Endosulfan	87	41	181	54	33,600
28.	Ethylbenzene[2]	567	401	2,920	931	140,000
29.	Fluoranthene	890	610	4,300	1,300	220,000
30.	*Hexachlorobenzene	0.075	0.022	0.075	0.022	4,500
31.	Hexachlorocyclopentadiene	34.7	25.6	195	65.3	8,400
32.	Hexachloroethane	8.7	3.3	13	3.7	5,600
33.	*gamma−BHC (lindane)	0.20	0.20	0.84	0.25	1,900
34.	Isophorone	5,500	5,300	180,000	80,000	1,100,000
35.	Lead	10	10	140	140	2,240
36.	*Mercury[5]	0.0015	0.0015	0.0015	0.0015	336
37.	Nickel[2]	100	100	43,000	43,000	110,000
38.	*Pentachlorobenzene	0.46	0.14	0.47	0.14	4,500
39.	Selenium[2]	50	50	2,600	2,600	28,000
40.	Silver	140	140	28,000	28,000	28,000
41.	*2,3,7,8−TCDD (pg/L)	0.11	0.032	0.11	0.032	7,300
42.	*1,2,4,5−Tetrachlorobenzene	0.54	0.17	0.58	0.17	1,700
43.	Tetrachloroethene	5.8	4.6	46	15	1,300
44.	Toluene[2]	1,000	1,000	15,359	5,201	280,000
45.	1,1,1−Trichloroethane[2]	200	200	270,000	110,000	2,000,000
46.	2,4,5−Trichlorophenol	1,600	830	3,900	1,200	560,000

* Indicates substances that are BCCs.

[1] A human threshold criterion expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000.

[2] For this substance the human threshold criteria for public water supply receiving water classifications equal the maximum contaminant level pursuant to s. NR 105.08 (4) (b).

[3] The human threshold criteria for this chemical class are applicable to each isomer.

4 For BCCs, these criteria apply to all water of the Great Lakes system.

[5] The mercury criteria were calculated using 20 g/day fish consumption and the human non−cancer criteria derivation procedure in 40 CFR Part 132, Appendix C. For these criteria, 40 CFR Part 132, Appendix C as stated on September 1, 1997 is incorporated by reference.

(b) For surface waters classified as public water supplies, if the human threshold criterion for a toxic substance as calculated in par. (a) exceeds the maximum contaminant level (MCL) for that substance as specified in ch. NR 809 or the July 8, 1987 Federal Register (52 FR 25690), the MCL shall be used as the human threshold criterion.

(5) The acceptable daily exposure (ADE) referenced in sub. (4) represents the maximum amount of a substance which if ingested daily for a lifetime results in no adverse effects to humans. Paragraphs (a) to (c) list methods for determining the acceptable daily exposure.

(a) The department shall review available references for acceptable daily exposure or equivalent values, such as a reference dose (RfD) as used by the U.S. environmental protection agency, and for human or animal toxicological data from which an acceptable daily exposure can be derived. Suitable references for review include, but are not limited to, those presented in s. NR 105.04 (5).

(b) When human or animal toxicological data are available, the department may derive an acceptable daily exposure by using as guidance procedures presented by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1986). Additional guidance for deriving acceptable daily exposures from toxicological data are given in subds. 1. to 4. Alternate procedures may be used if supported by credible scientific evidence.

1. No observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) from studies of humans or mammalian test species shall be divided by an uncertainty factor to derive an acceptable daily exposure. Uncertainty factors reflect uncertainties in predicting acceptable exposure levels for the general human population based upon experimental animal data or limited human data. Factors to be considered when selecting an uncertainty factor include, but are not limited to, interspecies and individual variations in response and susceptibility to a toxicant, and the quality and quantity of the available data. The following guidelines shall be considered when selecting an uncertainty factor:

a. Use an uncertainty factor of 10 when extrapolating from valid experimental results from studies on prolonged ingestion by humans. This 10−fold factor protects sensitive members of the human population.

b. Use an uncertainty factor of 100 when extrapolating from valid results of long−term feeding studies on experimental animals with results of studies of human ingestion not available or insufficient (e.g., acute exposure only). This represents an additional 10−fold uncertainty factor in extrapolating data from the average animal to the average human.

c. Use an uncertainty factor of 1000 when extrapolating from less than chronic results on experimental animals with no useful long−term or acute human data. This represents an additional 10−fold uncertainty factor in extrapolating from less than chronic to chronic exposures.

d. Use an additional uncertainty factor of between 1 and 10 depending on the severity of the adverse effect when deriving an acceptable daily exposure from a lowest observable adverse effect level (LOAEL). This uncertainty factor reduces the LOAEL into the range of a no observable adverse effect level (NOAEL).

e. Use an additional uncertainty factor of 10 when deriving an acceptable daily exposure for a substance which the U.S. environmental protection agency classifies as a "group C" carcinogen, but which is not defined as a carcinogen in s. NR 105.03 (13).

2. Results from studies of humans or mammalian test species used to derive acceptable daily exposures shall have units of milligrams of toxicant per kilogram of body weight per day (mg/kg−d). When converting study results to the required units, a water consumption of 2 liters per day (L/d) and a body weight of 70 kilograms (kg) is assumed for humans. The following examples and procedures illustrate the conversion of units:

a. Results from human studies which are expressed in milligrams of toxicant per liter of water consumed (mg/L) are converted to mg/kg−d by multiplying the results by 2 L/d and dividing by 70 kg.

b. Results from animal studies which are expressed in milligrams of toxicant per liter of water consumed (mg/L) are converted to mg/kg−d by multiplying the results by the daily average volume of water consumed by the test animals in liters per day (L/d) and dividing by the average weight of the test animals in kilograms (kg).

c. Results from animal studies which are expressed in milligrams of toxicant per kilogram of food consumed (mg/kg) are converted to mg/kg−d by multiplying the results by the average amount of food consumed daily by the test animals in kilograms per day (kg/d) and dividing by the average weight of the test animals in kilograms (kg).

d. If a study does not specify water or food consumption rates, or body weight of the test animals, standard values taken from appropriate references, such as the National Institute of Occupational Safety and Health, 1980, Registry of Toxic Effects of Chemical Substances, may be used to convert units.

e. Results from animal studies in which test animals were not exposed to the toxicant each day of the test period shall be multiplied by the ratio of days that the test animals were dosed to the total days of the test period. For the purposes of this adjustment, the test period is defined as the interval beginning with the administration of the first dose and ending with the administration of the last dose, inclusive.

3. When assessing the acceptability and quality of human or animal toxicological data from which an acceptable daily exposure can be derived, the department may use the following documents as guidance:

a. "Guidelines for Mutagenicity Risk Assessment", (51 FR 34006, September 24, 1986).

b. "Guidelines for the Health Risk Assessment of Chemical Mixtures", (51 FR 34014, September 24, 1986).

c. "Guidelines for the Health Assessment of Suspect Development Toxicants", (51 FR 34028, September 24, 1986).

d. "Guidelines for Exposure Assessment", (51 FR 34042, September 24, 1986).

e. Any other documents that the department deems reliable.

4. When the available human or animal toxicological data contains conflicting information, the department may consult with experts outside of the department for guidance in the selection of the appropriate data.

(c) Using sound scientific judgment, the department shall select an acceptable daily exposure as derived in pars. (a) and (b) for calculation of the human threshold criterion. When selecting an acceptable daily exposure, the department shall adhere to the following guidelines unless a more appropriate procedure is supported by credible scientific evidence:

1. Acceptable daily exposures based on human studies are given preference to those based on animal studies.

2. When deriving an acceptable daily exposure from animal studies preference is given to chronic studies involving oral routes of exposure, including gavage, over a significant portion of the animals' life span. If acceptable studies using oral exposure routes are not available, acceptable daily exposures derived from studies using alternate exposure routes, such as inhalation, may be used.

3. When 2 or more acceptable daily exposure values are available and have been derived from studies having equal preference as defined in subds. 1. and 2., the lowest acceptable daily exposure is generally selected. If the acceptable daily exposure values differ significantly, the department may consult with experts outside of the department for guidance in the selection of the more appropriate acceptable daily exposure.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; correction in (3) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, September, 1995, No. 477; renum. (2) to (4) to be (3) to (5) and am., cr. (2), r. and recr. Table 8, am. (5) (intro.), 1. (intro.),

d., e., 2 (intro.) and (c) and am., Register, August, 1997, No. 500, eff. 9−1−97; CR 03−050: am. Table 8 Register February 2004 No. 578, eff. 3−1−04; **CR 07−110: am. Table 8 Register November 2008 No. 635, eff. 12−1−08**.

NR 105.09 Human cancer criteria. (1) The human cancer criterion (HCC) is the maximum concentration of a substance or mixture of substances established to protect humans from an unreasonable incremental risk of cancer resulting from contact with or ingestion of surface waters of the state and from ingestion of aquatic organisms taken from surface waters of the state. Human cancer criteria are derived for those toxic substances which are carcinogens as defined in s. NR 105.03 (13).

(2) For any single carcinogen or any mixture of carcinogens the incremental cancer risk from exposure to surface waters and aquatic organisms taken from surface waters may not exceed one in 100,000. The combined cancer risk of individual carcinogens in a mixture is assumed to be additive unless an alternate model is supported by credible scientific evidence.

(3) Human cancer criteria are listed in Table 9. Criteria for the same substance may be different depending on the surface water classification, due to the lipid value of representative fish, a component of the BAF, and whether or not the water may be a source of drinking water. Further application of these criteria to protect drinking water and downstream uses in the Great Lakes system shall be according to s. NR 106.06 (1).

Table 9
Human Cancer Criteria
(ug/L unless specified otherwise[1])

		Public Water Supply		Non−Public Water Supply		
	Substance	Warm Water Sport Fish Communities	Cold Water[4] Communities	Warm Water Forage, Limited Forage, and Warm Water Sport Fish Communities	Cold Water Communities	Limited Aquatic Life
1.	Acrylonitrile	0.57	0.45	4.6	1.5	130
2.	Arsenic[2]	0.2	0.2	13.3	13.3	40
3.	*alpha−BHC	0.012	0.0037	0.013	0.0039	11
4.	*gamma−BHC (lindane)	0.052	0.018	0.064	0.019	54
5.	*BHC, technical grade	0.038	0.013	0.047	0.014	39
6.	Benzene[2]	5	5	140	45	1300
7.	Benzidine (ng/L)	1.5	1.5	81	55	300
8.	Beryllium	0.054	0.054	0.33	0.33	16
9.	Bis(2−chloroethyl) ether	0.31	0.29	7.6	3.0	64
10.	Bis(chloromethyl) ether (ng/L)	1.6	1.6	96	79	320
11.	Carbon tetrachloride	2.5	2.1	29	9.5	540
12.	*Chlordane (ng/L)	0.41	0.12	0.41	0.12	54000
13.	Chloroethene (vinyl chloride)	0.18	0.18	10	6.8	37
14.	Chloroform (trichloromethane)	55	53	1960	922	11200
15.	*4,4'−DDT (ng/L)	0.22	0.065	0.22	0.065	206000
16.	1,4−Dichlorobenzene	14	12	163	54	2940
17.	3,3'−Dichlorobenzidine	0.5	0.3	1.3	0.4	140
18.	1,3−Dichloropropene	3.4	3.4	173	108	700
19.	1,2−Dichloroethane	3.8	3.8	217	159	770
20.	Dichloromethane[2] (methylene chloride)	5	5	2700	2100	9600
21.	*Dieldrin (ng/L)	0.0091	0.0027	0.0091	0.0027	4400
22.	2,4−Dinitrotoluene	0.51	0.48	13	5.3	110
23.	1,2−Diphenylhydrazine	0.38	0.31	3.3	1.04	88
24.	Halomethanes[3]	55	53	1960	922	11200
25.	*Hexachlorobenzene (ng/L)	0.73	0.22	0.73	0.22	44000
26.	*Hexachlorobutadiene	0.59	0.19	0.69	0.2	910
27.	Hexachloroethane	7.7	2.9	11	3.3	5000
28.	N−Nitrosodiethylamine (ng/L)	2.3	2.3	150	140	460
29.	N−Nitrosodimethylamine	0.0068	0.0068	0.46	0.46	1.4
30.	N−Nitrosodi−n−butylamine	0.063	0.062	2.5	1.3	13
31.	N−Nitrosodiphenylamine	44	23	116	34	13000
32.	N−Nitrosopyrrolidine	0.17	0.17	11	11	34
33.	*Polychlorinated biphenyls (ng/L)	0.01	0.003	0.01	0.003	9100
34.	*2,3,7,8−Tetrachlorodibenzo−p−dioxin (pg/L)	0.014	0.0041	0.014	0.0041	930
35.	1,1,2,2−Tetrachloroethane	1.7	1.6	52	22	350
36.	Tetrachloroethene	5.8	4.6	46	15	1300
37.	*Toxaphene (ng/L)	0.11	0.034	0.14	0.034	63600
38.	1,1,2−Trichloroethane[2]	6.0	6.0	195	87	1200
39.	Trichloroethene[2]	5	5	539	194	6400
40.	2,4,6−Trichlorophenol	29	24	300	97	6400

* Indicates substances that are BCCs.

[1] A human cancer criterion expressed in micrograms per liter (ug/L), nanograms per liter (ng/L) or picograms per liter (pg/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000, 1,000,000 or 1,000,000,000, respectively.

[2] For this substance the human cancer criteria for public water supply receiving water classifications equal the maximum contaminant level pursuant to s. NR 105.09 (4) (b).

[3] Human cancer criteria for halomethanes are applicable to any combination of the following chemicals: bromomethane (methyl bromide), chloromethane (methyl chloride), tribromomethane (bromoform), bromodichloromethane (dichloromethyl bromide), dichlorodifluoromethane (fluorocarbon 12) and trichlorofluoromethane (fluorocarbon 11).

[4] For BCCs, these criteria apply to all waters of the Great Lakes system.

(4) To derive human cancer criteria for substances not included in Table 9 the following methods shall be used:

(a) The human cancer criterion shall be calculated as follows:

$$HCC = \frac{RAD \times 70\ kg}{W_H + (F_H \times BAF)}$$

Where:

- HCC = Human cancer criterion in milligrams per liter (mg/L).
- RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg−d) that is associated with a lifetime incremental cancer risk equal to one in 100,000 as derived in sub. (5).
- 70 kg = Average weight of an adult male in kilograms (kg).
- W_H = Average per capita daily water consumption of 2 liters per day (L/d) for surface waters classified as public water supplies or, for other surface waters, 0.01 liters per day (L/d) for exposure through contact or ingestion of small volumes of water during swimming or during other recreational activities.
- F_H = Average per capita daily consumption of sport−caught fish by Wisconsin anglers equal to 0.02 kilograms per day (kg/d).
- BAF = Aquatic life bioaccumulation factor with units of liter per kilogram (L/kg) as derived in s. NR 105.10.

(b) For surface waters classified as public water supplies, if the human cancer criterion for a toxic substance as calculated in par. (a) exceeds the maximum contaminant level (MCL) for that substance as specified in ch. NR 809 or the July 8, 1987 Federal Register (52 FR 25690), the MCL shall be used as the human cancer criterion.

(5) The risk associated dose (RAD) referenced in sub. (4) represents the maximum amount of a substance which if ingested daily for a lifetime of 70 years has an incremental cancer risk equal to one case of human cancer in a population of 100,000. Methods for deriving the risk associated dose are specified in pars. (a) to (d).

(a) The department shall review available references for acceptable human and animal studies from which the risk associated dose can be derived. The department shall use sound scientific judgment when determining the acceptability of a study and may use the U.S. environmental protection agency's "Guidelines for Carcinogen Risk Assessment" (FR 51 33992, September 24, 1986) as guidance for judging acceptability. Suitable references for review include, but are not limited to, those presented in s. NR 105.04 (5).

(b) If an acceptable human epidemiologic study is available, contains usable exposure data, and indicates a carcinogenic effect, the risk associated dose shall be set equal to the lifetime average exposure which would produce an incremental cancer risk of one in 100,000 based on the exposure information from the study and assuming the excess cancer risk is proportional to the lifetime average exposure. If more than one human epidemiologic study is judged to be acceptable, the most protective risk associated dose derived from the studies is generally used to calculate the human cancer criterion. If the risk associated dose values differ significantly, the department may consult with experts outside of the department for guidance in the selection of the more appropriate value.

(c) In the absence of an acceptable human epidemiologic study, the risk associated dose shall be derived from available studies which use mammalian test species and which are judged acceptable. Methods for deriving the risk associated dose are specified in subds. 1. to 4.

1. A linear, non−threshold dose−response relationship as applied by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1980) shall be assumed unless a more appropriate dose−response relationship or extrapolation model is supported by credible scientific evidence.

Note: The linear non−threshold dose−response model used by the U.S. environmental protection agency provides an upper−bound estimate (i.e., the one−sided 95% upper confidence limit) of incremental cancer risk. The true cancer risk is unknown. While the true cancer risk is not likely to be greater than the upper bound estimate, it may be lower.

2. When a linear, non−threshold dose−response relationship is assumed, the risk associated dose shall be calculated using the following equation:

$$RAD = \frac{1}{q_1^*} \times 0.00001$$

Where:

- RAD = Risk associated dose in milligrams toxicant per kilogram body weight per day (mg/kg−d).
- 0.00001 = Incremental risk of human cancer equal to one in 100,000.
- q_1^* = Upper 95% confidence limit (one−sided) of the carcinogenic potency factor in days per milligram toxicant per kilogram body weight (d−kg/mg) as derived from the procedures referenced in subd. 1. and the guidance presented in subd. 3.

3. The department shall adhere to the following guidance for deriving carcinogenic potency factors, or corresponding values if an alternate dose−response relationship or extrapolation model is used, unless more appropriate procedures are supported by credible scientific evidence:

a. If 2 or more mammalian studies are judged acceptable, but vary in either species, strain or sex of the test animals, or in tumor type or site, the study giving the greatest carcinogenic potency factor shall be used. Studies which produce a spuriously high carcinogenic potency factor due to the use of a small number of test animals may be excluded.

b. If 2 or more mammalian studies are judged acceptable, are comparable in size and are identical in regard to species, strain and sex of the test animals and to tumor sites, the geometric mean of the carcinogenic potency factors derived from each study shall be used.

c. If in an acceptable study, tumors were induced at more than one site, the number of animals with tumors at one or more of the sites shall be used as incidence data when deriving the cancer potency factor.

d. The combination of benign and malignant tumors shall be used as incidence data when deriving the cancer potency factor.

e. Calculation of an equivalent dose between animal species and humans using a surface area conversion, and conversion of units of exposure to milligrams of toxicant per day (mg/d) shall be performed as specified by the U.S. environmental protection agency in "Water Quality Criteria Documents; Availability" (45 FR 79318, November 28, 1980).

f. If the duration of the mammalian study (D) is less than the natural life span of the test animal (LS), the carcinogenicity potency factor is multiplied by the factor (D/LS)3.

4. When available mammalian studies contain conflicting information, the department shall consult with the department of health and social services and may consult with experts outside of the department for guidance in the selection of the appropriate study.

(d) If both a human epidemiologic study and a study of mammalian test species are judged reliable but only the animal study indicates a carcinogenic effect, it is assumed that a risk of cancer to humans exists but that it is less than could have been detected in the epidemiologic study. An upper limit of cancer incidence may be calculated assuming that the true incidence is just below the level of detection in the cohort of the epidemiologic study. The department may consult with experts outside of the department for guidance in the selection of the appropriate study.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; am. table 9 and (6), Register, July, 1991, No. 427, eff. 8−1−91; correction in (4) (b) made under s. 13.93 (2m) (b) 7., Stats., Register, September, 1995, No. 477; am. (1), (3), r. and recr. Table 9, am. (4) (a), (b), (5) (intro.), (a) (b), (c) (intro.) and 2., r. (6), Register, August, 1997, No. 500, eff. 9−1−97; CR 03−050: am. Table 9 Register February 2004 No. 578, eff. 3−1−04; **CR 07−110: am. Table 9 Register November 2008 No. 635, eff. 12−1−08**.

NR 105.10 Bioaccumulation factor. (1) The bioaccumulation factor used to derive wildlife, human threshold, human cancer and taste and odor criteria or secondary values is determined from a baseline BAF using the methodology provided in Appendix B to 40 CFR part 132. 40 CFR part 132, Appendix B as stated on September 1, 1997, is incorporated by reference. BAFs shall be used to calculate criteria and secondary values for human health and wildlife. Use of a BAF greater than 1000, as determined from either of the methods referred to in sub. (2) (c) or (d) for organic substances, will result in the calculation of a secondary value. The baseline BAF is based on the concentration of freely dissolved substances in the ambient water to facilitate extrapolation from one water to another.

(2) Baseline BAFs shall be derived using one of the following 4 methods, which are listed from most preferred to least preferred.

(a) A measured baseline BAF for an organic or inorganic substance derived from a field study of acceptable quality;

(b) A predicted baseline BAF for an organic substance derived using field−measured BSAFs of acceptable quality;

(c) A predicted baseline BAF for an organic or inorganic substance derived from a BCF measured in a laboratory study of acceptable quality and a food−chain multiplier. Food−chain multipliers are provided in 40 CFR part 132, Appendix B; or

(d) A predicted baseline BAF for an organic substance derived from a K_{OW} of acceptable quality and a food−chain multiplier.

(3) REVIEW AND SELECTION OF DATA. Measured BAFs, BSAFs and BCFs shall meet the quality assurance requirements provided in 40 CFR part 132, Appendix B and shall be obtained from available sources including the following:

(a) EPA Ambient Water Quality Criteria documents issued after January 1, 1980.

(b) Published scientific literature.

(c) Reports issued by EPA or other reliable sources.

(d) Unpublished data.

(4) HUMAN HEALTH AND WILDLIFE BAFS FOR ORGANIC SUBSTANCES. (a) To calculate human health and wildlife BAFs for organic substances, the K_{OW} of the substance shall be used with a POC concentration of 0.00000004 kg/L and a DOC concentration of 0.000002 kg/L to yield the fraction freely dissolved:

$$f_{fd} = \frac{1}{1 + \frac{(DOC)(K_{ow})}{10} + (POC)(Kow)}$$

$$= \frac{1}{1 + \frac{(0.000002\ kg/L)(K_{ow})}{10} + (0.00000004\ kg/L)(Kow)}$$

$$= \frac{1}{1 + (0.00000024\ kg/L)(K_{ow})}$$

Where:

DOC = concentration of dissolved organic carbon, kg of dissolved organic carbon/L of water.

POC = concentration of particulate organic carbon, kg of particulate organic carbon/L of water.

(b) The human health BAFs for an organic substance shall be calculated using the following equations:

For warm water communities:

Human Health BAF = $[(\text{baseline BAF})(0.013) + 1](f_{fd})$

For cold water communities:

Human Health BAF = $[(\text{baseline BAF})(0.044) + 1](f_{fd})$

Where: 0.013 and 0.044 are the fraction lipid values for warm and cold water fish and aquatic life communities, respectively, that are required to derive human health criteria and secondary values.

baseline BAF = the baseline BAF calculated according to 40 CFR part 132, Appendix B.

(c) The wildlife BAFs for an organic substance shall be calculated using the following equations:

1. For trophic level 3:
   Wildlife BAF = $[(\text{baseline BAF})(0.0646) + 1](f_{fd})$
2. For trophic level 4:
   Wildlife BAF = $[(\text{baseline BAF})(0.1031) + 1](f_{fd})$

Where: 0.0646 and 0.1031 are the standardized fraction lipid values for dietary consumption from trophic level 3 and 4 fish taxa, respectively, that are required to derive wildlife criteria and secondary values.

baseline BAF = the baseline BAF calculated according to 40 CFR part 132, Appendix B.

(5) HUMAN HEALTH AND WILDLIFE BAFS FOR INORGANIC SUBSTANCES. (a) *Human health.* 1. Measured BAFs and BCFs used to determine human health BAFs for inorganic substances shall be based on edible tissue (e.g., muscle) of freshwater fish. If it is demonstrated that whole−body BAFs or BCFs are similar to edible−tissue BAFs or BCFs, then these data are acceptable. BCFs and BAFs based on measurements of aquatic plants and invertebrates may not be used in the derivation of human health criteria and values.

2. If one or more field−measured baseline BAFs for an inorganic substance are available from studies conducted in the Great Lakes system with the muscle of fish, the geometric mean of the species mean baseline BAFs shall be used as the human health BAF for that substance.

3. If an acceptable measured baseline BAF is not available for an inorganic substance and one or more acceptable edible−portion BCFs are available for the substance, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM will be 1.0 unless chemical−specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the human health BAF for that substance.

(b) *Wildlife.* 1. Measured BAFs and BCFs used to determine wildlife BAFs for inorganic substances shall be based on whole−body freshwater fish and invertebrate data. If it is demonstrated that edible−tissue BAFs or BCFs are similar to whole−body BAFs or BCFs, then these data are acceptable.

2. If one or more field−measured baseline BAFs for an inorganic substance is available from studies conducted in the Great Lakes system with whole body of fish or invertebrates, then the following apply:

a. For each trophic level, a species mean measured baseline BAF shall be calculated as the geometric mean if more than one measured BAF is available for a given species.

b. For each trophic level, the geometric mean of the species mean measured baseline BAFs shall be used as the wildlife BAF for that substance.

3. If an acceptable measured baseline BAF is not available for an inorganic substance and one or more acceptable whole−body BCFs are available for the substance, a predicted baseline BAF shall be calculated by multiplying the geometric mean of the BCFs times a FCM. The FCM shall be 1.0 unless chemical−specific biomagnification data support using a multiplier other than 1.0. The predicted baseline BAF shall be used as the wildlife BAF for that substance.

Note: Copies of 40 CFR Part 132, Appendix B are available for inspection in the offices of the department of natural resources, secretary of state and the legislative reference bureau, Madison, WI or may be purchased from the superintendent of documents, US government printing office, Washington, D.C. 20402.

History: Cr. Register, February, 1989, No. 398, eff. 3−1−89; r. and recr., Register, August, 1997, No. 500, eff. 9−1−97.

NR 105.11 Final plant values. (1) A Final Plant Value (FPV) is the lowest plant value that was obtained with an important aquatic plant species in an acceptable toxicity test for which the concentrations of the test substance were measured and the adverse effect was biologically important. Appropriate measures of the toxicity of the substance to aquatic plants are used to compare the relative sensitivities of aquatic plants and animals.

(2) A plant value is the result of a 96−hour test conducted with an algae or a chronic test conducted with an aquatic vascular plant. A test of the toxicity of a metal to a plant may not be used if the medium contained an excessive amount of a complexing agent, such as EDTA, that might affect the toxicity of the metal. Concentrations of EDTA above 200 μg/L should be considered excessive.

(3) The FPV shall be established by selecting the lowest result from a test with an important aquatic plant species in which the concentrations of test material are measured and the endpoint is biologically important.

Note: Although procedures for conducting and interpreting the results of toxicity tests with plants are not well advanced, results of tests with plants usually indicate that criteria which adequately protect aquatic animals and their uses will, in most cases, also protect aquatic plants and their uses.

History: Cr. Register, August, 1997, No. 500, eff. 9−1−97.

APPENDIX 4.3.8.1-1 Gile Flowage Storage Reservoir Project Water Quality Monitoring Data

Monitoring Station

Station ID 263041
Station Name Gile Flowage - 3/4 Mile Above Dam

Show specific parameter: <Show All>

Sample Results

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Appraisal Monitoring 2000	08/09/2000 02:45 PM	TEMPERATURE FIELD		21.5	C		
Appraisal Monitoring 2000	08/09/2000 02:45 PM	CONDUCTIVITY FIELD		51	UMHOS/CM		
Appraisal Monitoring 2000	08/09/2000 02:45 PM	TEMPERATURE AT LAB		16	C		
Appraisal Monitoring 2000	08/09/2000 02:45 PM	DISSOLVED OXYGEN FIELD		7.0	MG/L		
Appraisal Monitoring 2000	08/09/2000 02:45 PM	PHOSPHORUS TOTAL		*0.025	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	COLOR		*110.	SU		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	TEMPERATURE AT LAB		16	C		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	NITROGEN KJELDAHL TOTAL		*0.82	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	NITROGEN NO3+NO2 DISS (AS N)		*0.016	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	PHOSPHORUS TOTAL		*0.030	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	CALCIUM TOTAL		6.4	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	MAGNESIUM TOTAL		1.7	MG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	SAMPLE SIZE LITERS		500	ML		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	CHLOROPHYLL A UNCORRECTED		*4.7	UG/L		
Lake Baseline Monitoring, DNR (1970s-2006)	08/09/2000 02:30 PM	SECCHI DEPTH - FEET		5.0	FEET		
Appraisal Monitoring 2000	07/20/2000 01:45 PM	TEMPERATURE FIELD		20.6	C		
Appraisal Monitoring 2000	07/20/2000 01:45 PM	TEMPERATURE AT LAB		ICED	C		
Appraisal Monitoring 2000	07/20/2000 01:45 PM	DISSOLVED OXYGEN FIELD		6.3	MG/L		
Appraisal Monitoring 2000	07/20/2000 01:45 PM	PH FIELD		7.0	SU		
Appraisal Monitoring 2000	07/20/2000 01:45 PM	PHOSPHORUS TOTAL		0.023	MG/L		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	TEMPERATURE FIELD		21.7	C		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	CLOUD COVER		60	%		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	TEMPERATURE AT LAB		ICED	C		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	DISSOLVED OXYGEN FIELD		6.9	MG/L		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	PH FIELD		7.0	SU		

Monitoring Station

Station ID 263041
Station Name Gile Flowage - 3/4 Mile Above Dam

Show specific parameter: <Show All> ▼

Sample Results

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Appraisal Monitoring 2000	07/20/2000 01:30 PM	PHOSPHORUS TOTAL		0.023	MG/L		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	SAMPLE SIZE LITERS		800	ML		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	CHLOROPHYLL A UNCORRECTED		5.	UG/L		
Appraisal Monitoring 2000	07/20/2000 01:30 PM	SECCHI DEPTH - FEET		6.0	FEET		
Appraisal Monitoring 2000	06/13/2000 01:40 PM	TEMPERATURE FIELD		18.2	C		
Appraisal Monitoring 2000	06/13/2000 01:40 PM	TEMPERATURE AT LAB		ICED	C		
Appraisal Monitoring 2000	06/13/2000 01:40 PM	DISSOLVED OXYGEN FIELD		7.7	MG/L		
Appraisal Monitoring 2000	06/13/2000 01:40 PM	PH FIELD		7.3	SU		
Appraisal Monitoring 2000	06/13/2000 01:40 PM	PHOSPHORUS TOTAL		*0.020	MG/L		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	TEMPERATURE FIELD		19.5	C		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	CLOUD COVER		90	%		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	TEMPERATURE AT LAB		ICED	C		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	DISSOLVED OXYGEN FIELD		8.0	MG/L		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	PH FIELD		7.3	SU		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	PHOSPHORUS TOTAL		*0.019	MG/L		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	SAMPLE SIZE LITERS		800	ML		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	CHLOROPHYLL A UNCORRECTED		*3.0	UG/L		
Appraisal Monitoring 2000	06/13/2000 01:30 PM	SECCHI DEPTH - FEET		6.1	FEET		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	TEMPERATURE FIELD		19.0	C		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	CLOUD COVER		100	%		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	SECCHI DEPTH		1.3	M		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	TEMPERATURE AT LAB		ICED	C		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	DISSOLVED OXYGEN FIELD		8.5	MG/L		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	PH FIELD		7.2	SU		
BASIC AGREEMENT 1988 (1895 fieldwork events)	08/14/1997 09:00 AM	PHOSPHORUS TOTAL		0.032	MG/L		

Monitoring Station

Station ID 263041
Station Name Gile Flowage - 3/4 Mile Above Dam

Show specific parameter: <Show All> ▼

Sample Results

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
LAKE EVALUATION	08/03/1994 02:31 PM	TEMPERATURE FIELD		21.5	C		
LAKE EVALUATION	08/03/1994 02:31 PM	TEMPERATURE AT LAB		8	C		
LAKE EVALUATION	08/03/1994 02:31 PM	DISSOLVED OXYGEN FIELD		7.0	MG/L		
LAKE EVALUATION	08/03/1994 02:31 PM	PH FIELD		7.4	SU		
LAKE EVALUATION	08/03/1994 02:31 PM	PHOSPHORUS TOTAL		0.030	MG/L		
LAKE EVALUATION	08/03/1994 02:30 PM	TEMPERATURE FIELD		24.0	C		
LAKE EVALUATION	08/03/1994 02:30 PM	CLOUD COVER		20	%		
LAKE EVALUATION	08/03/1994 02:30 PM	SECCHI DEPTH		1.3	M		
LAKE EVALUATION	08/03/1994 02:30 PM	TEMPERATURE AT LAB		8	C		
LAKE EVALUATION	08/03/1994 02:30 PM	DISSOLVED OXYGEN FIELD		8.2	MG/L		
LAKE EVALUATION	08/03/1994 02:30 PM	PH FIELD		7.6	SU		
LAKE EVALUATION	08/03/1994 02:30 PM	PHOSPHORUS TOTAL		0.032	MG/L		
LAKE EVALUATION	08/03/1994 02:30 PM	CHLOROPHYLL A UNCORRECTED		6.90	UG/L		
LAKE EVALUATION	06/21/1994 08:16 AM	TEMPERATURE FIELD		19.4	C		
LAKE EVALUATION	06/21/1994 08:16 AM	TEMPERATURE AT LAB		ICED	C		
LAKE EVALUATION	06/21/1994 08:16 AM	DISSOLVED OXYGEN FIELD		3.9	MG/L		
LAKE EVALUATION	06/21/1994 08:16 AM	PH FIELD		7.4	SU		
LAKE EVALUATION	06/21/1994 08:16 AM	PHOSPHORUS TOTAL		0.020	MG/L		
LAKE EVALUATION	06/21/1994 08:15 AM	TEMPERATURE FIELD		22.1	C		
LAKE EVALUATION	06/21/1994 08:15 AM	CLOUD COVER		0	%		
LAKE EVALUATION	06/21/1994 08:15 AM	SECCHI DEPTH		1.3	M		
LAKE EVALUATION	06/21/1994 08:15 AM	TEMPERATURE AT LAB		ICED	C		
LAKE EVALUATION	06/21/1994 08:15 AM	DISSOLVED OXYGEN FIELD		7.5	MG/L		
LAKE EVALUATION	06/21/1994 08:15 AM	PH FIELD		6.4	SU		
LAKE EVALUATION	06/21/1994 08:15 AM	PHOSPHORUS TOTAL		0.013	MG/L		

Monitoring Station

Station ID 263041
Station Name Gile Flowage - 3/4 Mile Above Dam

Show specific parameter: <Show All> ▼

Sample Results

Previous 76-76 of 76 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
LAKE EVALUATION	06/21/1994 08:15 AM	CHLOROPHYLL A UNCORRECTED		6.26	UG/L		

Monitoring Station

Station ID 10029743
Station Name West Fork Montreal River at West Branch Road

Show specific parameter: <Show All>

Sample Results

Previous 1-25 of 412 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
	09/30/2019 02:00 PM	SUSPENDED SOLIDS TOTAL		17.2	MG/L		
	09/30/2019 02:00 PM	ALKALINITY TOTAL CACO3		17.4	MG/L		
	09/30/2019 02:00 PM	CALCIUM TOTAL		8790	UG/L		
	09/30/2019 02:00 PM	MAGNESIUM TOTAL		2200	UG/L		
	09/30/2019 02:00 PM	SODIUM TOTAL		1160	UG/L		
	09/30/2019 02:00 PM	POTASSIUM, TOTAL		0.889	MG/L		
	09/30/2019 02:00 PM	CHLORIDE		0.97	MG/L		
	09/30/2019 02:00 PM	SULFATE TOTAL		1.5	MG/L		
	07/15/2019 11:55 AM	SUSPENDED SOLIDS TOTAL		1.2	MG/L		
	07/15/2019 11:55 AM	ALKALINITY TOTAL CACO3		48.2	MG/L		
	07/15/2019 11:55 AM	CALCIUM TOTAL		12100	UG/L		
	07/15/2019 11:55 AM	MAGNESIUM TOTAL		3050	UG/L		
	07/15/2019 11:55 AM	SODIUM TOTAL		2120	UG/L		
	07/15/2019 11:55 AM	POTASSIUM, TOTAL		1.24	MG/L		
	07/15/2019 11:55 AM	CHLORIDE		0.69	MG/L		
	07/15/2019 11:55 AM	SULFATE TOTAL		1.3	MG/L		
	10/29/2018 02:10 PM	SUSPENDED SOLIDS TOTAL		<0.95	MG/L		
	10/29/2018 02:10 PM	ALKALINITY TOTAL CACO3		<7.0	MG/L		
	10/29/2018 02:10 PM	CALCIUM TOTAL		4880	UG/L		
	10/29/2018 02:10 PM	MAGNESIUM TOTAL		1370	UG/L		
	10/29/2018 02:10 PM	SODIUM TOTAL		946	UG/L		
	10/29/2018 02:10 PM	POTASSIUM, TOTAL		0.370	MG/L		
	10/29/2018 02:10 PM	CHLORIDE		0.62	MG/L		
	10/29/2018 02:10 PM	SULFATE TOTAL		<1.0	MG/L		
	09/11/2018 02:10 PM	SUSPENDED SOLIDS TOTAL		2.4	MG/L		

Monitoring Station

Station ID 10029743
Station Name West Fork Montreal River at West Branch Road

Show specific parameter: <Show All>

Sample Results

Previous 26-50 of 412 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
	09/11/2018 02:10 PM	ALKALINITY TOTAL CACO3		12.3	MG/L		
	09/11/2018 02:10 PM	CALCIUM TOTAL		7600	UG/L		
	09/11/2018 02:10 PM	MAGNESIUM TOTAL		2050	UG/L		
	09/11/2018 02:10 PM	SODIUM TOTAL		994	UG/L		
	09/11/2018 02:10 PM	POTASSIUM, TOTAL		0.545	MG/L		
	09/11/2018 02:10 PM	CHLORIDE		0.88	MG/L		
	09/11/2018 02:10 PM	SULFATE TOTAL		<1.0	MG/L		
	08/07/2018 01:45 PM	SUSPENDED SOLIDS TOTAL		1.4	MG/L		
	08/07/2018 01:45 PM	ALKALINITY TOTAL CACO3		21.3	MG/L		
	08/07/2018 01:45 PM	CALCIUM TOTAL		7230	UG/L		
	08/07/2018 01:45 PM	MAGNESIUM TOTAL		1920	UG/L		
	08/07/2018 01:45 PM	SODIUM TOTAL		1070	UG/L		
	08/07/2018 01:45 PM	POTASSIUM, TOTAL		0.718	MG/L		
	08/07/2018 01:45 PM	CHLORIDE		<0.50	MG/L		
	08/07/2018 01:45 PM	SULFATE TOTAL		<1.0	MG/L		
	06/13/2018 01:55 PM	SUSPENDED SOLIDS TOTAL		5.4	MG/L		
	06/13/2018 01:55 PM	ALKALINITY TOTAL CACO3		18.5	MG/L		
	06/13/2018 01:55 PM	CALCIUM TOTAL		6700	UG/L		
	06/13/2018 01:55 PM	MAGNESIUM TOTAL		1820	UG/L		
	06/13/2018 01:55 PM	SODIUM TOTAL		1040	UG/L		
	06/13/2018 01:55 PM	POTASSIUM, TOTAL		0.495	MG/L		
	06/13/2018 01:55 PM	CHLORIDE		0.77	MG/L		
	06/13/2018 01:55 PM	SULFATE TOTAL		<1.0	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	TEMPERATURE FIELD		8.2	C		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CLOUD COVER		100	%		

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Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	STREAM FLOW - CFS		42.9	CFS		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CONDUCTIVITY FIELD		46	UMHOS/CM		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	SUSPENDED SOLIDS TOTAL		3.8	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	DISSOLVED OXYGEN FIELD		11.1	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		94.0	%		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	PH FIELD		7.3	SU		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	ALKALINITY TOTAL CACO3		11.9	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	NITROGEN NH3-N DISS		0.0210	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	NITROGEN NO3+NO2 DISS (AS N)		ND	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CARBON DISS ORGANIC		23.8	ppm C		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CALCIUM TOTAL		6860	UG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	MAGNESIUM TOTAL		1850	UG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	SODIUM TOTAL		1240	UG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	POTASSIUM, TOTAL		0.629	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CHLORIDE		0.82	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	SULFATE TOTAL		<1.0	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	ARSENIC TOTAL RECOVERABLE		0.545	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	IRON TOTAL RECOVERABLE		0.866	MG/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	NICKEL, TOTAL RECOVERABLE		0.754	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	ZINC TOTAL REC		2.65	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CADMIUM TOTAL RECOVERABLE		0.0145	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	LEAD TOTAL REC		0.241	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	CHROMIUM TOTAL RECOVERABLE		0.674	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	COPPER TOT REC		2.02	ug/L		

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Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	MANGANESE, TOTAL RECOVERABLE		57.1	ug/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	TRANSPARENCY TUBE MEASUREMENT		>120.0	CM		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	MERCURY TOTAL		5.77	ng/L		
Montreal River TWA 2017-2018-2019	10/24/2017 01:50 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		5.07	NTU		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	CONDUCTIVITY, UMHOS/CM @ 25C		46	UMHOS/CM		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DISSOLVED OXYGEN FIELD		10.7	MG/L		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		103.3	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PH FIELD		6.6	SU		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Average Stream Width of Reach (m)		12.0	METERS		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Average Stream Depth of Reach (m)		0.3	METERS		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Water Temperature		13.9	DEGREES C		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Measured Stream Velocity		0.3	m/s		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Average across all reps: Estimated Velocity		Moderate (0.15-0.5 m/s)	m/s		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Average across all reps: habitat type		Riffle			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Sand %		20	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Canopy Cover at sample site (%)?		0	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Embeddedness of substrate at sample site (%):		10	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Rubble %		30	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Gravel %		50	%		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Point Sources		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Construction Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Urban Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Streambank Erosion		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Septic Systems		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Tile Drains		N - Not a problem			

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Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Cropland Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Barnyard Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Pollutant Sources, Local: Livestock Pasturing		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Factors Affecting Habitat, Local: Wetlands		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Factors Affecting Habitat, Local: Low Flows		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Factors Affecting Habitat, Local: Downstream Channelization		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Factors Affecting Habitat, local: Sludge Deposits		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, local: Iron Bacteria		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, local: Slimes		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, Local: Planktonic Algae		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators: Local Filamentous Algae		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, Local: Macrophytes		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, Local: Chlorine		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macro Habitat, Water Quality Indicators, Local: Turbidity		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Total sampling time in minutes?		1.0	Minutes		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Estimated area sampled (in m2)?		1.5	METERS SQUARE		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Number of samples in composite?		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Reason for sampling?		Other: TWA Project			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Macrophytes		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Filamentous Algae		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Planktonic Algae		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Diatoms/Periphyton		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Diatoms/Periphyton		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Slimes		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Iron Bacteria		U - Uncertain			

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Sludge Deposits		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Thermal		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Thermal		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Turbidity		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Sedimentation		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Scour/Channel Incision		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Scour/Channel Incision		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Bank Erosion		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Upstream Channelization		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Upstream Channelization		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Downstream Channelization		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Low Flow		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Upstream Impoundments		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Downstream Impoundment		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Downstream Impoundment		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Chlorine		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Organic Toxics		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Organic Toxics		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Inorganic Toxics		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Inorganic Toxics		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Nutrients		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Nutrients		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Dissolved Oxygen		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Watershed-wide: Dissolved Oxygen		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Urban Runoff		PL - Present/Low Impact			

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Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Construction Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Point Sources		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Cropland Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Livestock Pasturing		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Streambank Erosion		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Barnyard Runoff		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Tile Drains Organic Soil		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Septic Systems		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat Effect: Local Tributaries		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat Effect: Watershed-wide Tributaries		U - Uncertain			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat Effect:Local Springs		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat Effect: Watershed-wide Springs		U - Uncertain			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat Effect: Watershed-wide Wetland		PL - Present/Low Impact			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat, Pollutant Source: Watershed-wide Tile Drains Mineral Soils		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Upstream Impoundment		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Sedimentation		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate habitat influence, Local: Tile Drainage Mineral Soils		N - Not a problem			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Percent Sample Sorted		20			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PLECOPTERA CAPNIIDAE PARACAPNIA ANGULATA		10			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PLECOPTERA PERLIDAE ACRONEURIA		11			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PLECOPTERA PERLIDAE ACRONEURIA LYCORIAS		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PLECOPTERA PERLODIDAE ISOPERLA SIGNATA		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA EPHEMERELLIDAE EURYLOPHELLA		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA HEPTAGENIIDAE MACCAFFERTIUM		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA HEPTAGENIIDAE MACCAFFERTIUM VICARIUM		3			

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA HEPTAGENIIDAE LEUCROCUTA		8			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA LEPTOPHLEBIIDAE PARALEPTOPHLEBIA		4			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA LEPTOPHLEBIIDAE PARALEPTOPHLEBIA MOLLIS		6			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	TRICHOPTERA PSYCHOMYIIDAE PSYCHOMYIA FLAVIDA		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	MEGALOPTERA CORYDALIDAE NIGRONIA SERRICORNIS		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	COLEOPTERA ELMIDAE STENELMIS		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	COLEOPTERA ELMIDAE STENELMIS CRENATA		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA TIPULIDAE ANTOCHA		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA TIPULIDAE HESPEROCONOPA DOLICHOPHALLUS		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA TANYPODINAE 0 CONCHAPELOPIA		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS (CRICOTOPUS) BICINCTUS GROUP CRANSTON ET AL. 1983		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 ORTHOCLADIUS (ORTHOCLADIUS)		4			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 PARAMETRIOCNEMUS		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 NANOCLADIUS (PLECOPTERACOLUTHUS)		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA CHIRONOMINAE 4 TANYTARSUS		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA CHIRONOMINAE 4 MICROTENDIPES PEDELLUS GROUP PINDER, REISS 1983		90			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	VENEROIDA PISIDIIDAE PISIDIUM		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 NANOCLADIUS (PLECOPTERACOLUTHUS) SPECIES #5 JACOBSEN IN PRESS		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 ORTHOCLADIUS (SYMPOSIOCLADIUS) ANNECTENS		1			

Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS/ORTHOCLADIUS FERRINGTON ET AL. 2008	3
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA CHIRONOMINAE 4 POLYPEDILUM (URESIPEDILUM) AVICEPS	2
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA CHIRONOMINAE 4 POLYPEDILUM (URESIPEDILUM) FLAVUM	1
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	MERMITHIDA MERMITHIDAE	1
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA CHIRONOMINAE 4 NEOSTEMPELLINA REISSI	4

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPHEMEROPTERA BAETIDAE BAETIS FLAVISTRIGA GROUP		1			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Haplotaxida Tubificinae (without hairs)		3			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DIPTERA ORTHOCLADIINAE 1 CRICOTOPUS		2			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	TRANSPARENCY TUBE MEASUREMENT		119	CM		
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Macroinvertebrate Index of Biological Integrity (IBI), Wadable		7.17465			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	HILSENHOFF'S BIOTIC INDEX (HBI)		4.283			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	FAMILY-LEVEL BIOTIC INDEX (FBI)		5.32			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	HBI Max 10		2.718			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	SPECIES RICHNESS		29			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	GENERA RICHNESS		28			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT EPT INDIVIDUALS		28			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT EPT GENERA		32			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT CHIRONOMIDAE INDIVIDUALS		65			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	SHANNON'S DIVERSITY INDEX		2.823			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT SCRAPERS		10			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT FILTERER		53			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT SHREDDERS		10			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	PERCENT GATHERERS		18			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Mean Pollution Tolerance Value		3.357			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DEPO Percent Individuals (DEP_PC_CNT)		66.86			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DEPO Genera (DEPO_G)		10			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	DEPO, percent genera (DEP_PC_GEN)		38.462			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPT Genera (EPT_GENERA)		9			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPT Individuals (EPT_COUNT)		50			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPT Percent Individuals (EPT_PC_CNT)		29.07			

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Amph Percent Individuals (AMP_PC_CNT)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPT Percent Genera (EPT_PC_GEN)		36			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Isop Percent Individuals (ISO_PC_CNT)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Isop Genera (ISOP_G)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Isop Percent Genera (ISO_PC_GEN)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Dipt Percent Genera (DIP_PC_GEN)		56			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Dipt Percent Individuals (DIP_PC_CNT)		68.023			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Chir Percent Individuals (CHI_PC_CNT)		66.86			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Chir Percent Genera (CHI_PC_GEN)		48			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Gatherers Percent Individuals (GAT_PC_CNT)		16.959			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Gatherers Percent Genera (GAT_PC_GEN)		41.667			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Scrapers Percent Individuals (SCR_PC_CNT)		9.942			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Shredders Percent Individuals (SHR_PC_CNT)		9.942			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Insect Taxa (INSECT_T)		26			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Insect Percent Individuals (INSECT_PI)		97.175			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	EPT Taxa (EPT_T)		9			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Dominance 3 Percent Individuals (DOM3_PI)		62.712			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Intolerant EPT 2 Percent Individuals (INTOL_EPT2_PI)		25.989			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Tolerant Chir Percent Individuals (TOL_CHIR8_PI)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Functional Trait Niches (ECOFTN)		12			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Amph Isop Percent Individuals (A_I_PC_CNT)		0			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	Species Richness (Wadable IBI Intermediate)		29			
Montreal River TWA 2017-2018-2019	09/29/2017 12:00 AM	WATER COLOR (VISUAL)		STAINED			
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	SUSPENDED SOLIDS TOTAL		2.2	MG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	ALKALINITY TOTAL CACO3		17.7	MG/L		

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	NITROGEN TOTAL		1.08	MG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	PHOSPHORUS TOTAL		0.0392	MG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	CALCIUM TOTAL		7870	UG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	MAGNESIUM TOTAL		2080	UG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	SODIUM TOTAL		1120	UG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	POTASSIUM, TOTAL		0.746	MG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	CHLORIDE		1.3	MG/L		
Montreal River TWA 2017-2018-2019	09/28/2017 11:05 AM	SULFATE TOTAL		<1.0	MG/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	TEMPERATURE FIELD		15.3	C		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	CLOUD COVER		100	%		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	STREAM FLOW - CFS		49.7	CFS		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	CONDUCTIVITY FIELD		46	UMHOS/CM		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	DISSOLVED OXYGEN FIELD		10.1	MG/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		100.8	%		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	PH FIELD		6.1	SU		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	NITROGEN NH3-N DISS		0.0283	MG/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	NITROGEN NO3+NO2 DISS (AS N)		1.14	MG/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	CARBON DISS ORGANIC		29.6	ppm C		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	ARSENIC TOTAL RECOVERABLE		0.690	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	IRON TOTAL RECOVERABLE		1.23	MG/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	NICKEL, TOTAL RECOVERABLE		0.703	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	ZINC TOTAL REC		3.09	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	CADMIUM TOTAL RECOVERABLE		0.0203	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	LEAD TOTAL REC		0.341	ug/L		Analyzed past the 180 days holding time.

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	CHROMIUM TOTAL RECOVERABLE		0.701	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	COPPER TOT REC		0.765	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	MANGANESE, TOTAL RECOVERABLE		56.1	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	TRANSPARENCY TUBE MEASUREMENT		103.00	CM		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	MERCURY TOTAL		7.46	ng/L		
Montreal River TWA 2017-2018-2019	09/27/2017 12:15 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		3.24	NTU		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	TEMPERATURE FIELD		19.9	C		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	CLOUD COVER		40	%		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	STREAM FLOW - CFS		8.7	CFS		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	CONDUCTIVITY FIELD		68	UMHOS/CM		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	DISSOLVED OXYGEN FIELD		9.8	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		107.8	%		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	PH FIELD		6.8	SU		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	NITROGEN NH3-N DISS		0.0330	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	NITROGEN NO3+NO2 DISS (AS N)		ND	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	CARBON DISS ORGANIC		18.4	ppm C		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	ARSENIC TOTAL RECOVERABLE		0.545	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	IRON TOTAL RECOVERABLE		0.447	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	NICKEL, TOTAL RECOVERABLE		0.539	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	ZINC TOTAL REC		0.958	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	CADMIUM TOTAL RECOVERABLE		ND	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	LEAD TOTAL REC		0.120	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	CHROMIUM TOTAL RECOVERABLE		0.487	ug/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	COPPER TOT REC		0.683	ug/L		

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Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	MANGANESE, TOTAL RECOVERABLE		37.1	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	TRANSPARENCY TUBE MEASUREMENT		>120.0	CM		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	MERCURY TOTAL		3.90	ng/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:50 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		1.70	NTU		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	SUSPENDED SOLIDS TOTAL		<0.95	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	ALKALINITY TOTAL CACO3		31.4	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	NITROGEN TOTAL		0.585	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	PHOSPHORUS TOTAL		0.0396	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	CALCIUM TOTAL		10000	UG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	MAGNESIUM TOTAL		2560	UG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	SODIUM TOTAL		1510	UG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	POTASSIUM, TOTAL		0.524	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	CHLORIDE		0.91	MG/L		
Montreal River TWA 2017-2018-2019	08/15/2017 01:45 PM	SULFATE TOTAL		1.5	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	TEMPERATURE FIELD		22.8	C		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CLOUD COVER		5	%		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	STREAM FLOW - CFS		5.1	CFS		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CONDUCTIVITY FIELD		86	UMHOS/CM		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	SUSPENDED SOLIDS TOTAL		<0.95	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	DISSOLVED OXYGEN FIELD		11.2	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		131.0	%		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	PH FIELD		7.3	SU		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	ALKALINITY TOTAL CACO3		37.9	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	NITROGEN TOTAL		0.637	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	NITROGEN NH3-N DISS		0.0337	MG/L		

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Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	NITROGEN NO3+NO2 DISS (AS N)		ND	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	PHOSPHORUS TOTAL		0.0299	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CARBON DISS ORGANIC		14.8	ppm C		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CALCIUM TOTAL		11400	UG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	MAGNESIUM TOTAL		2930	UG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	SODIUM TOTAL		1620	UG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	POTASSIUM, TOTAL		0.452	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CHLORIDE		1.0	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	SULFATE TOTAL		1.4	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	ARSENIC TOTAL RECOVERABLE		0.595	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	IRON TOTAL RECOVERABLE		0.515	MG/L		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	NICKEL, TOTAL RECOVERABLE		0.616	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	ZINC TOTAL REC		1.15	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CADMIUM TOTAL RECOVERABLE		ND	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	LEAD TOTAL REC		0.101	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	CHROMIUM TOTAL RECOVERABLE		0.482	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	COPPER TOT REC		0.665	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	MANGANESE, TOTAL RECOVERABLE		45.8	ug/L		Analyzed past the 180 days holding time.
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	TRANSPARENCY TUBE MEASUREMENT		120.0	CM		
Montreal River TWA 2017-2018-2019	07/31/2017 12:40 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		1.29	NTU		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	TEMPERATURE FIELD		17.0	C		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	CLOUD COVER		100	%		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	STREAM FLOW - CFS		23.9	CFS		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	CONDUCTIVITY FIELD		51	UMHOS/CM		

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Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	DISSOLVED OXYGEN FIELD		10.6	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		109.8	%		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	PH FIELD		6.6	SU		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	NITROGEN TOTAL		0.745	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	NITROGEN NH3-N DISS		ND	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	NITROGEN NO3+NO2 DISS (AS N)		0.0216	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	PHOSPHORUS TOTAL		0.0375	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	CARBON DISS ORGANIC		19.5	ppm C		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	ARSENIC TOTAL RECOVERABLE		0.559	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	IRON TOTAL RECOVERABLE		0.787	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	NICKEL, TOTAL RECOVERABLE		0.416	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	ZINC TOTAL REC		1.90	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	CADMIUM TOTAL RECOVERABLE		0.0119	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	LEAD TOTAL REC		0.223	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	CHROMIUM TOTAL RECOVERABLE		0.605	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	COPPER TOT REC		0.722	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	MANGANESE, TOTAL RECOVERABLE		38.8	ug/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	TRANSPARENCY TUBE MEASUREMENT		>120.00	CM		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	MERCURY TOTAL		2.63	ng/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:45 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		1.92	NTU		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	SUSPENDED SOLIDS TOTAL		1.4	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	ALKALINITY TOTAL CACO3		24.0	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	CALCIUM TOTAL		7540	UG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	MAGNESIUM TOTAL		1960	UG/L		

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Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	SODIUM TOTAL		1700	UG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	POTASSIUM, TOTAL		0.861	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	CHLORIDE		0.79	MG/L		
Montreal River TWA 2017-2018-2019	06/28/2017 12:00 PM	SULFATE TOTAL		<1.0	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	TEMPERATURE FIELD		13.2	C		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CLOUD COVER		100	%		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	STREAM FLOW - CFS		109.0	CFS		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CONDUCTIVITY FIELD		31	UMHOS/CM		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	SUSPENDED SOLIDS TOTAL		1.2	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	DISSOLVED OXYGEN FIELD		13.9	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	OXYGEN, DISSOLVED, PERCENT OF SATURATION %		132.3	%		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	PH FIELD		6.4	SU		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	ALKALINITY TOTAL CACO3		<7.0	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	NITROGEN TOTAL		0.614	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	NITROGEN NH3-N DISS		0.0204	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	NITROGEN NO3+NO2 DISS (AS N)		ND	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	PHOSPHORUS TOTAL		0.0262	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CARBON DISS ORGANIC		20.2	ppm C		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CALCIUM TOTAL		4750	UG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	MAGNESIUM TOTAL		1290	UG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	SODIUM TOTAL		1020	UG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	POTASSIUM, TOTAL		0.306	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CHLORIDE		2.6	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	SULFATE TOTAL		<5.0	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	ARSENIC TOTAL RECOVERABLE		0.403	ug/L		

Monitoring Station

Station ID 10029743
Station Name West Fork Montreal River at West Branch Road

Show specific parameter: <Show All>

Sample Results

Previous 401-412 of 412 Next

Project	Date/Time	DNR Parameter	Species	Result	Units	Present/Absent	Lab Comments
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	IRON TOTAL RECOVERABLE		0.469	MG/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	SELENIUM TOTAL RECOVERABLE		ND	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	NICKEL, TOTAL RECOVERABLE		0.818	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	ZINC TOTAL REC		2.82	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CADMIUM TOTAL RECOVERABLE		0.0132	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	LEAD TOTAL REC		0.175	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	CHROMIUM TOTAL RECOVERABLE		0.600	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	COPPER TOT REC		0.911	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	MANGANESE, TOTAL RECOVERABLE		25.2	ug/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	TRANSPARENCY TUBE MEASUREMENT		120.0	CM		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	MERCURY TOTAL		8.36	ng/L		
Montreal River TWA 2017-2018-2019	05/30/2017 01:30 PM	TURBIDITY, LAB NEPHELOMETRIC NTU		1.33	NTU		Analyzed past the 2 days holding time.

APPENDIX 4.3.8.1-2 Gile Flowage Storage Reservoir Project Citizen Monitoring Reports

Wisconsin Department of Natural Resources

Lake Water Quality 1993 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
10/23/1993	4.5	1.4	NO			55			NORMAL		BROWN	2-Very minor aesthetic problems

Date	Data Collectors	Project
10/23/1993	Bill Ahrens	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 1997 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
05/21/1997	5.2	1.6			38	53		56				

05/21/1997		
Depth	Temp. C	D.O. MG/L
	9.0	10.8

Date	Data Collectors	Project
05/21/1997	Data Collectors	BASIC AGREEMENT 1988 (1895 fieldwork events)

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 2012 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
07/26/2012	4	1.2	NO	18.5	30	57	57	54				

07/26/2012		
Depth METERS	Temp. DEGREES C	D.O. MG/L
0	25.1	7.39
0.5	25.2	7.37
1	25.2	7.28
1.5	25.1	7.16
2	25	7.04
2.5	25	7.01
3	25	7.02
3.5	25	7
4	25	7
4.5	25	7.01
5	25	7
5.5	25	7.01
6	25	6.96
6.5	25	6.64
	25.1	7.37

Date	Data Collectors	Project
07/26/2012	Angie Stine	FRIENDS OF THE GILE FLOWAGE INC: Integrated Education- Planning + Research Approach to Spiny Water Flea Populations in Northern Lakes

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 2015 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 2017 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
06/27/2017	5	1.5	NO	7.16	31.7	54	50	55	HIGH	CLEAR	BROWN	2-Very minor aesthetic problems
07/31/2017	4	1.2	NO	5.82	30.1	57	48	55	NORMAL	CLEAR	BROWN	2-Very minor aesthetic problems

06/27/2017		
Depth FEET	Temp. DEGREES F	D.O.
0	66.2	
3	66	
6	65.6	
9	65.4	
12	65.3	
15	65.1	
18	64.7	
21	64.5	
24	64.4	
27	64.2	

07/31/2017		
Depth FEET	Temp. DEGREES F	D.O.
0	76.8	
3	76.2	
6	76.1	
9	74.1	
12	72.8	
15	71.9	
18	71.4	
21	70.5	
24	70.3	
27	70.3	

Date	Collector Comments
06/27/2017	Harold Schmude took myself- Jeff and Karla Miller out on his pontoon to complete June Citizen Lake Monitoring. Conditions were calm- partial cloudy- 65 degrees. Harold Schmude took myself- Jeff and Karla Miller out on his pontoon to complete June Citizen Lake Monitoring. Conditions were calm- partial cloudy- 65 degrees.
07/31/2017	Clyde Smith took Karla + Jeff Miller along with myself out on the Gile Flowage. The weather was warm- 80 degrees- calm waters. It was a beautiful day. We viewed an eagle nest with 2 young eagles and mother flying nearby.

Date	Data Collectors	Project
06/27/2017	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
07/31/2017	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 2018 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
05/29/2018	4.8	1.5	NO		27.7	55		54	HIGH	CLEAR	BROWN	2-Very minor aesthetic problems
06/25/2018	4	1.2	NO	8.66	33.9	57	51	55	HIGH	CLEAR	BROWN	2-Very minor aesthetic problems
07/31/2018	4	1.2	NO	10.7	30.5	57	53	55	NORMAL	CLEAR	BROWN	2-Very minor aesthetic problems
09/11/2018	4	1.2	NO	9.18	33.7	57	52	55	LOW	CLEAR	BROWN	2-Very minor aesthetic problems

05/29/2018		
Depth FEET	Temp. DEGREES F	D.O.
3	72.3	
6	70.8	
9	68.7	
12	60.2	
15	58.8	
18	58.4	
21	58.2	
24	57.5	

06/25/2018		
Depth FEET	Temp. DEGREES F	D.O.
0	70.3	
3	69.9	
6	69	
9	68.8	
12	68.3	
15	68.1	
18	68	
21	68	
24	68	

07/31/2018		
Depth FEET	Temp. DEGREES F	D.O.
0	73.2	
3	73.1	
6	71	
9	70.5	
12	69.9	
15	69.6	
18	69.4	
21	69.4	
24	69.2	

09/11/2018		
Depth FEET	Temp. DEGREES F	D.O.
0	67	
3	67.1	
6	66.9	
9	66.9	
12	66.9	
15	66.7	
18	66.5	

Date	Collector Comments
05/29/2018	Clyde Smith- Harold Schmude- Cathy Techtmann- Jeff Miller- Tom and Julie Sotis assisted. Observed eagles with their nest- we could hear babies in the nest Observed wood duck entering a wood duck box Unusually warm temperatures over Memorial Day weekend...high of 90 predicted for today. 75 degrees while out gathering data at 10AM
06/25/2018	Cool and cloudy.

06/25/2018	cool temperatures this AM 55 degrees/cloudy/rather windy experienced heavy storms/rains June 15-18- 2018 Denise- Harold- Clyde- Jeff- Karla took samples today
07/31/2018	Denise- Clyde- Harold- Jeff- and Karla took pontoon out. Beautiful 70 degrees- calm water. Viewed mature and young eagles. Checked out a close to surface rock that was hit by a boat July 29th weekend.

Date	Data Collectors	Project
05/29/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
05/29/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage
06/25/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
06/25/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage
07/31/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
07/31/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage
09/11/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
09/11/2018	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

Wisconsin Department of Natural Resources

Lake Water Quality 2019 Annual Report

Gile Flowage
Iron County
Waterbody Number: 2942300

Lake Type: DRAINAGE
DNR Region: NO
GEO Region:NW

Site Name	Storet #
Gile Flowage - Deep Hole	263124

Date	SD (ft)	SD (m)	Hit Bottom	CHL	TP	TSI (SD)	TSI (CHL)	TSI (TP)	Lake Level	Clarity	Color	Perception
06/25/2019				6.31	25.8		49	53				
06/25/2019	4	1.2	NO			57			NORMAL	CLEAR	BROWN	2-Very minor aesthetic problems
08/14/2019				13.2	37.1		54	56				
08/14/2019	4	1.2	NO			57			LOW	CLEAR	BROWN	2-Very minor aesthetic problems

06/25/2019		
Depth FEET	Temp. DEGREES F	D.O.
0	68	
3	68	
6	67.8	
9	67.6	
12	67.4	
15	67.4	
18	65.4	
20	64	

08/14/2019		
Depth FEET	Temp. DEGREES F	D.O.
1	71.4	
3	72.3	
6	72.5	
9	72.1	
12	71.9	
15	71.9	
18	71.7	
20	71.6	

Date	Data Collectors	Project
06/25/2019	Data Collectors	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage
06/25/2019	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole
08/14/2019	Data Collectors	Citizen Lake Monitoring - Water Quality - Hurley School - Gile Flowage
08/14/2019	Denise Schmitz-Enking	Citizen Lake Monitoring - Water Quality - Gile Flowage - Deep Hole

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter(ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD), TSI(CHL), TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet.

Wisconsin Department of Natural Resources **Wisconsin Lakes Partnership**

Report Generated: 09/12/2019

APPENDIX 4.4.1.1-1 WDNR Gile Flowage Storage Reservoir Project Fish Mapper Data

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	GEAR_TYI	GEAR_EF	RIVER_MIL	TOWNSHIF	RANGE	SECTION	QUARTER	TER_QUA
BLACK CRAPPIE	Pomoxis nigromaculatus	6	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
BLACK CRAPPIE	Pomoxis nigromaculatus	21	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
BULLHEADS	Ameiurus spp.	12	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
CRAPPIES	Pomoxis spp.	15	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
IOWA DARTER	Etheostoma exile	1	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
JOHNNY DARTER	Etheostoma nigrum	1	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
MUSKELLUNGE	Esox masquinongy	1	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
MUSKELLUNGE	Esox masquinongy	1	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
NORTHERN PIKE	Esox lucius	3	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
NORTHERN PIKE	Esox lucius	1	1994-07-18	GILE FL	IRON	DC BOOM SHOCKER		0.2	N46	E2	34	NW	SE
NORTHERN PIKE	Esox lucius	6	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
NORTHERN PIKE	Esox lucius	2	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
PUMPKINSEED	Lepomis gibbosus	8	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
PUMPKINSEED	Lepomis gibbosus	9	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
PUMPKINSEED	Lepomis gibbosus	1	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
ROCK BASS	Ambloplites rupestris	12	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
ROCK BASS	Ambloplites rupestris	3	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
SMALLMOUTH BASS	Micropterus dolomieu	6	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-18	GILE FL	IRON	DC BOOM SHOCKER		0.2	N46	E2	34	NW	SE
SMALLMOUTH BASS	Micropterus dolomieu	12	1994-07-19	GILE FL	IRON	SMALL-MESH SEINE		0.2	N46	E2	34	NW	SE
SUCKERS		18	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
WALLEYE	Sander vitreus	9	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
WALLEYE	Sander vitreus	5	1994-07-18	GILE FL	IRON	DC BOOM SHOCKER		0.2	N46	E2	34	NW	SE
WALLEYE	Sander vitreus	437	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
WALLEYE	Sander vitreus	92	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
WHITE SUCKER	Catostomus commersonii	7	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
WHITE SUCKER	Catostomus commersonii	16	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
WHITE SUCKER	Catostomus commersonii	4	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW
YELLOW PERCH	Perca flavescens	3690	1994-07-21	GILE FL	IRON	MINIFYKE WITHOUT		0.2	N46	E2	34	NW	SE
YELLOW PERCH	Perca flavescens	6	1994-07-18	GILE FL	IRON	DC BOOM SHOCKER		0.2	N46	E2	34	NW	SE
YELLOW PERCH	Perca flavescens	21	1984-04-29	GILE FL	IRON	FYKE HOOP TRAP O		0	N46	E2	34	NE	NW
YELLOW PERCH	Perca flavescens	1	1973-09-25	GILE FL	IRON	UNKNOWN LEGACY		0	N46	E2	34	NE	NW

COMMON_NAME	SCIENTIFIC_NAME	ISH_COUN	SAMPLE_DATE	OFFICIAL_I	COUNTY	STATE	RIVER_MILI	GEAR_TYI	GEAR_EFFORT	TOWNSHIF	RANGE	SECTION	QUARTER	TER_QUAI
WALLEYE	Sander vitreus	6	1994-07-20	GILE FL	IRON	WISCONS	1.7	MINIFYKE	WITHOUT TURTLE EX	N45	E2	4	SE	NW
WALLEYE	Sander vitreus	12	1994-07-18	GILE FL	IRON	WISCONS	1.7	DC BOOM	SHOCKER	N45	E2	4	SE	NW
NORTHERN PIKE	Esox lucius	4	1994-07-19	GILE FL	IRON	WISCONS	1.7	SMALL-MESH	SEINE	N45	E2	4	SE	NW
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONS	1.7	DC BOOM	SHOCKER	N45	E2	4	SE	NW
ROCK BASS	Ambloplites rupestris	5	1994-07-20	GILE FL	IRON	WISCONS	1.7	MINIFYKE	WITHOUT TURTLE EX	N45	E2	4	SE	NW
ROCK BASS	Ambloplites rupestris	1	1994-07-18	GILE FL	IRON	WISCONS	1.7	DC BOOM	SHOCKER	N45	E2	4	SE	NW
YELLOW PERCH	Perca flavescens	525	1994-07-20	GILE FL	IRON	WISCONS	1.7	MINIFYKE	WITHOUT TURTLE EX	N45	E2	4	SE	NW
PUMPKINSEED	Lepomis gibbosus	5	1994-07-20	GILE FL	IRON	WISCONS	1.7	MINIFYKE	WITHOUT TURTLE EX	N45	E2	4	SE	NW
YELLOW PERCH	Perca flavescens	45	1994-07-18	GILE FL	IRON	WISCONS	1.7	DC BOOM	SHOCKER	N45	E2	4	SE	NW
YELLOW PERCH	Perca flavescens	22	1994-07-19	GILE FL	IRON	WISCONS	1.7	SMALL-MESH	SEINE	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	2	1994-07-20	GILE FL	IRON	WISCONS	1.7	MINIFYKE	WITHOUT TURTLE EX	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-18	GILE FL	IRON	WISCONS	1.7	DC BOOM	SHOCKER	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	4	1994-07-19	GILE FL	IRON	WISCONS	1.7	SMALL-MESH	SEINE	N45	E2	4	SE	NW

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MI	GEAR_TYI	TOWNSHI	RANGE	SECTION	QUARTER	QUARTER_
BLACK CRAPPIE	Pomoxis nigromaculatus	1	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
BLACK CRAPPIE	Pomoxis nigromaculatus	1	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
BLACKNOSE SHINER	Notropis heterolepis	4	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
CENTRAL MUDMINNOW	Umbra limi	3	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
CENTRAL MUDMINNOW	Umbra limi	1	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
COMMON SHINER	Luxilus cornutus	1	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
GOLDEN SHINER	Notemigonus crysoleucas	2	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
GOLDEN SHINER	Notemigonus crysoleucas	1	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
JOHNNY DARTER	Etheostoma nigrum	1	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
MUSKELLUNGE	Esox masquinongy	1	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
NORTHERN PIKE	Esox lucius	7	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
NORTHERN PIKE	Esox lucius	20	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
NORTHERN PIKE	Esox lucius	6	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
PUMPKINSEED	Lepomis gibbosus	2	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
PUMPKINSEED	Lepomis gibbosus	3	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
ROCK BASS	Ambloplites rupestris	1	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
ROCK BASS	Ambloplites rupestris	1	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
ROCK BASS	Ambloplites rupestris	1	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
ROCK BASS	Ambloplites rupestris	1	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
WALLEYE	Sander vitreus	1	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
WALLEYE	Sander vitreus	1	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
WHITE SUCKER	Catostomus commersonii	3	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
YELLOW PERCH	Perca flavescens	142	1994-07-18	GILE FL	IRON	WISCONS	2.3	DC BOOM	N45	E2	4	SW	SW
YELLOW PERCH	Perca flavescens	230	1994-07-19	GILE FL	IRON	WISCONS	2.3	SMALL-ME	N45	E2	4	SW	SW
YELLOW PERCH	Perca flavescens	98	1994-07-20	GILE FL	IRON	WISCONS	2.3	MINIFYKE	N45	E2	4	SW	SW

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MILI	GEAR_TYPE	TOWNSHIF	RANGE	SECTION	QUARTER	TER_QUAI
ROCK BASS	Ambloplites rupestris	3	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
YELLOW PERCH	Perca flavescens	17	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
NORTHERN PIKE	Esox lucius	1	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
WALLEYE	Sander vitreus	12	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONSIN	2.7	DC BOOM SHOCKER	N45	E2	9	NW	SW
YELLOW PERCH	Perca flavescens	405	1994-07-19	GILE FL	IRON	WISCONSIN	2.7	SMALL-MESH SEINE	N45	E2	9	NW	SW
NORTHERN PIKE	Esox lucius	5	1994-07-19	GILE FL	IRON	WISCONSIN	2.7	SMALL-MESH SEINE	N45	E2	9	NW	SW
BLACK CRAPPIE	Pomoxis nigromaculatus	3	1994-07-19	GILE FL	IRON	WISCONSIN	2.7	SMALL-MESH SEINE	N45	E2	9	NW	SW
WHITE SUCKER	Catostomus commersonii	19	1994-07-19	GILE FL	IRON	WISCONSIN	2.7	SMALL-MESH SEINE	N45	E2	9	NW	SW
ROCK BASS	Ambloplites rupestris	1	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW
YELLOW PERCH	Perca flavescens	204	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW
PUMPKINSEED	Lepomis gibbosus	3	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW
NORTHERN PIKE	Esox lucius	1	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW
WALLEYE	Sander vitreus	4	1994-07-20	GILE FL	IRON	WISCONSIN	2.7	MINIFYKE WITHOUT T	N45	E2	9	NW	SW

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MILE	GEAR_TY	OWNSH	RANGE	ECTIO	UARTE	TER_QUA
NORTHERN PIKE	Esox lucius	2	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	SMALL-ME	N45	E2	16	SE	NW
PUMPKINSEED	Lepomis gibbosus	3	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	MINIFYKE	N45	E2	16	SE	NW
ROCK BASS	Ambloplites rupestris	3	1994-07-18	GILE FL	IRON	WISCONSIN	3.9	DC BOOM	N45	E2	16	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	3	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	SMALL-ME	N45	E2	16	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	2	1994-07-18	GILE FL	IRON	WISCONSIN	3.9	DC BOOM	N45	E2	16	SE	NW
WALLEYE	Sander vitreus	9	1994-07-18	GILE FL	IRON	WISCONSIN	3.9	DC BOOM	N45	E2	16	SE	NW
WALLEYE	Sander vitreus	1	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	SMALL-ME	N45	E2	16	SE	NW
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONSIN	3.9	DC BOOM	N45	E2	16	SE	NW
YELLOW PERCH	Perca flavescens	1	1994-07-18	GILE FL	IRON	WISCONSIN	3.9	DC BOOM	N45	E2	16	SE	NW
YELLOW PERCH	Perca flavescens	15	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	SMALL-ME	N45	E2	16	SE	NW
YELLOW PERCH	Perca flavescens	5	1994-07-21	GILE FL	IRON	WISCONSIN	3.9	MINIFYKE	N45	E2	16	SE	NW

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MILE	GEAR_TYPE	TOWNSHIF	RANGE	SECTION	QUARTER	TER_QUA
PUMPKINSEED	Lepomis gibbosus	3	1994-07-20	GILE FL	IRON	WISCONS	3.6	MINIFYKE WITHOUT	N45	E2	15	SW	NE
ROCK BASS	Ambloplites rupestris	6	1994-07-20	GILE FL	IRON	WISCONS	3.6	MINIFYKE WITHOUT	N45	E2	15	SW	NE
SMALLMOUTH BASS	Micropterus dolomieu	4	1994-07-18	GILE FL	IRON	WISCONS	3.6	DC BOOM SHOCKER	N45	E2	15	SW	NE
WALLEYE	Sander vitreus	8	1994-07-20	GILE FL	IRON	WISCONS	3.6	MINIFYKE WITHOUT	N45	E2	15	SW	NE
WALLEYE	Sander vitreus	17	1994-07-18	GILE FL	IRON	WISCONS	3.6	DC BOOM SHOCKER	N45	E2	15	SW	NE
WHITE SUCKER	Catostomus commersonii	1	1994-07-20	GILE FL	IRON	WISCONS	3.6	MINIFYKE WITHOUT	N45	E2	15	SW	NE
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONS	3.6	DC BOOM SHOCKER	N45	E2	15	SW	NE
YELLOW PERCH	Perca flavescens	1	1994-07-19	GILE FL	IRON	WISCONS	3.6	SMALL-MESH SEINE	N45	E2	15	SW	NE
YELLOW PERCH	Perca flavescens	424	1994-07-20	GILE FL	IRON	WISCONS	3.6	MINIFYKE WITHOUT	N45	E2	15	SW	NE
YELLOW PERCH	Perca flavescens	13	1994-07-18	GILE FL	IRON	WISCONS	3.6	DC BOOM SHOCKER	N45	E2	15	SW	NE

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MIL	GEAR_TYPE	OWNSH	RANGE	ECTIO	UARTE	TER_QUA
BLACKNOSE SHINER	Notropis heterolepis	1	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	MINIFYKE WITHOUT T	N45	E2	11	NW	NE
ROCK BASS	Ambloplites rupestris	3	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
ROCK BASS	Ambloplites rupestris	4	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	MINIFYKE WITHOUT T	N45	E2	11	NW	NE
ROCK BASS	Ambloplites rupestris	7	1994-07-18	GILE FL	IRON	WISCONSIN	2.6	DC BOOM SHOCKER	N45	E2	10	SE	NW
ROCK BASS	Ambloplites rupestris	2	1994-07-19	GILE FL	IRON	WISCONSIN	2.3	DC BOOM SHOCKER	N45	E2	11	NW	NE
YELLOW PERCH	Perca flavescens	1	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	SMALL-MESH SEINE	N45	E2	10	SE	NW
YELLOW PERCH	Perca flavescens	144	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
YELLOW PERCH	Perca flavescens	3	1994-07-18	GILE FL	IRON	WISCONSIN	2.6	DC BOOM SHOCKER	N45	E2	10	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	2	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	5	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	MINIFYKE WITHOUT T	N45	E2	11	NW	NE
SMALLMOUTH BASS	Micropterus dolomieu	7	1994-07-18	GILE FL	IRON	WISCONSIN	2.6	DC BOOM SHOCKER	N45	E2	10	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	4	1994-07-19	GILE FL	IRON	WISCONSIN	2.3	DC BOOM SHOCKER	N45	E2	11	NW	NE
SMALLMOUTH BASS	Micropterus dolomieu	5	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	SMALL-MESH SEINE	N45	E2	10	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	8	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	SMALL-MESH SEINE	N45	E2	11	NW	NE
NORTHERN PIKE	Esox lucius	1	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
WALLEYE	Sander vitreus	1	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
WALLEYE	Sander vitreus	2	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	MINIFYKE WITHOUT T	N45	E2	11	NW	NE
NORTHERN PIKE	Esox lucius	2	1994-07-21	GILE FL	IRON	WISCONSIN	2.3	MINIFYKE WITHOUT T	N45	E2	11	NW	NE
WALLEYE	Sander vitreus	27	1994-07-18	GILE FL	IRON	WISCONSIN	2.6	DC BOOM SHOCKER	N45	E2	10	SE	NW
WALLEYE	Sander vitreus	8	1994-07-19	GILE FL	IRON	WISCONSIN	2.3	DC BOOM SHOCKER	N45	E2	11	NW	NE
CENTRAL MUDMINNOW	Umbra limi	1	1994-07-21	GILE FL	IRON	WISCONSIN	2.6	MINIFYKE WITHOUT T	N45	E2	10	SE	NW
JOHNNY DARTER	Etheostoma nigrum	2	1994-07-18	GILE FL	IRON	WISCONSIN	2.6	DC BOOM SHOCKER	N45	E2	10	SE	NW

COMMON_NAME	SCIENTIFIC_NAME	FISH_COUNT	SAMPLE_DATE	OFFICIAL_	COUNTY	STATE	RIVER_MILE	GEAR_TYPE	OWNSH	RANGE	SECTIO	UARTER	TER_QUARTER
ROCK BASS	Ambloplites rupestris	1	1994-07-18	GILE FL	IRON	WISCONSIN	1.7	DC BOOM SHOCKE	N45	E2	4	SE	NW
ROCK BASS	Ambloplites rupestris	5	1994-07-20	GILE FL	IRON	WISCONSIN	1.7	MINIFYKE WITHOU	N45	E2	4	SE	NW
ROCK BASS	Ambloplites rupestris	12	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
IOWA DARTER	Etheostoma exile	1	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
YELLOW PERCH	Perca flavescens	22	1994-07-19	GILE FL	IRON	WISCONSIN	1.7	SMALL-MESH SEIN	N45	E2	4	SE	NW
YELLOW PERCH	Perca flavescens	525	1994-07-20	GILE FL	IRON	WISCONSIN	1.7	MINIFYKE WITHOU	N45	E2	4	SE	NW
PUMPKINSEED	Lepomis gibbosus	5	1994-07-20	GILE FL	IRON	WISCONSIN	1.7	MINIFYKE WITHOU	N45	E2	4	SE	NW
PUMPKINSEED	Lepomis gibbosus	8	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
YELLOW PERCH	Perca flavescens	3690	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
YELLOW PERCH	Perca flavescens	45	1994-07-18	GILE FL	IRON	WISCONSIN	1.7	DC BOOM SHOCKE	N45	E2	4	SE	NW
YELLOW PERCH	Perca flavescens	6	1994-07-18	GILE FL	IRON	WISCONSIN	0.2	DC BOOM SHOCKE	N46	E2	34	NW	SE
SMALLMOUTH BASS	Micropterus dolomieu	4	1994-07-19	GILE FL	IRON	WISCONSIN	1.7	SMALL-MESH SEIN	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	12	1994-07-19	GILE FL	IRON	WISCONSIN	0.2	SMALL-MESH SEIN	N46	E2	34	NW	SE
SMALLMOUTH BASS	Micropterus dolomieu	2	1994-07-20	GILE FL	IRON	WISCONSIN	1.7	MINIFYKE WITHOU	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	6	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-18	GILE FL	IRON	WISCONSIN	1.7	DC BOOM SHOCKE	N45	E2	4	SE	NW
SMALLMOUTH BASS	Micropterus dolomieu	1	1994-07-18	GILE FL	IRON	WISCONSIN	0.2	DC BOOM SHOCKE	N46	E2	34	NW	SE
NORTHERN PIKE	Esox lucius	4	1994-07-19	GILE FL	IRON	WISCONSIN	1.7	SMALL-MESH SEIN	N45	E2	4	SE	NW
WALLEYE	Sander vitreus	6	1994-07-20	GILE FL	IRON	WISCONSIN	1.7	MINIFYKE WITHOU	N45	E2	4	SE	NW
NORTHERN PIKE	Esox lucius	3	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
WALLEYE	Sander vitreus	9	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
WALLEYE	Sander vitreus	12	1994-07-18	GILE FL	IRON	WISCONSIN	1.7	DC BOOM SHOCKE	N45	E2	4	SE	NW
WALLEYE	Sander vitreus	5	1994-07-18	GILE FL	IRON	WISCONSIN	0.2	DC BOOM SHOCKE	N46	E2	34	NW	SE
NORTHERN PIKE	Esox lucius	1	1994-07-18	GILE FL	IRON	WISCONSIN	0.2	DC BOOM SHOCKE	N46	E2	34	NW	SE
BLACK CRAPPIE	Pomoxis nigromaculatus	6	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
JOHNNY DARTER	Etheostoma nigrum	1	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
WHITE SUCKER	Catostomus commersonii	7	1994-07-21	GILE FL	IRON	WISCONSIN	0.2	MINIFYKE WITHOU	N46	E2	34	NW	SE
WHITE SUCKER	Catostomus commersonii	1	1994-07-18	GILE FL	IRON	WISCONSIN	1.7	DC BOOM SHOCKE	N45	E2	4	SE	NW

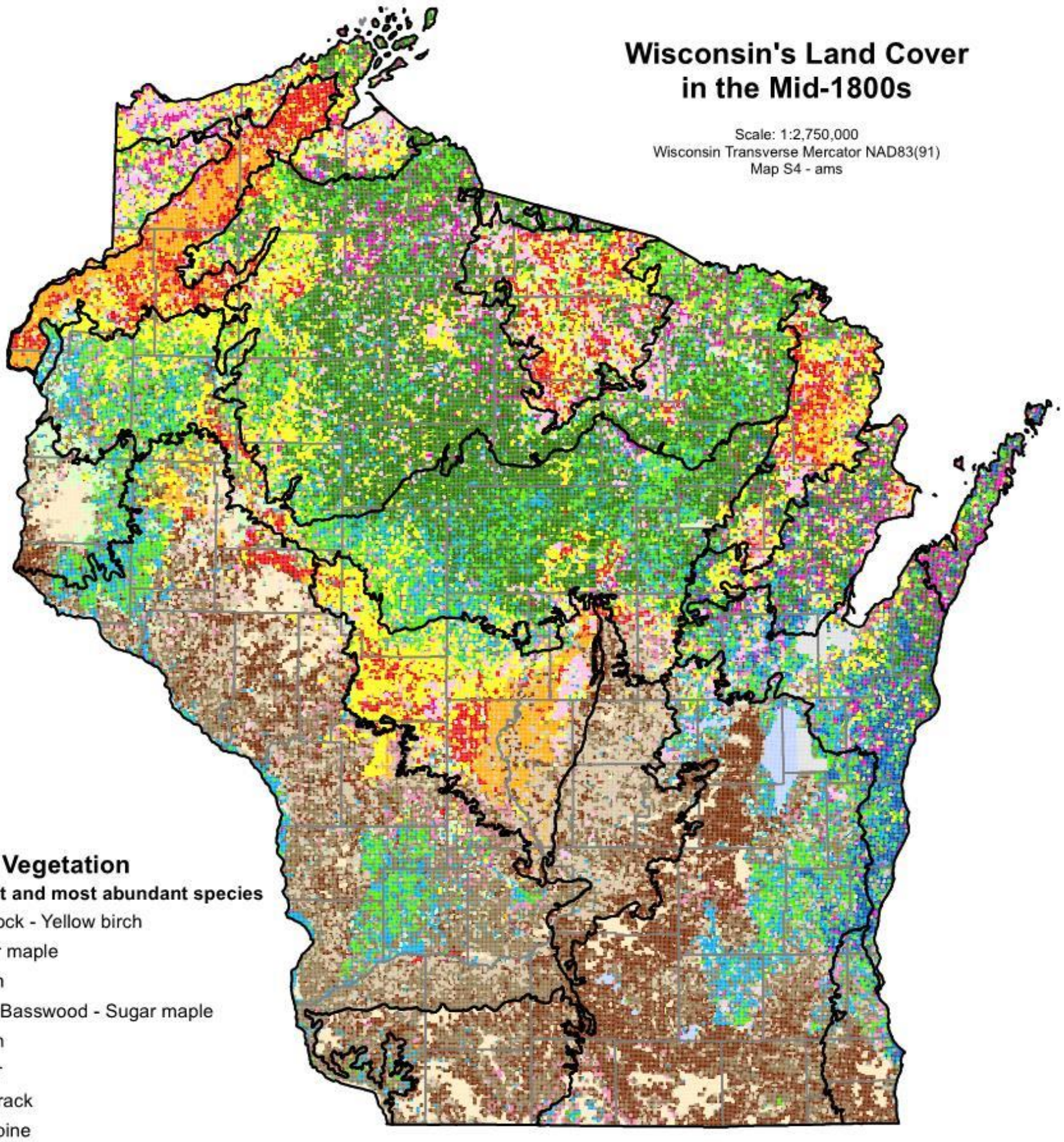
APPENDIX 4.4.1.1-2 WDNR Fish Stocking Data

Year	StockedWaterbodyName	LocalWaterbodyName	Location	Species	Strain (Stock)	Age Class	NumberFis	Avg FishLength (IN)
1972	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,122	13
1973	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	800	13
1974	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	7
1975	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	677	11
1976	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	8
1977	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	7
1978	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,700	12
1979	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,000	8
1980	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	9
1981	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	500	11
1982	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,250	11
1983	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,587	10.33
1984	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	7
1985	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,500	10
1986	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,500	11
1987	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	5,250	9
1988	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	4,500	10.33
1989	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,176	13
1990	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	1,250	13
1991	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,500	11.67
1992	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	2,500	10.33
1993	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	FINGERLING	3,300	11.97
1998	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	2,486	12
2001	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	884	10.6
2002	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	2,500	10.85
2004	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	2,836	11.8
2010	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UPPER WISCONSIN	LARGE FINGERLING	1,267	13.15
2012	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UPPER CHIPPEWA	LARGE FINGERLING	1,692	13.3
2017	GILE FLOWAGE	Giles Flowage	46N-2E-34	MUSKELLUNGE	UPPER CHIPPEWA	LARGE FINGERLING	551	11.2
1985	GILE FLOWAGE	Giles Flowage	46N-2E-34	SMALLMOUTH BASS	UNSPECIFIED	FINGERLING	34,545	3
1986	GILE FLOWAGE	Giles Flowage	46N-2E-34	SMALLMOUTH BASS	UNSPECIFIED	FINGERLING	10,000	3
							65,828	muskie
							44,545	smallmouth bass

APPENDIX 4.5.1-1: Land Cover in the Mid-1800's

Wisconsin's Land Cover in the Mid-1800s

Scale: 1:2,750,000
Wisconsin Transverse Mercator NAD83(91)
Map S4 - ams



Native Vegetation

Dominant and most abundant species

- Hemlock - Yellow birch
- Sugar maple
- Aspen
- Elm - Basswood - Sugar maple
- Beech
- Cedar
- Tamarack
- Jack pine
- Red pine
- White pine
- Red oak
- Black oak - Jack oak
- Bur oak
- White oak
- Prairie
- Water
- No data
- Ecological Landscape
- County Boundaries

This data was compiled by the Forest Landscape Ecology Lab at the University of Wisconsin - Madison (http://landscape.forest.wisc.edu/). It is published here courtesy of David J. Mladenoff.

For more information about the General Land Office Public Land Survey, see Schulte L.A. and Mladenoff D.J. 2001. The original Public Land Survey records: their use and limitations in reconstructing presettlement vegetation. J. Forestry 99(10) 5-10.

0 12.5 25 50 75 100 Miles

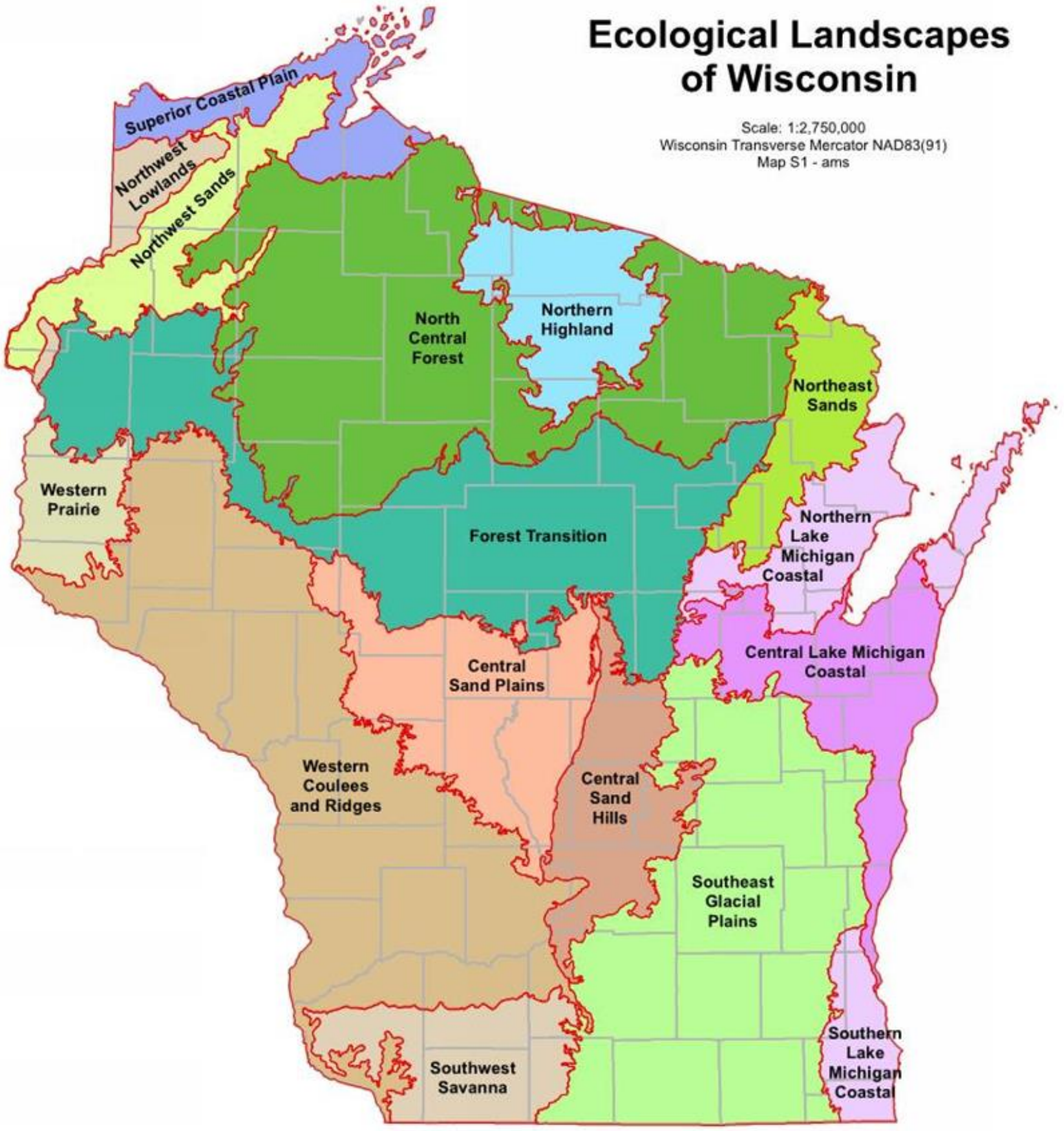
0 20 40 80 120 160 Kilometers

N W E S

APPENDIX 4.5-1: Ecological Landscapes of Wisconsin

Ecological Landscapes of Wisconsin

Scale: 1:2,750,000
Wisconsin Transverse Mercator NAD83(91)
Map S1 - ams

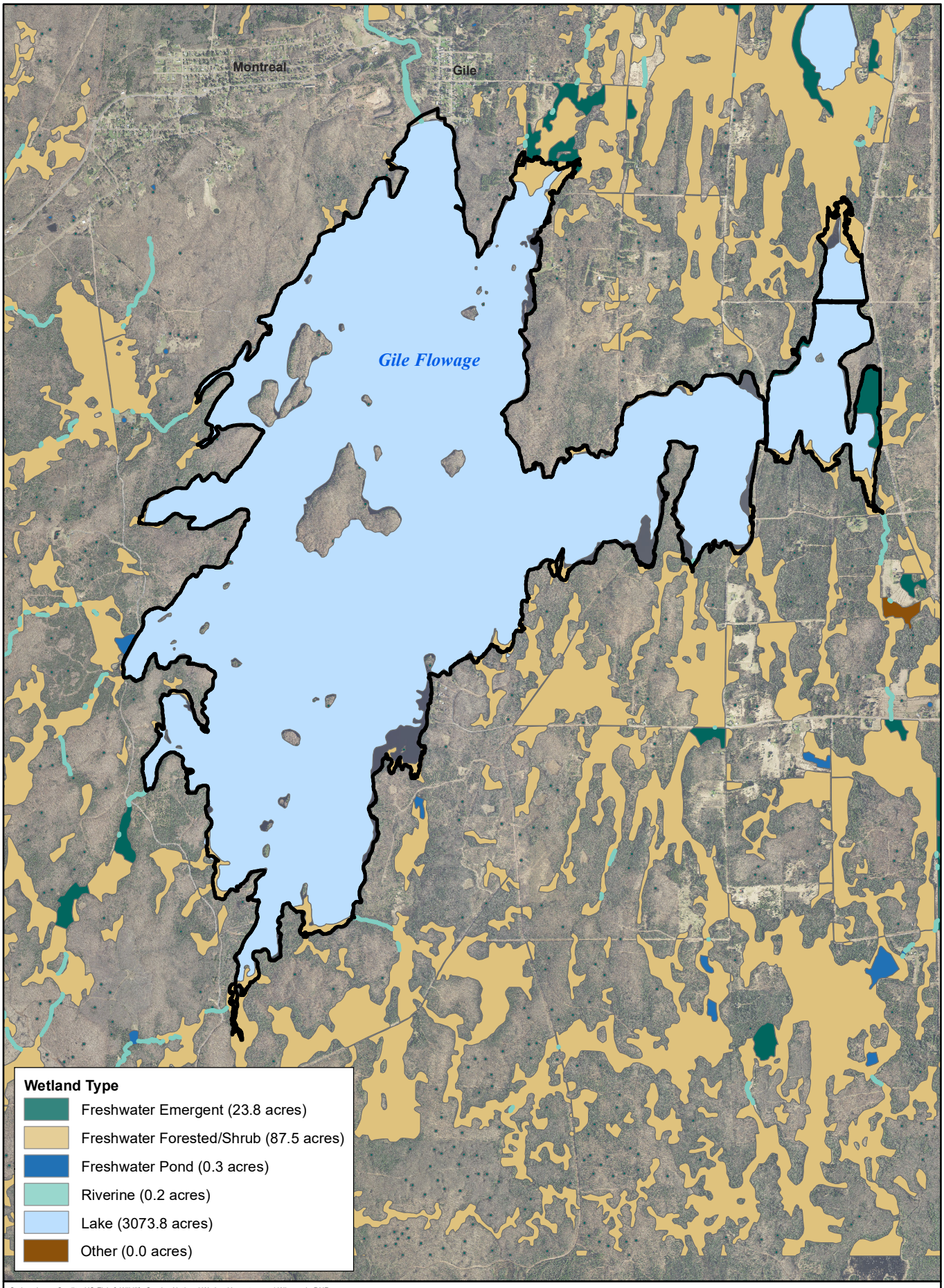


Wisconsin was divided into 16 ecoregions with similar ecology and management opportunities. Each of these ecoregions is called an Ecological Landscape. The Ecological Landscapes are based on the National Hierarchical Framework of Ecological Units (NHFEU; Cleland et al. 1997). There were too many NHFEU Subsections and too few NHFEU Sections to be useful for management purposes. Ecological Landscapes use the same boundaries as NHFEU Sections or Subsections. However, some NHFEU Subsections were combined to reduce the number of geographical units in the state to a manageable number. Therefore, Ecological Landscapes are at a size (scale) between NHFEU Sections and Subsections.

Ecological Landscapes
County Boundaries

0 12.5 25 50 75 100
Miles
0 20 40 80 120 160
Kilometers

APPENDIX 4.6.2-1 **Wetlands in Project Vicinity**



X:\2400100\156358.01\TECH\Saxon Falls and Superior Falls\Maps\GileFlowage_Wetlands.mxd

Serivce Layer Credits: US Fish & Wildlife Service National Wetland Inventory and Wisconsin DNR

Xcel Energy®

Mead & Hunt

Project Boundary

N

0 1,700 3,400

Feet

Gile Flowage Vicinity Wetlands

NID ID: WI01222

APPENDIX 4.7.2-1 **Gile Flowage Storage Reservoir Project IPaC List**

IPaC Information for Planning and Consultation U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Iron County, Wisconsin

Local office

Green Bay Ecological Services Field Office

(920) 866-1717
(920) 866-1710

2661 Scott Tower Drive
New Franken, WI 54229-9565

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act requires Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are not shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf Canis lupus There is final critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/4488	Endangered
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act [1] and the Bald and Golden Eagle Protection Act [2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black Tern Chlidonias niger This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

Canada Warbler Cardellina canadensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Golden-winged Warbler Vermivora chrysoptera This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Jul 20
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence ( )

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

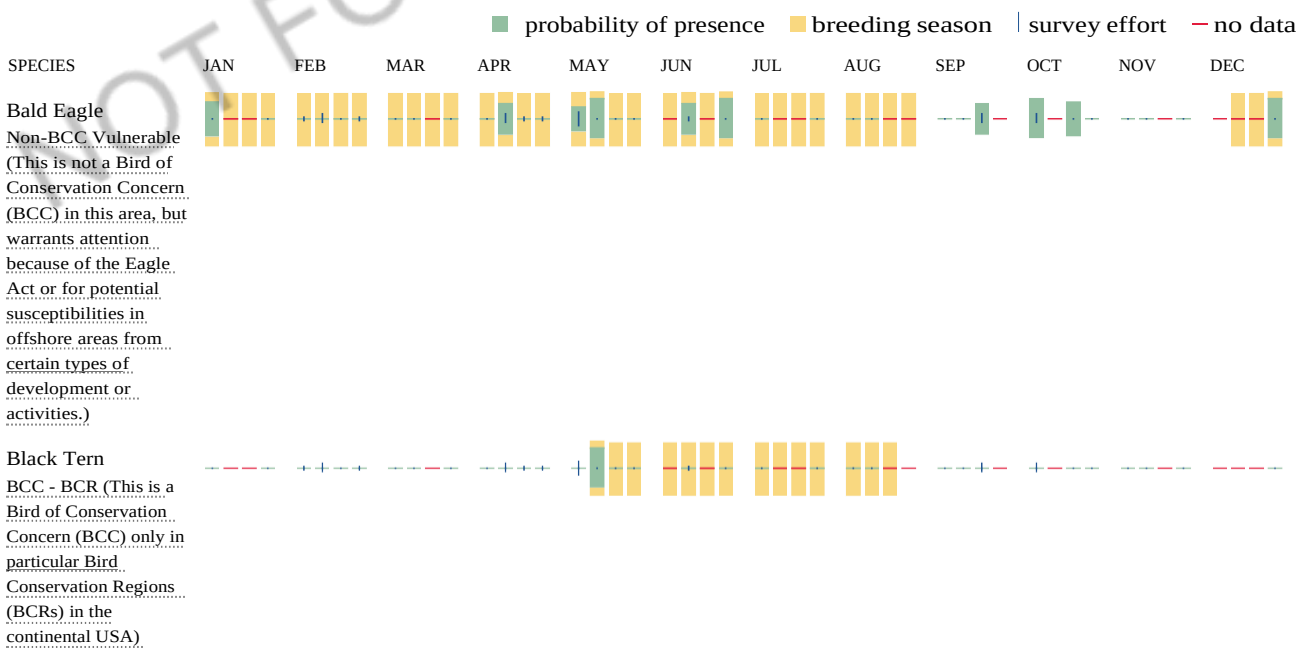
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ( )
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data ( )
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Black-billed Cuckoo
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Canada Warbler
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Evening Grosbeak
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Golden-winged Warbler
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Lesser Yellowlegs
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Rusty Blackbird
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wood Thrush
BCC Rangewide (CON)
(This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be

breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1/4B
- PSS1F
- PFO1C
- PSS1C
- PFO2/SS3Bg
- PFO1/SS1C
- PSS1/EM1C
- PFO5F
- PFO2B
- PFO1/SS1A
- PFO1/SS1F
- PFO5/UBG

FRESHWATER POND

- PUBH

LAKE

- L1UBH

RIVERINE

- R2UBH
- R5UBH
- R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX 4.7.4-1 Northern Long-Eared Bat “4D” Rule

Synopsis

As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507), the FCC is notifying the public that it received final OMB approval on December 17, 2015, for the information collection requirements contained in the modifications to the Commission's rules in 47 CFR part 5. Under 5 CFR part 1320, an agency may not conduct or sponsor a collection of information unless it displays a current, valid OMB Control Number. No person shall be subject to any penalty for failing to comply with a collection of information subject to the Paperwork Reduction Act that does not display a current, valid OMB Control Number. The OMB Control Number is 3060–0065. The foregoing notice is required by the Paperwork Reduction Act of 1995, Public Law 104–13, October 1, 1995, and 44 U.S.C. 3507.

The total annual reporting burdens and costs for the respondents are as follows:

OMB Control Number: 3060–0065.

OMB Approval Date: December 17, 2015.

OMB Expiration Date: December 31, 2018.

Title: Radio Experimentation and Market Trials—Streamlining Rules.

Form Number: FCC Form 442.

Respondents: Business or other for-profit entities; not-for-profit institutions, and individuals or household.

Number of Respondents and Responses: 495 respondents; 560 responses.

Estimated Time per Response: 4 hours.

Frequency of Response: On-occasion reporting requirements; recordkeeping requirements; and third party disclosure.

Obligation to Respond: Required to obtain or retain benefits. The statutory authority for this information collection is contained in sections 47 U.S.C. Sections 4, 302, 303, 306, and 307 of the Communications Act of 1934, as amended.

Total Annual Burden: 3,049 hours.

Total Annual Cost: $41,600.

Nature and Extent of Confidentiality: There is no need for confidentiality, except for personally identifiable information individuals may submit, which is covered by a system of records, FCC/OET–1, ''Experimental Radio Station License Files,'' 71 FR 17234, April 6, 2006.

Privacy Act: No impact(s).

Needs and Uses: On January 31, 2013, the Commission adopted a Report and Order, in ET Docket No. 10–236 and 06–155; FCC 13–15, which updates part 5 of the CFR—''Experimental Radio Service'' (ERS). The Commission's recent Report and Order revises and streamlines rules for Experimental licenses. The new rules provide additional license categories to potential licensees. The new license categories are: (1) Program Experimental Radio License; (2) Medical Testing Experimental Radio License; and (3) Compliance Testing Experimental Radio License, including testing of radio frequency equipment in an Open Area Test Site.

Federal Communications Commission.

Sheryl Todd,

Deputy Secretary.

[FR Doc. 2015–33250 Filed 1–13–16; 8:45 am]

BILLING CODE 6712–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R5–ES–2011–0024; 4500030113]

RIN 1018–AY98

Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), finalize a rule under authority of section 4(d) of the Endangered Species Act of 1973 (Act), as amended, that provides measures that are necessary and advisable to provide for the conservation of the northern long-eared bat (*Myotis septentrionalis*), a bat species that occurs in 37 States, the District of Columbia, and 13 Canadian Provinces.

DATES: This rule is effective February 16, 2016.

ADDRESSES: This final 4(d) rule, the final environmental assessment, biological opinion, and list of references are available on the Internet at *http://www.regulations.gov* under Docket No. FWS–R5–ES–2011–0024 and at *http://www.fws.gov/midwest/Endangered.* Comments and materials we received, as well as supporting documentation we used in preparing this final 4(d) rule, are available for public inspection at *http://www.regulations.gov,* and by appointment, during normal business hours at: U.S. Fish and Wildlife Service, Twin Cities Ecological Services Field Office, 4101 American Blvd. East, Bloomington, MN 55425; telephone (612) 725–3548, ext. 2201; or facsimile (612) 725–3609.

FOR FURTHER INFORMATION CONTACT: Peter Fasbender, Field Supervisor, U.S. Fish and Wildlife Service, Twin Cities Ecological Services Field Office, 4101 American Blvd. East, Bloomington, MN 55425; telephone (612) 725–3548, ext. 2210; or facsimile (612) 725–3609. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

The need for the regulatory action and how the action will meet that need: Consistent with section 4(d) of the Act, this final 4(d) rule provides measures that are tailored to our current understanding of the conservation needs of the northern long-eared bat.

On April 2, 2015, we published a document that is both a final rule to list the northern long-eared bat as a threatened species and an an interim 4(d) rule to provide measures that are necessary and advisable to provide for the conservation of the northern long-eared bat. At that time, we opened a 90-day public comment period on the interim rule, and we committed to publish a final 4(d) rule by December 31, 2015, and to complete review pursuant to the National Environmental Policy Act (NEPA). Previously, on January 16, 2015, we published a proposed 4(d) rule with a 60-day public comment period. Therefore,we have had two comment periods totaling 150 days on two versions of the 4(d) rule.

Statement of legal authority for the regulatory action: Under section 4(d) of the Act, the Secretary of the Interior has discretion to issue such regulations she deems necessary and advisable to provide for the conservation of the species. The Secretary also has the discretion to prohibit by regulation, with respect to a threatened species, any act prohibited by section 9(a)(1) of the Act.

Summary of the major provisions of the regulatory action: This final species-specific 4(d) rule prohibits purposeful take of northern long-eared bats throughout the species' range, except in instances of removal of northern long-eared bats from human structures, defense of human life (including public health monitoring), removal of hazardous trees for protection of human life and property, and authorized capture and handling of northern long-eared bats by individuals permitted to conduct these same activities for other

bats until May 3, 2016. After May 3, 2016, individuals who wish to capture and handle northern long-eared bats for recovery purposes will need a permit pursuant to section 10(a)(1)(A) of the Act.

Incidental take resulting from otherwise lawful activities will not be prohibited in areas not yet affected by white-nose syndrome (WNS). WNS is a fungal disease affecting many hibernating U.S. bat species. Ninety- to one-hundred-percent mortality has been seen in bats affected by the disease in the eastern United States.

Take of northern long-eared bats in their hibernacula (which includes caves, mines, and other locations where bats hibernate in winter) is prohibited in areas affected by WNS, unless permitted under section 10(a)(1)(A) of the Act. Take of northern long-eared bats inside of hibernacula may include disturbing or disrupting hibernating individuals when they are present as well as the physical or other alteration of the hibernaculum's entrance or environment when bats are not present if the result of the activity will impair essential behavioral patterns, including sheltering northern long-eared bats.

For northern long-eared bats outside of hibernacula, we have established separate prohibitions from take for activities involving tree removal and activities that do not involve tree removal. Incidental take of northern long-eared bats outside of hibernacula resulting from activities other than tree removal is not prohibited. Incidental take resulting from tree removal is prohibited if it: (1) Occurs within a 0.25 mile (0.4 kilometer) radius of known northern long-eared bat hibernacula; or (2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the known maternity tree during the pup season (June 1 through July 31). Incidental take of northern long-eared bats as a result of the removal of hazardous trees for the protection of human life and property is also not prohibited.

Peer review and public comment: We sought comments on our proposed 4(d) rule from independent specialists to ensure that this rule is based on scientifically sound data, assumptions, and analyses. We also considered all comments and information we received during the comment periods on the proposed and interim 4(d) rules.

Previous Federal Actions

Please refer to the proposed (78 FR 61046; October 2, 2013) and final (80 FR17974; April 2, 2015) listing rules for the northern long-eared bat for a detailed description of previous Federal actions concerning this species. On January 16, 2015, we published a proposed 4(d) rule (80 FR 2371) for the northern long-eared bat and on April 2, 2015, we published an interim 4(d) rule (80 FR 17974) for this species.

Background

The northern long-eared bat is a wide-ranging species that is found in a variety of forested habitats in summer and hibernates in caves, mines, and other locations in winter. WNS is the main threat to this species and has caused a precipitous decline in bat numbers (in many cases, 90–100 percent) where the disease has occurred. Declines in the numbers of northern long-eared bats are expected to continue as WNS extends across the species' range. For more information on the northern long-eared bat, its habitat, and WNS, please refer to the October 2, 2013, proposed listing (78 FR 61046) and the April 2, 2015, final listing (80 FR 17974) rules.

The Act (16 U.S.C. 1531 *et seq.*) does not specify particular prohibitions, or exceptions to those prohibitions, for threatened species. Instead, under section 4(d) of the Act, the Secretary of the Interior has the discretion to issue such regulations as she deems necessary and advisable to provide for the conservation of such species. The Secretary also has the discretion to prohibit by regulation, with respect to any threatened wildlife species, any act prohibited under section 9(a)(1) of the Act with respect to endangered species. Exercising this discretion under section 4(d) of the Act, the Service developed general prohibitions (50 CFR 17.31) and exceptions to those prohibitions (50 CFR 17.32) under the Act that apply to most threatened wildlife species.

In addition, for threatened species, under the authority of section 4(d) of the Act, the Service may develop prohibitions and exceptions that are tailored to the specific conservation needs of the species. In such cases, some of the prohibitions and authorizations under 50 CFR 17.31 and 17.32 may be appropriate for the species and be incorporated into a separate, species-specific, rule under section 4(d) of the Act. These rules will also include provisions that are tailored to the specific conservation needs of the threatened species and may be more or less restrictive than the general provisions at 50 CFR 17.31.

Definitions

This final rule uses several definitions and provisions contained in the Act and its implementing regulations.

The Act and its implementing regulations (50 CFR part 17) define take as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.

The term ''harass'' (50 CFR 17.3) means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

The term ''harm'' (50 CFR 17.3) means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

''Purposeful take'' includes the capture and handling of individual bats. Take in this manner includes both capture and handling to remove bats from human structures and take that is for research purposes (*e.g.,* attaching a radiotracking device). Other purposeful take would include intentional removal of bats from hibernacula or the intentional killing or harassing of bats under any circumstance.

''Human structures'' are defined as houses, garages, barns, sheds, and other buildings designed for human entry.

''Incidental take'' is defined at 50 CFR 17.3 as any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, an otherwise lawful activity. Examples of incidental take (or non-purposeful take as it is sometimes referred to in this rule) include land-management actions, such as implementation of forestry practices, where bats may be harmed, harassed, or killed as a result of those otherwise lawful actions. The actions contemplated in this rule include a wide range of actions for purposes such as right-of-way development and maintenance, forestry, land use for development unrelated to wildlife management, management of lands as habitats other than bat habitat (*e.g.,* prairie), energy production and transmission, and other activities.

Incidental take within the context of this rule is regulated in distinct and separate manners relative to the geographic location of the activity in question. For the purposes of this rule, we have developed a map associated with the occurrence and spread of WNS. This map will be updated by the first of each month as the disease spreads throughout the range of the species and

posted at *http://www.fws.gov/midwest/Endangered.*

''Known hibernacula'' are defined as locations where northern long-eared bats have been detected during hibernation or at the entrance during fall swarming or spring emergence.

''Known, occupied maternity roost trees'' are defined as trees that have had female northern long-eared bats or juvenile bats tracked to them or the presence of females or juveniles is known as a result of other methods.

''Tree removal'' is defined as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

WNS Zone

The WNS zone, as mapped, provides the boundary for the distinction of implementation of this rule. To estimate the area impacted by WNS, we have used data on the presence of the fungus causing the disease, called *Pseudogymnoascus destructans,* or *Pd,* or evidence of the presence of the disease (WNS) in the bats within a hibernaculum. Our final listing determination provides additional information concerning *Pd* and WNS (80 FR 17993; April 2, 2015). Confirmed evidence of infection at a location within a county is mapped as a positive detection for the entire county. In addition, we have added a 150-mile (241-kilometer (km)) buffer to the *Pd*-positive county line to account for the spread of the fungus from one year to the next. In instances where the 150-mile (241-km) buffer line bisects a county, the entire county is included in the WNS zone.

Over the past 5 years, an average of 96 percent of the new *Pd* or WNS counties in any single year were within 150 miles (241 km) of a county that was *Pd*- or WNS-positive in a prior year (Service 2015, unpublished data). *Pd* is generally present for a year or two before symptoms of WNS appear and mortality of bats begins to occur. Given the relatively short amount of time between detection and population-level impacts, it is important that we protect those buffer areas and the bats within them with the same regulations as those in known WNS positive counties. Therefore, the positive counties, plus a buffer around them, are the basis for the WNS zone map.

Summary Comparison of the Interim 4(d) Rule and This Final Rule

Based on information we received in comment periods on the proposed and interim 4(d) rules (see Summary of Comments and Recommendations below), we revised the provisions of the interim 4(d) rule to better reflect the disproportionate effect that the disease, WNS, has had and will continue to have, we believe, on northern long-eared bat populations.

In the interim rule, we used the term ''white-nose syndrome buffer zone'' to identify ''the portion of the range of the northern long-eared bat'' within 150 miles (241 km) of the boundaries of U.S. counties or Canadian districts where the fungus *Pseudogymnoascus destructans (Pd)* or WNS had been detected. For purposes of clarification, in this final rule, we have changed the term ''white-nose syndrome buffer zone'' to ''white-nose syndrome zone'' or ''WNS zone.'' And we state that the ''WNS zone'' is ''the set of counties within the range of the northern long-eared bat'' within 150 miles (241 km) of the boundaries of U.S. counties or Canadian districts where *Pd* or WNS had been detected.

The interim 4(d) rule generally applies the prohibitions of 50 CFR 17.31 and 17.32 to the northern long-eared bat, which means that the interim rule, among other things, prohibits the purposeful take of northern long-eared bats throughout the species' range, but the interim rule includes exceptions to the purposeful take prohibition. The exceptions for purposeful take are: (1) In instances of removal of northern long-eared bats from human structures (if actions comply with all applicable State regulations); and (2) for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. Under the interim rule, incidental take is not prohibited outside the WNS zone if the incidental take results from otherwise lawful activities. Inside the WNS zone, there are exceptions for incidental take for the following activities, subject to certain conditions: Implementation of forest management; maintenance and expansion of existing rights-of-way and transmission corridors; prairie management; minimal tree removal; and removal of hazardous trees for the protection of human life and property.

This final 4(d) rule does not generally apply the prohibitions of 50 CFR 17.31 to the northern long-eared bat. This rule continues to prohibit purposeful take of northern long-eared bats throughout the species' range, except in certain cases, including instances of removal of northern long-eared bats from human structures and for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. After May 3, 2016, a permit pursuant to section 10(a)(1)(A) of the Act is required for the capture and handling of northern long-eared bats. Under this rule, incidental take is still not prohibited outside the WNS zone.

We have revised the interim rule's language concerning incidental take inside the WNS zone. Under this final rule, within the WNS zone, incidental take is prohibited only if: (1) Actions result in the incidental take of northern long-eared bats in hibernacula; (2) actions result in the incidental take of northern long-eared bats by altering a known hibernaculum's entrance or interior environment if the alteration impairs an essential behavioral pattern, including sheltering northern long-eared bats; or (3) tree-removal activities result in the incidental take of northern long-eared bats when the activity either occurs within 0.25 mile (0.4 kilometer) of a known hibernaculum, or cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the maternity roost tree, during the pup season (June 1 through July 31). Take of northern long-eared bats in their hibernacula may include disturbing or disrupting hibernating individuals when they are in the hibernacula. Take of northern long-eared bat also includes the physical or other alteration of the hibernaculum's entrance or environment when bats are not present if the result of the activity will impair essential behavioral patterns, including sheltering northern long-eared bats. Any take resulting from otherwise lawful activities outside known hibernacula, other than tree removal, is not prohibited, as long as it does not change the bat's access to or quality of a known hibernaculum for the species. This final rule makes these revisions because, in areas impacted by WNS, the most important conservation actions for the northern long-eared bat are to protect bats in hibernacula and maternity roost trees, and to continue to monitor populations in summer habitat (*e.g.,* identify where the species continues to survive after the detection of *Pd* or WNS and determine the factors influencing its resilience), while developing methods to abate WNS as quickly as possible.

Under this rule, we individually set forth prohibitions on possession and other acts with unlawfully taken northern long-eared bats, and on import and export of northern long-eared bats. These prohibitions were included in the interim 4(d) through the general application of the prohibitions of 50 CFR 17.31 to the northern long-eared bat. Under this rule, take of the northern

long-eared bat is also not prohibited for the following: Removal of hazardous trees for protection of human life and property; take in defense of life; and take by an employee or agent of the Service, of the National Marine Fisheries Service, or of a State conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the Service. Regarding these three exceptions, take in defense of life was not included in the interim 4(d) rule, but the other two exceptions were, either through the general application of 50 CFR 17.31 or through a specific exception included in the interim 4(d) rule.

Provisions of the 4(d) Rule for the Northern Long-Eared Bat

For a threatened species, the Act does not specify prohibitions, or exceptions to those prohibitions, relative to take of the species. Instead, under Section 4(d) of the Act, the Secretary has discretion to issue regulations deemed to be necessary and advisable for the conservation of a threatened species. By regulation, the Secretary has determined that take prohibitions for endangered species are also applicable to threatened species unless a special rule is issued under section 4(d) for a particular threatened species. Under this 4(d) rule, we have applied several of the prohibitions specified in the Act for endangered species and the provisions of 50 CFR 17.32 (permit regulations) to the northern long-eared bat as described below.

For this 4(d) rule, the Service has completed a biological opinion under Section 7 of the Act on our action of finalizing this rule. In addition, the biological opinion provides for streamlined consultation for all federal agency actions that may affect the northern long-eared bat; therefore, the scope of the biological opinion included the finalization and implementation of the 4(d) rule. The biological opinion resulted in a non-jeopardy determination. Provided Federal action agencies follow the criteria outlined in this rule and implement the streamlined consultation process outlined in the biological opinion, their section 7 consultation requirements will be met. If unable to follow these criteria, standard section 7 procedures will apply.

Exceptions to the Purposeful Take Prohibition

We have exempted the purposeful take of northern long-eared bats related to the protection of human health and safety. A very small percentage of bats may be infected with rabies or other diseases that can be transmissible to humans. When there is the possibility that a person has been exposed to a diseased bat, it is important that they coordinate with medical professionals (*e.g.,* doctor, local health department) to determine the appropriate response. When warranted to protect human health and safety, we have exempted from the take prohibition of northern long-eared bats in defense of one's own life or the lives of others, including for public health monitoring purposes (*i.e.,* collecting a bat after human exposure and submitting for disease testing).

We have also exempted the purposeful take of northern long-eared bats related to removing the species from human structures, but only if the actions comply with all applicable State regulations. Northern long-eared bats have occasionally been documented roosting in human-made structures, such as houses, barns, pavilions, sheds, cabins, and bat houses (Mumford and Cope 1964, p. 480; Barbour and Davis 1969, p. 77; Cope and Humphrey 1972, p. 9; Amelon and Burhans 2006, p. 72; Whitaker and Mumford 2009, p. 209; Timpone et al. 2010, p. 119; Joe Kath 2013, pers. comm.). We conclude that the overall impact of bat removal from human structures is not expected to adversely affect conservation and recovery efforts for the species. In addition, we provide the following recommendations:

- Minimize use of pesticides (*e.g.,* rodenticides) and avoid use of sticky traps as part of bat evictions/exclusions.
- Conduct exclusions during spring or fall unless there is a perceived public health concern from bats present during summer and/or winter.
- Contact a nuisance wildlife specialist for humane exclusion techniques.

We have exempted the purposeful take that results from actions relating to capture, handling, and related activities for northern long-eared bats by individuals permitted to conduct these same activities for other species of bats until May 3, 2016. Under the interim rule, for a period of 1 year from the interim rule's effective date (May 3, 2016), we had exempted the purposeful take that is caused by the authorized capture, handling, and related activities (*e.g.,* attachment of radio transmitters for tracking) of northern long-eared bats by individuals permitted to conduct these same activities for other bats. We have continued the exemption through the expiration date established by the interim rule. After May 3, 2016, a permit pursuant to section 10(a)(1)(A) of the Act is required for the capture and handling of northern long-eared bats,except that associated with bat removal from human structures. We determined that it was important to regulate the intentional capture and handling of northern long-eared bats through the Act's scientific permit process to help ensure that the surveyor's qualifications and methods used are adequate to protect individual bats and provide reliable survey results.

Incidental Take Outside of the WNS Zone Not Prohibited

Incidental take in areas that have not yet been impacted by WNS (*i.e.,* in areas outside the WNS zone) is not prohibited by this final rule. We believe the level of take associated with on-going land management and development actions, including all actions that may incidentally take the northern long-eared bat, do not individually or cumulatively affect healthy bat populations. As noted in our decision to list the northern long-eared bat as a threatened species, WNS is the primary cause of the species' decline, and we would not have listed the northern long-eared bat if not for the impact of WNS. In addition, we conclude that regulating incidental take in areas not affected by WNS is not expected to change the rate at which WNS progresses across the range of the species. In other words, regulating incidental take outside the WNS zone will not influence the future impact of the disease throughout the species' range or the status of the species. For these reasons, we have concluded that the prohibition of incidental take outside of the WNS zone is not necessary and advisable for the protection and recovery of the species. Incidental take, therefore, is not prohibited outside of the WNS zone.

Prohibitions and Exemptions Related to Incidental Take Inside the WNS Zone

Our approach to designing the regulatory provisions for the northern long-eared bat inside the WNS zone reflects the significant role WNS plays as the central threat affecting the species. For other threatened species, habitat loss or other limiting factors usually contribute to the decline of a species. In these situations, regulations are needed to address either the habitat loss or the other limiting factors.

The northern long-eared bat is not habitat-limited and has demonstrated a great deal of plasticity within its environment (*e.g.,* living in highly fragmented forest habitats to contiguous forest blocks from the southern United States to Canada's Yukon Territory) in the absence of WNS. For the northern long-eared bat, land management and

development actions that have been ongoing for centuries (*e.g.,* forest management, forest conversion) have not been shown to have significant negative impacts to northern long-eared bat populations.

As WNS continues to move across the range of the species, northern long-eared bat populations have declined and will continue to decline. Declines in northern long-eared bat populations in WNS-positive regions have been significant, and northern long-eared bats are now relatively rare on those landscapes. As populations decline as a result of WNS, the chances of any particular activity affecting northern long-eared bats becomes more remote. Therefore, in the WNS zone, we focused the regulatory provisions on sensitive life stages at known, occupied maternity roost trees and hibernacula.

We developed regulations that provide some level of protection to the species where it persists in the face of WNS. However, we have provided flexibility so that the regulated public will seek to conserve the species and foster its recovery at sites where it has been lost should tools to address WNS become available or where the species shows signs of resilience. Further, because we believe recovery of this species will require many partnerships across the species' range, minimizing regulatory impacts on activities inconsequential to northern long-eared bat populations provides an important step in building partnerships for the species' recovery.

The northern long-eared bat is a forest-dependent species, typically roosting in trees. In establishing regulations that are necessary and advisable for the conservation of the species, we have tailored species-specific regulatory provisions toward potential impacts to trees. For the incidental take of bats outside of hibernacula, we have specifically established two sets of provisions: the first set applies to activities that do not involve tree removal and the second applies to activities that do involve tree removal. By tree removal, we mean cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation that is likely to be used by the northern long-eared bat.

In this final 4(d) rule, we have limited the prohibition of incidental take of northern long-eared bats to specific circumstances. This does not mean that all activities that could result in the incidental take of the northern long-eared bat will do so. The relative exposure of the species and the species response to a potential stressor are critical considerations in evaluating the potential for incidental take to occur. For example, under the discussion of tree removal, below, we describe what is prohibited by the final 4(d) rule in the WNS zone and provide examples of how other activities could be implemented in a way that avoids the potential for incidental take.

Hibernacula

Northern long-eared bats predominantly overwinter in hibernacula that include caves and abandoned mines. For additional details about the characteristics of the hibernacula selected by northern long-eared bats, see the final listing determination (80 FR 17974; April 2, 2015). Northern long-eared bats have shown a high degree of philopatry (using the same site over multiple years) for a hibernaculum (Pearson 1962, p. 30), although they may not return to the same hibernaculum in successive seasons (Caceres and Barclay 2000, p. 2).

Hibernacula are so significant to the northern long-eared bat that they are considered a primary driver in the species distribution (*e.g.,* Kurta 1982, p. 302). Northern long-eared bats are documented in hibernacula in 29 of the 37 states in the species' range. Other States within the species' range have no known hibernacula, which may reflect that no suitable hibernacula are present, a limited survey effort, or the northern long-eared bat's use of sites not previously identified as suitable.

In general, bats select hibernacula because they have characteristics that allow the bats to meet specific life-cycle requirements. Factors influencing a hibernaculum's suitability include its physical structure (*e.g.,* openings, interior space, depth), air circulation, temperature profile, and location relative to foraging sites (Tuttle and Stevenson 1978, pp. 108–121).

Overwinter survival can be a particularly challenging period in the northern long-eared bat's life cycle. Hibernating bats appear to balance their physical condition (*e.g.,* fat reserves upon entering hibernation), hibernacula characteristics (*e.g.,* temperature variation, humidity), social resources (*e.g.,* roosting singly or in groups), and metabolic condition (*i.e.,* degree of torpor, which is the state of mental or physical inactivity) to meet overwinter survival needs. The overwinter physiological needs of the species include maintaining body temperature above freezing, minimizing water loss, meeting energetic needs until prey again become available, and responding to disturbance or disease. Because of this complex interplay of hibernacula characteristics and bat physiology, changes to hibernacula can significantly impact their suitability as well as the survival of any hibernating bats.

In general, northern long-eared bats arrive at hibernacula in August or September, enter hibernation in October and November, and emerge from the hibernacula in March or April (Caire et al. 1979, p. 405; Whitaker and Hamilton 1998, p. 100; Amelon and Burhans 2006, p. 72). However, hibernation may begin as early as August (Whitaker and Rissler 1992b, p. 56). Northern long-eared bats have been observed moving among hibernacula throughout the winter (Griffin 1940a, p. 185; Whitaker and Rissler 1992a, p. 131; Caceres and Barclay 2000, pp. 2–3). Whitaker and Mumford (2009, p. 210) found that this species flies in and out of some mines and caves in southern Indiana throughout the winter.

Human disturbance of hibernating bats has long been considered a threat to cave-hibernating bat species like the northern long-eared bat. Modifications to bat hibernacula can affect the microclimate (*e.g.,* temperature, humidity) of the subterranean habitat, and thus the ability of the cave or mine to support hibernating bats, including the northern long-eared bat. Anthropogenic modifications to cave and mine entrances may not only alter flight characteristics and access (Spanjer and Fenton 2005, p. 1110), but may change airflow and alter internal microclimates of the caves and mines, eliminating their utility as hibernacula (Service 2007, p. 71). For example, Richter et al. (1993, p. 409) attributed the decline in the number of Indiana bats at Wyandotte Cave, Indiana (which harbors one of the largest known population of hibernating Indiana bats (*Myotis sodalis*)), to an increase in the cave's temperature resulting from restricted airflow caused by a stone wall erected at the cave's entrance. In addition to the direct access modifications to caves discussed above, debris buildup at entrances or on cave gates can also significantly modify the cave or mine site characteristics by restricting airflow and the course of natural water flow. Water-flow restriction could lead to flooding, thus drowning hibernating bats (Amelon and Burhans 2006, p. 72). Thomas (1995, p. 942) used infrared detectors to measure flight activity in hibernating northern long-eared bats and little brown bats in response to the presence of a human observer. Flight activity significantly increased with the presence of an observer, beginning within 30 minutes

of the visit, peaking 1.0 to 7.5 hours later, and remaining significantly above baseline level for 2.5 to 8.5 hours. These results suggest that hibernating bats are sensitive to non-tactile stimuli and arouse and fly following human visits. Boyles and Brack's (2009) model predicted that the survival rate of hibernating little brown bats drops from 96 percent to 73 percent with human visitations to hibernacula. Prior to the outbreak of WNS, Amelon and Burhans (2006, p. 73) indicated that ''the widespread recreational use of caves and indirect or direct disturbance by humans during the hibernation period pose the greatest known threat to [the northern long-eared bat].''

Hibernacula and surrounding forest habitats play important roles in the life cycle of the northern long-eared bat beyond the time when the bats are overwintering. In both the early spring and fall, the hibernacula and surrounding forested habitats are the focus of bat activity in two separate periods referred to as ''spring staging'' and ''fall swarming.''

During the spring staging, bats begin to gradually emerge from hibernation, exit the hibernacula to feed, but re-enter the same or alternative hibernacula to resume daily bouts of torpor (Whitaker and Hamilton 1998, p. 100). The staging period for the northern long-eared bat is likely short in duration (Whitaker and Hamilton 1998, p. 100; Caire et al. 1979, p. 405). In Missouri, Caire et al. (1979, p. 405) found that northern long-eared bats moved into the staging period in mid-March through early May. In Michigan, Kurta et al. (1997, p. 478) determined that by early May, two-thirds of the *Myotis* species, including the northern long-eared bat, had dispersed to summer habitat.

Beginning in mid to late summer, after their young have gained some level of independence, northern long-eared bats exhibit a behavior near hibernacula referred to as swarming. Both male and female northern long-eared bats are present at swarming sites (often with other species of bats). During this period, heightened activity and congregation of transient bats around caves and mines is observed, followed later by increased sexual activity and bouts of torpor prior to winter hibernation (Fenton 1969, p. 601; Parsons et al. 2003, pp. 63–64; Davis and Hitchcock 1965, pp. 304–306). The purposes of swarming behavior may include introduction of juveniles to potential hibernacula, copulation, and stopping over sites on migratory pathways between summer and winter regions (Kurta et al. 1997, p. 479; Parsons et al. 2003, p. 64; Lowe 2012, p. 51; Randall and Broders 2014, pp. 109–110). The swarming season for some species of the genus *Myotis* begins shortly after females and young depart maternity colonies (Fenton 1969, p. 601). For the northern long-eared bat, the swarming period may occur between July and early October, depending on latitude within the species' range (Fenton 1969, p. 598; Kurta et al. 1997, p. 479; Lowe 2012, p. 86; Hall and Brenner 1968, p. 780; Caire et al. 1979, p. 405). The northern long-eared bat may investigate several cave or mine openings during the transient portion of the swarming period, and some individuals may use these areas as temporary daytime roosts or may roost in forest habitat adjacent these sites (Kurta et al. 1997, pp. 479, 483; Lowe 2012, p. 51). Little is known about northern long-eared bat roost selection outside of caves and mines during the swarming period (Lowe 2012, p. 6).

Based on the importance of hibernacula to northern long-eared bats, take is prohibited in and around the hibernacula within the WNS zone, including activities that may alter the hibernacula at any time of the year. Further, we have determined that when the conservation measures for the northern long-eared bat included in this final 4(d) rule are applied to areas within 0.25 mile (0.4 km) of the hibernacula, the potential for negative impacts to individuals is significantly reduced.

Activities Not Involving Tree Removal Are Not Prohibited

Under this final 4(d) rule, activities within the WNS zone not involving tree removal are not prohibited provided they do not result in the incidental take of northern long eared bats in hibernacula or otherwise impair essential behavioral patterns at known hibernacula. In our final listing determination (80 FR 17974; April 2, 2015), we identified a number of activities not involving tree removal that may have direct or indirect effects on northern long-eared bats. These activities have the potential to cause the incidental take of northern long-eared bats and include activities such as the operation of utility-scale wind-energy turbines, application of pesticides, and prescribed fire (this is not an exhaustive list; it is merely representative of activities that may result in take of northern long-eared bats).

At the time of our listing determination and the interim 4(d) rule (80 FR 17974; April 2, 2015), we stated that we had no compelling evidence that these activities would have significant effects on the northern long-eared bat when considered alone. However, we thought these factors may have a cumulative effect on this species when considered in concert with WNS. After additional consideration and our review of public comments received on the proposed and interim 4(d) rules, we did not find compelling evidence that regulating these potential cumulative effects would result in significant impacts at the species level. Effects to relatively small numbers of individuals are not anticipated to impair conservation efforts or the recovery potential of the species.

Wind-Energy Facilities

Wind-energy facilities are found scattered throughout the range of the northern long-eared bat, and many new facilities are anticipated to be constructed over the next 15 years (United States Department of Energy 2008, unpaginated). We reviewed post-construction mortality monitoring studies conducted at various times from 1998 through 2014 at 81 unique operating wind-energy facilities in the range of the northern long-eared bat in the United States and Canada (Service 2015, unpublished data). In these studies, 43 northern long-eared bat mortalities were documented at 19 of the sites. The northern long-eared bat fatalities comprised less than 1 percent of all documented bat mortalities. In most cases, the level of effort for most post-construction monitoring studies is not sufficient to confidently exclude the possibility that infrequent fatalities are being missed, but finding none or only small numbers over many sites and years can suggest the order of what may be missed. Thus while sustained mortality at particular facilities could potentially cause declines in local populations of the northern long-eared bat, if that is in fact occurring, it does not appear to be wide-spread at least when compared to other bat species which are nearly always found in fatality monitoring at wind facilities. At those sites with a northern long-eared bat fatality where multiple years of monitoring data were also available for review (n = 12), fatalities of northern long-eared bats were only reported in multiple years at two of the sites and for the other 10 sites only a single fatality was reported over multiple years of monitoring. For example, one site reported one northern long-eared bat fatality in 2008, but none in 2009, 2010, or 2011. Further, the number of fatalities of northern long-eared bats found at any given site has been relatively small (*e.g.,* most often a single fatality was found, but in all cases no more than six), and typically most sites (62 out of 81) found

no northern long-eared bat fatalities at all. There is a great deal of uncertainty related to extrapolating these numbers to generate an estimate of total northern long-eared bat mortality at wind-energy facilities due to variability in post-construction survey effort and methodology (Huso and Dalthorp 2014, pp. 546–547). Further, bat mortality can vary between years and between sites, and detected carcasses are only a small percentage of total bat mortalities. However, even with those limitations, northern long-eared bats were rarely detected as mortalities, even when they were known to be common on the landscape around the wind-energy facility.

We recognize that several wind energy facilities have completed, or are currently working to complete, habitat conservation plans (HCPs; permit pursuant to section 10(a)(1)(B) of the Act) for other listed bat species where the number of fatalities reported is also very low. When the take of an endangered species is reasonably certain to occur, we recommend that a project proponent secure incidental take coverage pursuant to section 10 of the Act. Over the operational life of a wind energy facility (typically anticipated to be at least 20 to 30 years), the take of listed species may be reasonably certain to occur, even if the level of mortalities annually is anticipated to be quite low. However, this does not mean that prohibiting that incidental take in the case of a threatened species is necessary and advisable for the conservation of such a species. For the northern long-eared bat, we do not anticipate that the fatalities that will be caused by wind energy would meaningfully change the species' status in the foreseeable future.

In addition, the wind industry has recently published best management practices establishing voluntary operating protocols, which they expect ''to reduce impacts to bats from operating wind turbines by as much as 30 percent'' (AWEA 2015, unpaginated). Given the large numbers of other bat species impacted by wind energy (Hein et al. 2013, p. 12) and the economic importance of bats in controlling agricultural or forest pest species (Boyles et al. 2011, pp. 41–42; Maine and Boyles, 2015, p. 12442), we anticipate that these new standards will be adopted by the wind-energy sector and ultimately required by wind-energy-siting regulators at State and local levels. We recommend that wind facilities adopt these operating protocols.

Our primary reason for not establishing regulatory criteria for wind-energy facilities is that the best available information does not indicate significant impacts to northern long-eared bats from such operations. We conclude that there may be adverse effects posed by wind-energy development to individual northern long-eared bats; however, there is no evidence suggesting that effects from wind-energy development has led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species in the face of WNS. Furthermore, with the adoption by wind-energy facilities of the new voluntary standards, risk to all bats, including the northern long-eared bat, should be further reduced.

Environmental Contaminants

Environmental contaminants, in particular insecticides, pesticides, and inorganic contaminants, such as mercury and lead, may also have detrimental effects on individual northern long-eared bats. However, across the wide-range of the species, it is unclear whether environmental contaminants, regardless of the source (*e.g.,* pesticide applications, industrial waste-water), would be expected to cause population-level impacts to the northern long-eared bat either independently or in concert with WNS. Historically, the most intensively-studied contaminants in bats have been the organochlorine insecticides (OCs; O'Shea and Clark 2002, p. 238). During wide-spread use of OCs in the 1960s and 1970s, lethal pesticide poisoning was demonstrated in gray bats (*Myotis grisescens*), Mexican free-tailed bats (*Tadarida brasiliensis*), and Indiana bats (*Myotis sodalis*) (O'Shea and Clark 2002, p. 239, 242). Since the phasing out of OCs in the United States, the effects of chemical contaminants on bats have been less well studied (O'Shea and Johnston 2009, p. 501); however, a few recent studies have demonstrated the accumulation of potentially toxic elements and chemicals in North American bats. For instance, Yates et al. (2014, pp. 48–49) quantified total mercury (Hg) levels in 1,481 fur samples and 681 blood samples from 10 bat species captured across 8 northeastern U.S. States and detected the highest Hg levels in tri-colored bats (*Perimyotis subflavus*), little brown bats (*Myotis lucifugus*) and northern long-eared bats. More recently, Secord et al. (2015) analyzed tissue samples from 48 northeastern bat carcasses of four species, including northern long-eared bats, and detected accumulations of several contaminants of emerging concern (CECs), including most commonly polybrominated diphenyl ethers (PDBEs; 100 percent of samples), salicylic acid (81 percent), thiabendazole (50 percent), and caffeine (23 percent). Digoxigenin, ibuprofen, warfarin, penicillin V, testosterone, and N,N-diethyl-meta-toluamide (DEET) were also present in at least 15 percent of samples. Compounds with the highest concentrations were bisphenol A (397 ng/g), PDBE congeners 28, 47, 99, 100, 153, and 154 (83.5 ng/g), triclosan (71.3 n/g), caffeine (68.3 ng/g), salicylic acid (66.4 ng/g), warfarin (57.6 ng/g), sulfathiazole (55.8 ng/g), tris(1-chloro-2-propyl) phosphate (53.8 ng/g), and DEET (37.2 ng/g).

Although there is the potential for direct and indirect contaminant-related effects, mortality or other population-level impacts have not been reported for northern long-eared bats. Long-term sublethal effects of environmental contaminants on bats are largely unknown; however, environmentally relevant exposure levels of various contaminants have been shown to impair nervous system, endocrine, and reproductive functioning in other wildlife (Yates et al. 2014, p. 52; Köhler and Triebskorn 2013, p. 761; Colborn et al. 1993, p. 378). Moreover, bats' high metabolic rates, longevity, insectivorous diet, migration-hibernation patterns of fat deposition and depletion, and immune impairment during hibernation, along with potentially exacerbating effects of WNS, likely increase their risk of exposure to and accumulation of environmental toxins (Secord et al. 2015, p. 411, Yates et al. 2014, p. 46, Geluso et al. 1976, p. 184; Quarles 2013, p. 4, O'Shea and Clark 2002, p. 238). Following WNS-caused population declines in northeastern little brown bats, Kannan et al. (2010) investigated whether exposure to toxic contaminants could be a contributing factor in WNS-related mortality. Although high concentrations of polychlorinated biphenyls (PCBs), PBDEs, polybrominated biphenyls (PBBs), and chlordanes were found in the fat tissues of WNS-infected bats in New York, relative concentrations in bats from an uninfected population in Kentucky were also high (Kannan et al. 2010, p. 615). The authors concluded that the study's sample sizes were too small to accurately associate contaminant exposure with the effects of WNS in bats (Kannan et al. 2010, p. 618), but argued that additional research is needed. Despite the lack of knowledge on the effects of various contaminants on northern long-eared bats, we recognize the potential for direct and indirect consequences.

However, contaminant-related mortality has not been reported for northern long-eared bats. Additionally, Ingersoll (2013, p. 9) suggested it was unclear what other threats or combination of threats other than WNS (*e.g.,* changes to critical roosting or foraging habitat, collisions, effects from chemicals) may be responsible for recent bat declines.

Prescribed Fire

Prescribed fire is a useful forest-management tool. However, there are potential negative effects from prescribed burning, including direct mortality to the northern long-eared bat. Therefore, when using prescribed burning as a management tool, fire frequency, timing, location, and intensity all need to be considered to lower the risk of incidental take of bats. Carter et al. (2002, pp. 140–141) suggested that the risk of direct injury and mortality to southeastern forest-dwelling bats resulting from summer prescribed fire is generally low. During warm temperatures, bats are able to arouse from short-term torpor quickly. Northern long-eared bats use multiple roosts, switch roost trees often, and could likely use alternative roosts in unburned areas, should fire destroy the current roost. Non-volant pups are likely the most vulnerable to death and injury from fire. Although most eastern bat species are able to carry their young for some time after they are born (Davis 1970, pp. 187–189), the degree to which this behavior would allow females to relocate their young if fire threatens the nursery roost is unknown. The potential for death or injury resulting from prescribed burning depends largely on site-specific circumstances, *e.g.,* fire intensity near the maternity roost tree and the height above ground of pups in the maternity roost tree. Not all fires through maternity roosting areas will kill or injure all pups present.

Bats are known to take advantage of fire-killed snags and continue roosting in burned areas. Boyles and Aubrey (2006, pp. 111–112) found that, after years of fire suppression, initial burning created abundant snags, which evening bats (*Nycticeius humeralis*) used extensively for roosting. Johnson et al. (2010, pp. 115) found that after burning, male Indiana bats roosted primarily in fire-killed maples. In the Daniel Boone National Forest, Lacki et al. (2009, p. 5) radio-tracked adult female northern long-eared bats before and after prescribed fire, finding more roosts (74.3 percent) in burned habitats than in unburned habitats. Burning may create more suitable snags for roosting through exfoliation of bark (Johnson et al. 2009a, p. 240), mimicking trees in the appropriate decay stage for roosting bats. In addition to creating snags and live trees with roost features, prescribed fire may enhance the suitability of trees as roosts by reducing adjacent forest clutter. Perry et al. (2007, p. 162) found that five of six species, including northern long-eared bat, roosted disproportionately in stands that were thinned and burned 1 to 4 years prior but that still retained large overstory trees.

The use of prescribed fire, where warranted, will, in any given year, impact only a small proportion of the northern long-eared bat's range during the bats active period. In addition, there are substantial benefits of prescribed fire for maintaining forest ecosystems. For example, the U.S. Forest Service's Southern Region manages approximately 10.9 million acres (4.4 million hectares (ha)) of land, and the maximum estimate of acres where prescribed fire is employed annually during the active period of northern-long eared bats (April through October) was 320,577 acres (129,732 ha), which is less than 3 percent of the National Forest regional lands. Similarly, the Forest Service's Eastern Region manages 15 Forests in 13 States that include about 12.2 million acres (4.88 million ha), of which 11.3 million acres (4.52 million ha) are forested habitat. The U.S. Forest Service anticipates applying prescribed burning to 107,684 acres (43,073 ha) or about 1percent of the forested habitat across the eastern region annually. In addition, only 17,342 acres (6937 ha) (*i.e.,* 0.15 percent of the forested habitat) of prescribed burning annually is anticipated to occur during the non-volant period on the eastern forests.

Further, there are substantial benefits of prescribed fire for maintaining forest ecosystems, such as providing the successional and disturbance processes that renew the supply of suitable roost trees (Silvis et. al. 2012, pp.6–7), as well as helping to ensure a varied and reliable prey base (Dodd et. al. 2012, p. 269). There is no evidence that prescribed fire has led to population-level declines in this species nor is there evidence that regulating the incidental take that might occur would meaningfully change the conservation status or recovery potential of the species in the face of WNS.

Hazardous Tree Removal Is Not Prohibited

Under this final 4(d) rule, incidental take that is caused by removal and management of hazardous trees is not prohibited. The removal of these hazardous trees may be widely dispersed, but limited, and should result in very minimal incidental take of northern long-eared bats. We recommend, however, that removal of hazardous trees be done during the winter, wherever possible, when these trees will not be occupied by northern long-eared bats. We conclude that the overall impact of removing hazardous trees is not expected to adversely affect conservation and recovery efforts for the species.

Activities Involving Tree Removal

We issued the interim species-specific rule under section 4(d) of the Act in recognition that WNS is the primary threat to the species' continued existence. We further recognized that all other (non-WNS) threats cumulatively were not impacting the species at the population level. Therefore, we apply the take prohibitions only to activities that we have determined may impact the species in its most vulnerable life stages, allowing for management flexibility and a limited regulatory burden.

In this final 4(d) rule, we have determined that the conservation of the northern long-eared bat is best served by limiting the prohibitions to the most vulnerable life stages of the northern long-eared bat (*i.e.,* while in hibernacula or in maternity roost trees) within the WNS zone and to activities, tree removal in particular, that are most likely to affect the species. We have also revised some of the conservation measures. To further simplify the regulation, we have established separate prohibitions for activities involving tree removal and those that do not involve tree removal. Within the WNS zone incidental take outside of hibernacula that results from tree removal is only prohibited when it (1) Occurs within 0.25 miles (0.4 km) of known northern long-eared bat hibernacula; or (2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the known occupied maternity trees, during the pup season (June 1 through July 31).

Forest Management

Forest management maintains forest habitat on the landscape, and the impacts from management activities are, for the most part, temporary in nature. Forest management is the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives (Society of American Foresters, *http://dictionaryofforestry.org/dict/term/forest_*

management). It includes a broad range of silvicultural practices and this discussion specifically addresses tree-removal practices (*e.g.,* timber harvest) associated with forest management. Timber harvesting includes a wide variety of practices from selected removal of individual trees to clearcutting. Impacts to northern long-eared bats from forest management would be expected to range from positive (*e.g.,* maintaining or increasing suitable roosting and foraging habitat within northern long-eared bat home ranges) to neutral (*e.g.,* minor amounts of forest removal, forest management in areas outside northern long-eared bat summer home ranges, forest management away from hibernacula) to negative (*e.g.,* death of adult females or pups or both resulting from the removal of maternity roost trees).

The best available data indicate that the northern long-eared bat shows a varied degree of sensitivity to timber-harvesting practices. For example, Menzel et al. (2002, p. 112) found northern long-eared bats roosting in intensively managed stands in West Virginia, indicating that there were sufficient suitable roosts (primarily snags) remaining for their use. At the same study site, Owen et al. (2002, p. 4) concluded that northern long-eared bats roosted in areas with abundant snags, and that in intensively managed forests in the central Appalachians, roost availability was not a limiting factor. Northern long-eared bats often chose black locust and black cherry as roost trees, which were quite abundant and often regenerate quickly after disturbance (*e.g.,* timber harvest). Similarly, Perry and Thill (2007, p. 222) tracked northern long-eared bats in central Arkansas and found roosts were located in eight forest classes with 89 percent occurring in three classes of mixed pine-hardwood forest. The three classes of mixed pine-hardwood forest that supported the majority of the roosts were partially harvested/thinned, unharvested (50 to 99 years old), and group-selection harvested (Perry and Thill 2007, pp. 223–224).

Certain levels of timber harvest may result in canopy openings, which could result in more rapid development of young bats. In central Arkansas, Perry and Thill (2007, pp. 223–224) found female bat roosts were more often located in areas with partial harvesting than males, with more male roosts (42 percent) in unharvested stands than female roosts (24 percent). They postulated that females roosted in relatively more open forest conditions because they may receive greater solar radiation, which may increase developmental rates of young or permit young bats a greater opportunity to conduct successful initial flights (Perry and Thill 2007, p. 224). Cryan et al. (2001, p. 49) found several reproductive and non-reproductive female northern long-eared bat roost areas in recently harvested (less than 5 years) stands in the Black Hills of South Dakota in which snags and small stems (diameter at breast height (dbh)) of 2 to 6 inches (5 to 15 centimeters) were the only trees left standing; however, the largest colony (n = 41) was found in a mature forest stand that had not been harvested in more than 50 years.

Forest size and continuity are also factors that define the quality of habitat for roost sites for northern long-eared bats. Lacki and Schwierjohann (2001, p. 487) stated that silvicultural practices could meet both male and female roosting requirements by maintaining large-diameter snags, while allowing for regeneration of forests. Henderson et al. (2008, p. 1825) also found that forest fragmentation affects northern long-eared bats at different scales based on sex; females require a larger unfragmented area with a large number of suitable roost trees to support a colony, whereas males are able to use smaller, more fragmented areas. Henderson and Broders (2008, pp. 959–960) examined how female northern long-eared bats use the forest-agricultural landscape on Prince Edward Island, Canada, and found that bats were limited in their mobility and activities are constrained when suitable forest is limited. However, they also found that bats in a relatively fragmented area used a building for colony roosting, which suggests an alternative for a colony to persist in an area with fewer available roost trees.

In addition to impacts on roost sites, we considered effects of forest-management practices on foraging and traveling behaviors of northern long-eared bats. In southeastern Missouri, the northern long-eared bat showed a preference for contiguous tracts of forest cover (rather than fragmented or wide open landscapes) for foraging or traveling, and different forest types interspersed on the landscape increased likelihood of occupancy (Yates and Muzika 2006, p. 1245). Similarly, in West Virginia, female northern long-eared bats spent most of their time foraging or travelling in intact forest, diameter-limit harvests (70 to 90 year-old stands with 30 to 40 percent of basal area removed in the past 10 years), and road corridors, with no use of deferment harvests (similar to clearcutting) (Owen et al. 2003, p. 355). When comparing use and availability of habitats, northern long-eared bats preferred diameter-limit harvests and forest roads. In Alberta, Canada, northern long-eared bats avoided the center of clearcuts and foraged more in intact forest than expected (Patriquin and Barclay 2003, p. 654). On Prince Edward Island, Canada, female northern long-eared bats preferred open areas less than forested areas, with foraging areas centered along forest-covered creeks (Henderson and Broders 2008, pp. 956–958). In mature forests in South Carolina, 10 of the 11 stands in which northern long-eared bats were detected were mature stands (Loeb and O'Keefe 2006, p. 1215). Within those mature stands, northern long-eared bats were more likely to be recorded at points with sparse or medium vegetation rather than points with dense vegetation, suggesting that some natural gaps within mature forests can provide good foraging habitat for northern long-eared bats (Loeb and O'Keefe 2006, pp. 1215–1217). However, in southwestern North Carolina, Loeb and O'Keefe (2011, p. 175) found that northern long-eared bats rarely used forest openings, but often used roads. Forest trails and roads may provide small gaps for foraging and cover from predators (Loeb and O'Keefe 2011, p. 175). In general, northern long-eared bats appear to prefer intact mixed-type forests with small gaps (*i.e.,* forest trails, small roads, or forest-covered creeks) in forest with sparse or medium vegetation for forage and travel rather than fragmented habitat or areas that have been clearcut.

Impacts to northern long-eared bats from forest management would be expected to vary depending on the timing of tree removal, location (within or outside northern long-eared bat home range), and extent of removal. While bats can flee during tree removal, removal of occupied roosts (during spring through fall) may result in direct injury or mortality to some percentage of northern long-eared bats. This percentage would be expected to be greater if flightless pups or inexperienced flying juveniles were also present. Forest management outside of northern long-eared bat summer home ranges or away from hibernacula would not be expected to affect the conservation of the species.

Forest management is not usually expected to result in a permanent loss of suitable roosting or foraging habitat for northern long-eared bats. On the contrary, forest management is expected to maintain a forest over the long term for the species. However, localized temporary reductions in suitable roosting and/or foraging habitat can occur from various forest practices (*e.g.,*

clearcuts). As stated above, northern long-eared bats have been found in forests that have been managed to varying degrees, and as long as there is sufficient suitable roosting and foraging habitat within their home range and travel corridors between those areas, we would expect northern long-eared bat colonies to continue to occur in managed landscapes. However, in areas with WNS, northern long-eared bats may be less resilient to stressors and maternity colonies are smaller. Given the low inherent reproductive potential of northern long-eared bats (one pup per female per year), death of adult females or pups or both during tree felling could reduce the long-term viability of some of the WNS-impacted colonies if they are also in the relatively small percentage of forest habitat directly affected by forest management.

As we documented in the interim 4(d) rule, forestry management and silviculture are vital to the long-term survival and recovery of the species. Based on information obtained during comment periods, approximately 2 percent of forests in States within the range of the northern long-eared bat are impacted by forest management activities annually (Boggess et al., 2014, p.9). Of this amount, in any given year, a smaller fraction of forested habitat would be impacted during the active season when female bats and pups are most vulnerable. Therefore, we have determined that when the prohibitions for the northern long-eared bat included in this final 4(d) rule are applied to forest management activities, the potential impacts will be significantly reduced.

Forest Conversion

In our listing determination for the northern long-eared bat, we noted that current and future forest conversion may have negative additive impacts where the species has been impacted by WNS (80 FR 17991; April 2, 2015). Our assessment was based largely on the species' summer-home-range fidelity and the potential for increased energetic demands for individuals where the loss of summer habitat had been removed or degraded (*e.g.,* fragmentation). We noted that forest conversion ''can result in a myriad of effects to the species, including direct loss of habitat, fragmentation of remaining habitat, and direct injury or mortality'' (80 FR 17993; April 2, 2015). In the interim 4(d) rule we exempted most forest-management activities except for the conversion of mature hardwood or mixed forest into intensively managed monoculture-pine plantation stands, or non-forested landscape (80 FR 18025; April 2, 2015).

Many of the comments on the proposed and interim 4(d) rules noted that habitat is not limiting for the northern long-eared bat. As we documented in the final listing determination (80 FR 1802; April 2, 2015), the extent of conversion from forest to other land cover types has been fairly consistent with conversion to forest (cropland reversion/plantings). Further, the recent past and projected amounts of forest loss to conversion was, and is anticipated to be, only a small percentage of the total amount of forest habitat. For example by 2060, 4 to 8 percent of the forested area found in 2007 across the conterminous United States is expected to be lost (U.S Forest Service 2012, p. 12). The northern long-eared bat has been documented to use a wide variety of forest types across its wide range. Therefore, we agree that the availability of forested habitat does not now, nor will it likely in the future, limit the conservation of the northern long-eared bat.

We have determined that when the prohibitions for the northern long-eared bat included in this final 4(d) rule are applied to forest-conversion activities, the potential for negative additive impacts to individuals or colonies is significantly reduced. As WNS impacts bat populations, unoccupied, suitable forage and roosting habitat will be increasingly available for remaining bats.

Tree-Removal Conservation Measures

Under this final 4(d) rule, incidental take within the WNS zone involving tree removal is not prohibited if two conservation measures are followed. The first measure is the application of a 0.25 mile (0.4 km) buffer around known occupied northern long-eared bat hibernacula. The second conservation measure is that the activity does not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius around the maternity roost tree, during the pup season (June 1 through July 31). The rationale for these measures is discussed below.

Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula

''Known hibernacula'' are defined as locations where one or more northern long-eared bats have been detected during hibernation or at the entrance during fall swarming or spring emergence. Given the documented challenges of surveying for northern long-eared bats in the winter (use of cracks, crevices that are inaccessible to surveyors), any hibernacula with northern long-eared bats observed at least once, will continue to be considered ''known hibernacula'' as long as the hibernacula remains suitable for the northern long-eared bat. A hibernaculum remains suitable for northern long-eared bats even when *Pd* or WNS has been detected.

We have adopted the 0.25-mile (0.4-km) buffer around known northern long-eared bat hibernacula for several reasons: (1) It will help to protect microclimate characteristics of the hibernacula; (2) for many known hibernacula, bats use multiple entrances that may not be reflected in the primary location information (*e.g.,* bats may use other smaller entrances that are often spread out from the main entrance accessed for surveys or other purposes) and the hibernacula may have extensive underground features that extend out from known entrances; (3) in the late summer and fall when bat behavior begins to center on hibernacula (swarming), it appears that northern long-eared bats may roost in a widely dispersed area, which may reduce the potential that any activity outside of this buffer would significantly affect the species; (4) outside of the maternity period, northern long-eared bats have demonstrated the ability to adapt to forest-management-related and other types of disturbances; and (5) regardless of the buffer size, bats will remain fully protected from take while in the hibernacula, when they are most vulnerable.

The microclimate, temperature, humidity, and air and water flow within a hibernaculum are all important variables that could potentially be impacted by forest management or other activities when conducted in proximity to a hibernaculum. A 0.25-mile (0.4-km) buffer will protect the hibernaculum's microclimate. Studies that have evaluated the depth of edge influence from forest edge or tree removal on temperature, humidity, wind speed, and light penetration suggest that although highly variable among forest types and other site-specific factors (such as aspect and season), the depth of edge influence can range from 164 feet (50 m) (Matlack 1993, p. 193) to over 1,312 feet (400 m) (Chen et al. 1995, p. 83). However, the hibernacula often selected by northern long-eared bats are ''large, with large passages'' (Raesly and Gates 1987, p. 20), and may be less affected by relatively minor surficial micro-climatic changes that might result from the limited exempted activities outside of the 0.25-mile (0.4-km) buffer. Further, bats rarely hibernate near the entrances of structures (Grieneisen 2011, p. 10), as these areas can be subject to greater

predation (Grieneisen 2011, p. 10; Kokurewicz 2004, p. 131) and daily temperature fluctuations (Grieneisen 2011, p. 10). Davis et al. (1999, p. 311) reported that partial clearcutting ''appears not to affect winter temperatures deep in caves.'' Caviness (2003, p. 130) reported that prescribed burns were found to have no notable influence on bats hibernating in various caves in the Ozark National Forest. All bats present in caves at the beginning of the burn were still present and in ''full hibernation'' when the burn was completed, and bat numbers increased in the caves several days after the burn. There were minute changes in relative humidity and temperature during the burn, and elevated short-term levels of some contaminants from smoke were noted.

Northern long-eared bat hibernacula can be large and complex and, spatially, may not be fully represented in locational information contained in species records by State or Federal agencies or by natural heritage programs. A 0.25-mile (0.4-km) buffer will help protect the spatial extent of many known hibernacula. For example, one limestone mine in Ohio used by northern long-eared bats had approximately 44 miles (71 km) of passages and multiple entrances (Brack 2007, p. 740). In northern Michigan, bats (including northern long-eared bats) occupied mines that were more structurally complex and longer (1,007 ft ± 2,837 ft (307m ± 865 m) than mines that were unoccupied, and the occupied mines had a total length of passages that ranged from 33 feet to 4 miles (10 meters to 6.4 kilometers) (Kurta and Smith 2014, p. 592).

Only a relatively small proportion of the areas where swarming northern long-eared bats may occur are likely to be affected by tree-removal activity. There are over 1,500 known hibernacula for the species in the United States (Service 2015, unpublished data), several known in Canada, and potentially many others yet to be identified. Lowe (2012, p. 58) reported that the roosts of northern long-eared bats were evenly distributed over distances within 4.6 miles (7.3 km) from a swarming site. If the northern long-eared bat's potential swarming habitat (including foraging habitat during that period) can be approximated as the forest habitat within 5 miles (8.1 km) of hibernacula, that equates to a 50,265 acre (20,342 ha) area per hibernaculum. In any given year, only a small proportion of the forest habitat within the potential swarming habitat is likely to be impacted by tree-removal activities (*e.g.,* generally 2 percent of forests are managed in any given year and over 1,500 hibernacula documented as used by the species). Similarly, forest conversion is anticipated to be relatively small compared to available habitat; therefore, based on our current understanding of potential swarming-habitat, on the scale of 50,000 acres (20,342ha) per hibernaculum, the relatively small foot-print of activities not prohibited by this final rule are unlikely to affect the conservation or recovery potential of the species. Raesly and Gates (1987, p. 24) evaluated external habitat characteristics of hibernacula and reported that for the northern long-eared bat the percentage of cultivated fields within 0.6 miles (1 km) of the hibernacula was greater (52.6 percent) for those caves used by the species, than for those caves not used by the species (37.7 percent), suggesting that the removal of some forest around a hibernacula can be consistent with the species needs.

Outside of the maternity period, northern long-eared bats have demonstrated the ability to respond successfully to forest-management-related and other types of disturbances. Therefore, the limited disturbance associated with incidental-take exceptions outside of the 0.25-mile (0.4-km) buffer on hibernacula is consistent with the conservation of the species. For example, Silvis et al.'s (2015, p.1) experimental removal of roosts suggested that the ''loss of a primary roost or 20 percent of secondary roosts in the dormant season may not cause northern long-eared bats to abandon roosting areas or substantially alter some roosting behaviors in the following active season when tree-roosts are used.''

Prior to WNS, the most significant risk identified for northern long-eared bat conservation was direct human disturbance while bats are hibernating (*e.g.,* Olson et al. 2011, p. 228; Bilecki 2003, p. 55; Service 2012, unpublished data). This final 4(d) rule (within the WNS zone) addresses these impacts.

We have prohibited incidental take of northern long-eared bats under specific tree-removal circumstances; however, that does not mean that all activities involving tree-removal activities within the 0.25-mile (0.4-k) buffer of hibernacula will result in take. For example, a timber harvest might be conducted within 0.25 miles (0.4 km) of a hibernaculum at a time when bats are unlikely to be roosting in trees within the buffer (*e.g.,* winter), which fully protects any bats in the hibernaculum as well as the hibernaculum's suitability for bats (*i.e.,* access, microclimate), and does not significantly change the suitability of the habitat for foraging by northern long-eared bats or perhaps even improves prey availability. In such a case, the timber harvest, although closer than 0.25 miles (0.4 km) to the hibernaculum, is not likely to result in incidental take so we would not recommend that the harvester seek authorization for incidental take pursuant to the Act. For activities planned within 0.25 miles (0.4 km) of hibernaculum, we encourage you to contact the local Ecological Services Field Office (*http://www.fws.gov/offices*) to help evaluate the potential for take of northern long-eared bats.

Conservation Measure 2: Tree Removal Near Known Maternity Roost Trees

Female northern long-eared bats roost communally in trees in the summer (Foster and Kurta 1999, p. 667) and exhibit fission-fusion behavior (Garroway and Broders 2007, p. 961), where members frequently roost together (fusion), but the composition and size of the groups is not static, with individuals frequently departing to be solitary or to form smaller or different groups (fission) (Barclay and Kurta 2007, p. 44). As part of this behavior, northern long-eared bats switch tree roosts often (Sasse and Pekins 1996, p. 95), typically every 2 to 3 days (Foster and Kurta 1999, p. 665; Owen et al. 2002, p. 2; Carter and Feldhamer 2005, p. 261; Timpone et al. 2010, p. 119). In Missouri, the longest time spent roosting in one tree was 3 nights (Timpone et al. 2010, p. 118). Bats switch roosts for a variety of reasons, including temperature, precipitation, predation, parasitism, sociality, and ephemeral roost sites (Carter and Feldhamer 2005, p. 264).

Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009, p. 212) to 60 individuals (Caceres and Barclay 2000, p. 3); however, one group of 100 adult females was observed in Vermilion County, Indiana (Whitaker and Mumford 2009, p. 212) and Lereculeur (2013, p. 25) documented a colony of at least 116 northern long-eared bats. In West Virginia, maternity colonies in two studies had a range of 7 to 88 individuals (Owen et al. 2002, p. 2) and 11 to 65 individuals, with a mean size of 31 (Menzel et al. 2002, p. 110). Lacki and Schwierjohann (2001, p. 485) found that the number of bats within a given roost declined as the summer progressed. Pregnant females formed the largest aggregations (mean=26) and post-lactating females formed the smallest aggregation (mean=4). Their largest overall reported colony size was 65 bats.

Northern long-eared bats change roost trees frequently, but use roost areas repeatedly and to a lesser extent, reuse specific roosts (*e.g.,* Cryan et al. 2001, p. 50; Foster and Kurta 1999, p. 665). The northern long-eared bat appears to be somewhat flexible in tree-roost selection, selecting varying roost tree species and types of roosts throughout its range. Females tend to roost in more open areas than males, likely due to the increased solar radiation, which aids pup development (Perry and Thill 2007, p. 224). Fewer trees surrounding maternity roosts may also benefit juvenile bats that are starting to learn to fly (Perry and Thill 2007, p. 224). Female roost-site selection, in terms of canopy cover and tree height, changes depending on reproductive stage; relative to pre- and post-lactation periods, lactating northern long-eared bats have been shown to roost higher in tall trees situated in areas of relatively less canopy cover and lower tree density (Garroway and Broders 2008, p. 91).

The northern long-eared bat's tendency for frequent roost switching may help them avoid or respond effectively to disturbance by people outside of the maternity season. The frequent-roost-switching behavior of northern long-eared bat suggests that they are adapted to responding quickly to changes in roost availably (ephemeral roosts), changing environmental conditions (temperature), prey availability, or physiological needs (torpor, reproduction). In a study of radio-tracked northern long-eared bats responding to the disturbance from prescribed fire (Dickinson et al. 2009, pp. 55–57), the bats appeared ''to limit their exposure to conditions created by fire. At no point did they fly outside of their typical home range area, nor did they travel far from the burn itself.'' While some of the bats soon returned to areas recently burned, by day 6 and 7 post burn, they ''appeared to return to pre-burn norms in terms of emergence time, length of foraging bouts, and use of the burn unit and adjacent habitats.'' Carter et al. (2000, pp 139–140), noted that ''During the summer months, bats are able to arouse quickly as the difference between the ambient temperature and active body temperature of bats is less. Most bat species utilizing trees and snags have multiple roosts throughout the forest (Sasse and Pekins 1996; Callahan et al. 1997; Menzel et al. 1998; Foster and Kurta 1999, Menzel et al. 2001), providing alternate roosts should the current roost be destroyed by fire.'' Sparks et al. (2008, pp. 207–208) documented that northern long-eared bats released in the open during the day demonstrated a successful rapid ''flight-to-cover'' response.

Adult females give birth to a single pup (Barbour and Davis 1969, p. 104). Birthing within the colony tends to be synchronous, with the majority of births occurring around the same time (Krochmal and Sparks 2007, p. 654). Parturition (birth) likely occurs in late May or early June (Caire et al. 1979, p. 406; Easterla 1968, p. 770; Whitaker and Mumford 2009, p. 213), but may occur as late as July (Whitaker and Mumford 2009, p. 213). Upon birth, the pups are unable to fly, and females return to nurse the pups between foraging bouts at night. In other *Myotis* species, mother bats have been documented carrying flightless young to a new roosting location (Humphrey et al. 1977, p. 341). The ability of a mother to move young may be limited by the size of the growing pup. Juvenile volancy (flight) often occurs by 21 days after birth (Krochmal and Sparks 2007, p. 651; Kunz 1971, p. 480) and has been documented as early as 18 days after birth (Krochmal and Sparks 2007, p. 651). Prior to gaining the ability to fly, juvenile bats are particularly vulnerable to tree-removal activities. Based on this information, we have determined that the most sensitive period to protect pups at maternity roost trees is from June 1 through July 31 (the ''pup season'').

Known occupied maternity roost trees are defined as trees that have had female northern long-eared bats or juvenile bats tracked to them or the presence of female or juvenile bats is known as a result of other methods. Once documented, northern-long eared bats are known to continue to use the same roosting areas. Therefore, a tree will be considered to be a ''known, occupied maternity roost'' as long as the tree and surrounding habitat remain suitable for northern long-eared bats. The incidental take prohibition for known, occupied maternity roosts trees applies only during the during the pup season (June 1 through July 31).

In addition to protecting the known roosts, we have also included in this conservation measure avoiding the cutting or destroying of any other trees within a 150-foot (45-meter) radius from the known, occupied maternity roost tree during the pup season (June 1 through July 31). Leaving a buffer of other trees around the maternity roost tree will help to protect the roost tree from damage or destruction that may be caused by other nearby trees being removed as well as helping protect the roost tree from wind throw and micro-climate changes. O'Keefe (2009 p. 42) documented that a 39-foot (12-meter) buffer around a maternity roost tree during a harvest in May allowed the roost to be successfully used through late July and that one buffered tree was used 2 years in a row. We have adopted a standard for exception of take that is almost four times that which proved effective in this example, in order to better account for the variation in forest types used by the northern long-eared bat and a variety of slopes that might influence how large a buffer may need to be in order to prove effective. Roost trees used by northern long-eared bats are often in fairly close proximity to each other within the species' summer home range. For female northern long-eared bats, the mean distance between roosts was reported as 63m to 600m from a variety of studies published 1996 through 2014 (Foster and Kurta 1999 p. 665; Cryan et al. 2001, p. 46; Swier 2003, pp. 58–59; Jackson 2004, p. 89; Henderson and Broders 2008, p. 958; Johnson et al. 2009, p. 240; Badin 2014, p. 76; Bohrman and Fecske, unpublished data). Further, within that data, the distance between roosts was reported as small as 5 meters in one study (Badin 2014, p. 76) and 36 meters in another (Jackson 2004, p. 89). As Sasse 1995, p. 23, noted ''some roost sites appeared to be 'clustered' together.'' Therefore, even this modest additional buffer may also protect other roosts trees used by female northern long-eared bats during the maternity period that have not yet been documented. In addition, because colonies occupy more than one maternity roost in a forest stand and individual bats frequently change roosts, in some cases a portion of a colony or social network is likely to be protected by multiple 150-foot buffers during the maternity season.

Currently, since most States and natural heritage programs do not track roosts and many have not tracked any northern long-eared bat occurrences, we recognize that not all northern long-eared bat maternity roost sites are known. Therefore, this measure will not protect an unknown maternity roosts unless it falls under one of the buffers related to protecting a known roost or hibernaculum.

Although not fully protective of every individual, the conservation measures identified in this final rule help protect maternity colonies. This final species-specific rule under section 4(d) of the Act provides the regulatory flexibility for certain activities to occur that have not been the cause of the species' imperilment, while allowing us to focus conservation efforts on WNS, promoting

conservation of the species across its range.

Additional Prohibitions and Exceptions

In this final 4(d) rule we carry forward other standard prohibitions and exceptions that are typically applied to threatened species and are currently applicable under the interim rule for the northern long-eared bat. These prohibitions included the possession of and other acts with unlawfully taken northern long-eared bats, as well as import and export. We also included standard exemptions, including all the permitting provisions of 50 CFR 17.32 and the exemption for employees or agents of the Service, of the National Marine Fisheries Service, or of a State conservation agency when acting in the course of their official duties to take northern long-eared bats covered by an approved cooperative agreement to carry out conservation programs.

Summary of Comments and Recommendations on the Proposed and Interim 4(d) Rules

The northern long-eared bat was listed as a threatened species under the Act, with an interim rule under section 4(d) of the Act, on April 2, 2015 (80 FR 17974). At that time, the Service invited public comments on the interim 4(d) rule for 90 days, ending July 1, 2015. The Service had already received comments for 60 days on its proposed 4(d) rule (80 FR 2371, January 16, 2015). In total, the Service received approximately 40,500 comments on the proposed and interim 4(d) rules. We discuss them below.

Peer Reviewer Comments

1. *Comment:* Peer reviewer(s) commented that the 0.25-mile (radius) around hibernacula is an inadequate buffer. There were additional suggestions for alternative buffer distances as well as more detail on how activities might be limited within those buffers. A specific suggestion of a 1.6-mile buffer was made, with a statement that most forest practices could occur within the buffer provided that the trees were not completely removed (conversion). In addition, a suggestion of 0.5-mile buffer was made.

Our Response: We have revised the approach used in this final 4(d) rule to ensure that hibernating northern long-eared bats in the WNS zone are protected from incidental take independent of the buffer size used in the conservation measure. In addition, all northern long-eared bats both in and outside of the WNS zone are protected from purposeful take (*e.g.,* killing or intentionally harassing northern long-eared bats), including while in the hibernacula where they are most vulnerable. We have retained the 0.25-mile buffer (0.25-mile radius around known hibernacula entrance/access points used by bats) to further protect the hibernaculum and associated forested habitat for several reasons (see discussion above under *Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula*). Some of the peer-reviewers recommended that within the hibernacula buffer that certain limited activities should be allowed (*e.g.,* timber harvest that only removes a small percentate of the forest habitat when bats are not active). As discussed above under *Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula,* not all tree-removal activities within the buffer of hibernacula will result in take. For example, a timber harvest might be conducted within the buffer when bats are unlikely to be roosting in trees (*e.g.,* winter) that fully protects any bats in the hibernaculum as well as the hibernaculum's suitability for bats (*i.e.,* access, microclimate), and does not significantly change the suitability of the habitat for foraging by northern long-eared bats or perhaps even improves prey availability. In such a case, the timber harvest, although within the buffer, is not likely to result in incidental take so we would not recommend that the harvester seek authorization for incidental take pursuant to the Act. Because the buffer only applies to actions that result in incidental take of the northern long-eared bat, we determined that there was no need to attempt to exempt activities (*e.g.,* a limited timber harvest) where incidental take is unlikely.

2. *Comment:* Peer reviewer(s) commented that the WNS buffer zone should be removed and protections should occur throughout the range of the species.

Our Response: We have established prohibitions on the purposeful take of northern long eared bats throughout the species range. However, because WNS is the most significant threat known to be imperiling the species, we have determined that in areas where WNS has not been detected, additional prohibitions are not warranted. We recognize that the WNS zone will change over time. We remain committed to regularly updating the WNS zone map as new information about the spread of the *Pd* fungus becomes known.

3. *Comment:* Peer reviewer(s) commented that the WNS buffer zone should be expanded and/or changed to accommodate a more site-specific approach, based on proximity to hibernacula, for example.

Our Response: We reevaluated the approach to the WNS zone in this final rule and determined that the 150-mile buffer used for the interim 4(d) rule appears to be very effective in capturing counties where new *Pd* detections are reported, in particular when looking at the new occurrences over the last 5 years. For more details of this analysis, please see our discussion in the WNS Zone section of this rule.

4. *Comment:* Peer reviewer(s) commented that the Service's definitions relative to forestry practices should be more precise and should use silviculture terminology.

Our Response: We have revised the prohibitions to no longer use specific forestry practices or silviculture terminology. Take of the northern long-eared bat within the context of forest management is not prohibited provided that conservation measures to protect hibernacula and known maternity roost trees are implemented as described in this rule.

5. *Comment:* Peer reviewer(s) recommended that the seasonal restrictions for the northern long-eared bat ''pup season'' be expanded and/or based on climate and geography within the species' range.

Our Response: We recognize that in some areas or in some years the period when young northern long-eared bats are non-volant may be earlier or later than the June and July timeframe. The timing of when northern long-eared bats give birth is likely a complex interplay of a variety of factors affecting fetal development (*e.g.,* condition of the mother, temperature, prey availability), and similar factors may also influence the time required for young to develop the ability to fly. In addition, a study in West Virginia documented that the peak pregnancy and lactation dates shifted post WNS (Francl et al. 2012, p. 36). However, looking across a variety of studies, the June and July timeframe appears to generally capture what is typically reported as the non-volant period for northern long-eared bats across much of their range within the United States. We have determined that a single timeframe for implementing the prohibition on maternity roost tree removal provides clarity for the regulated public. In addition, while it does not modify the incidental take prohibition established in these regulations, our local field offices may be able to provide more refined local estimates of the non-volant period for specific areas. Project planners may choose to use these local estimates for

planning purposes where they are available.

6. *Comment:* Peer reviewer(s) recommended year-round protections for maternity roost trees or conversely that we remove entirely the protections for maternity trees because it is ineffective and serves as a disincentive for conducting surveys.

Our Response: Although northern long-eared bats have been documented to use some roost trees over multiple years, in many cases it is because the tree is dead or dying or has structural defects that provides the roosting features attractive to the species. Further, maternity roost trees are used only briefly (*e.g.,* northern long-eared bats typically change roosts every few days, and only a relatively small percentage of those are used more than once in any one season). Given that maternity roosts trees are ephemeral on the landscape and used for very short periods of time in the active season, we determined that year-round protections for known, occupied maternity roost trees are not warranted. We considered removing the protections for known, occupied maternity roosts as recommended by another peer reviewer, but instead modify the protection so as to minimize the disincentive for conducting surveys. In developing this final rule, we kept protections for known, occupied maternity roosts for two reasons: (1) While it may be unlikely, in cases where a tree was about to be removed, but was known to be occupied by northern long-eared bats, they would have some protections while the young could not fly; and (2) we wanted known, occupied maternity roosts to be given consideration because they help to signal to project planners an area that is likely to be used by northern long-eared bats in the future (as this species has a high degree of site fidelity). We refined the protection for known, occupied maternity roosts to make it as practical to implement as possible in order to minimize the disincentive created for conducting surveys. Many forest managers implement similar types of relatively small seasonal buffers to protect other species of sensitive wildlife (*e.g.,* around nesting raptors) and therefore we do not view this provision as a real disincentive to conducting surveys. Please see the *Conservation Measure 2: Tree Removal Near Known Maternity Roost Trees* section of this rule for additional details. We believe that the seasonal restriction helps to protect the most vulnerable life stages, in this case the non-volant pups, and is adequate for the purposes of this rule.

7. *Comment:* Peer reviewer(s) recommended that pregnant females should be protected as part of the seasonal restriction criteria.

Our Response: We recognize that pregnant females may be in torpor or less able to flee in early spring. However, we did not have information on how pregnancy in northern long-eared bats influenced the degree of torpor or their ability to flee from disturbance. As discussed in this rule, we expect only a small percentage of the species' forested habitat to be affected by activities (*e.g.,* tree removal, prescribed fire) that might impact a pregnant northern long-eared bats in torpor and, therefore, we expect only small proportion of the species' population to be potentially exposed to these activities. Because of the relatively small exposure and uncertainty about how pregnancy affects degree of torpor or ability to flee, we have not expanded the seasonal protections for this purpose. We believe that seasonal restrictions help protect the vulnerable pup stage, when young pups cannot fly, and are adequate for the purposes of this rule.

8. *Comment:* Peer reviewer(s) stated that the conservation efforts will not be effective because the natural heritage data are limited with respect to known maternity roost trees and hibernacula.

Our Response: We agree that the data are limited and this can be challenging from the implementation and/or project planning perspective. However, we have purposefully limited protections where possible, to minimize the potential disincentive to continue to survey for the species. However, we anticipate that information in State natural heritage data bases will continue to improve post-listing.

9. *Comment:* Peer reviewer expressed concern with allowing lethal take of northern long-eared bats from human dwellings.

Our Response: We encourage the non-lethal removal of northern long-eared bats from human structures, preferably by excluding them outside of the maternity period, whenever possible. However, because of the potential for human health considerations, we have not required this as part of the exception to the purposeful take prohibition. We have limited this take to houses, garages, barns, sheds, and other buildings designed for human entry.

Public Comments

General

10. *Comment:* Commenters from many development sectors requested that their activities be included in the suite of exempted activities under the 4(d) rule (specific sectors addressed below).

Our Response: In general, this final rule has been restructured to clarify prohibitions to take rather than to rely on a list of excepted activities. Prohibitions are applied in this final rule where necessary and advisable for the conservation of the species. Therefore, the various ''sectors'' do not need to be identified or ''excepted'' to apply rule provisions.

Forest Management

11. *Comment:* Several commenters recommended that forest conversion be included as an excepted activity. Comments were specific to conversion of hardwood forests to pine plantations, managed pine forest, pine ecosystem, and the Service's characterization of pine stands as monoculture stands representing poor bat habitat.

Our Response: Incidental take resulting from forest management, including forest conversion, is not a prohibited action pursuant to this final 4(d) rule provided conservation measures to protect known hibernacula and known, occupied maternity roost trees are employed. Please see sections above titled Forest Management and Forest Conversion.

12. *Comment:* Commenters stated that forest management must occur to avoid habitat deterioration to poor quality bat habitat. They further stated that forest health depends upon active management including tree removal and clearcutting.

Our Response: We agree that forest management can be very important in creating or maintaining forest successional patterns that help to ensure suitable trees are available for roosting northern long-eared bats. Further, forest management can help to increase prey availability or suitability of foraging habitat. Please see our discussion above under Forest Management for additional details. Incidental take resulting from forest management is not prohibited pursuant to this final 4(d) rule provided conservation measures to protect known hibernacula and known maternity roost trees are employed.

13. *Comment:* Commenters suggested that the Service consider exemptions for sustainable forest practices implemented under a sustainable forest management plan or sustainable forestry certificate program.

Our Response: We considered incorporating other possible conservation measures related to forest management and conversion. However, given the overall small percentage of the species' range potentially affected by

these activities in any given year, it was not clear that additional conditions related to incidental take from forest management or conversion would meaningfully change the conservation outlook for the species. Further, adding protections with uncertain benefits, but with large potential public impacts can hinder support for species conservation. Incidental take resulting from forest management is not prohibited pursuant to this final 4(d) rule provided conservation measures to protect known hibernacula and known, occupied maternity roost trees are employed.

14. *Comment:* Commenters stated that the Service should focus on the elimination of WNS rather than regulating timber harvest in summer habitat.

Our Response: Efforts to address the threat posed by WNS are on-going by the Service and many partners across the species range. Incidental take resulting from forest management or forest conversion is not prohibited pursuant to this final 4(d) rule provided conservation measures to protect known hibernacula and known, occupied maternity roost trees are employed.

15. *Comment:* A commenter stated that the Service should halt commercial timber harvest and another commenter suggested restricting the removal of snags and coarse woody debris in areas populated by the species.

Our Response: The northern long-eared bat is not limited in terms of habitat availability for feeding, breeding, and sheltering in the summer (non-hibernating) months. Please see the discussions under Forest Management and Forest Conversion above in this rule. We have carefully considered the value of habitat protection for the species. We have determined that protection of summer habitat is not required for species conservation except where trees may be occupied by young, non-volant (flightless) pups and for areas immediately surrounding hibernacula where they swarm and feed just prior to hibernation and when they emerge from hibernation in the spring. Due to this swarming behavior and the vulnerability of bats when hibernating, we have determined that take prohibitions are necessary and advisable in winter habitat (hibernacula), where bats are subject to the effects of WNS. In addition, we have determined that protection of known, occupied maternity roost trees is necessary and advisable in order to protect young pups.

16. *Comment:* The Service should increase protections to avoid impacts to bats from the point that they emerge from hibernation to the end of the maternity/pup season. Forest management should only be done in a manner that retains sufficient vegetative cover and protects northern long-eared bats at the maternity colony level.

Our Response: We considered incorporating other possible conservation measures related to forest management and conversion. However, given the overall small percentage of the species' range potentially affected by these activities in any given year, it was not clear that additional conditions related to the incidental take from forest management or conversion would meaningfully change the conservation outlook for the species. Further, adding protections with uncertain benefits, but with large potential public impacts can hinder support for the species conservation. We have determined that protection of known, occupied maternity roost trees during the months of June and July is an adequate conservation measure for the protection of non-volant pups.

17. *Comment:* Commenter(s) suggested an exemption for invasive species management in forested landscapes.

Our Response: Outside of hibernacula, this final rule does not prohibit take from activities other than tree removal. Therefore, incidental take associated with management of invasive species using pesticides or other interventions is not prohibited. Where intervention involves tree removal, conservation measures must be followed to comply with this rule. However, entities that cannot apply the required conservation measures have other means to have take excepted, such as section 10 permits or section 7 incidental take authorization.

Human Structures

18. *Comment:* Commenters suggested expansion of the definition of human structures/dwellings to include bridges, culverts, cattle passes, and other human-made structures.

Our Response: This final rule does not prohibit direct take of northern long-eared bats occupying human structures defined as houses, garages, barns, sheds, and other buildings designed for human entry. While we encourage landowners and project proponents to find other mechanisms to avoid killing or injuring bats that occupy bridges, culverts, and other structures, incidental take is not prohibited by this rule. While bridge and culvert use for the species has been documented, it is relatively uncommon compared to tree or other types of roost sites (*e.g.,* barns) and, therefore, did not warrant specific provisions in this final rule. Within the WNS zone, however, project proponents must apply conservation measures to avoid habitat removal around hibernacula and to avoid cutting or destroying known, occupied maternity roost trees or any other trees within a 150-foot radius from the maternity roost tree during June and July.

19. *Comment:* Commenters stated that take of northern long-eared bat in human dwellings should not be exempted and requested that the Service provide rationale for determining that this exemption is necessary.

Our Response: We encourage the non-lethal removal of northern long-eared bats from human structures whenever possible, preferably by excluding them from the structure outside of the maternity period. However, because of the potential for human health considerations, we have not required this as part of the exception to the purposeful take prohibition. Please see the discussion under Exceptions to the Purposeful Take Prohibition in this rule for additional details. Take of northern long-eared bats to remove them from human structures is not prohibited.

Hazardous Tree Removal

20. *Comment:* Several comments requested clarification and/or expansion of the exception to take for removal of hazardous trees.

Our Response: Our intent is to provide for the removal of hazardous trees for the protection of human life and property. This is not the same as hazard tree removal within the context of forest management or rights-of-way management where hazard trees are identified as trees that are in danger of falling. Incidental take of northern long-eared bats from hazardous tree removal in the context of rights-of-way management is not prohibited by the final 4(d) rule provided conservation measures to protect known hibernacula and known, occupied maternity roost trees are applied.

Minimal Tree Removal

21. *Comment:* Several commenters requested that minimal tree removal be expanded to a larger acreage.

Our Response: Conversion of forested cover to alternate uses is not prohibited under this final rule, provided that conservation measures are followed when those activities occur within the WNS zone. For a discussion of this issue, please see Forest Conversion section in this rule.

22. *Comment:* Several commenters stated that the exemption for minimal tree removal should be expanded to other (non-forest) industry entities and should include all activities that have a

minimal effect on the northern long-eared bat.

Our Response: Conversion of forested acreages to alternate uses is not prohibited under this final rule, provided that conservation measures are followed. This is applicable to all entities that may engage in activities that remove trees or convert forested acres. See the Forest Conversion section in this rule.

Oil and Gas Industry

23. *Comment:* A number of commenters from the oil and gas industry stated that the industry should be included within exemptions from take prohibitions because: (1) Their impact on northern long-eared bat habitat is small compared to forest management impacts; (2) habitat is re-vegetated following pipeline installation; (3) oil and gas exploration and transport are not the stated primary threat to the species (WNS is the primary threat); and (4) adequate regulatory mechanisms exist for mitigating industry environmental impacts.

Our Response: Take of northern long-eared bats attributable to habitat conversion and habitat loss is not prohibited under this final 4(d) rule, provided that developers and project proponents follow conservation measures described herein when activities occur within the WNS zone. See the Forest Conversion section in this rule.

Rights-of-Way

24. *Comment:* Commenter(s) stated that loss of habitat attributable to clearing for linear projects is miniscule compared to habitat conversion due to forest management.

Our Response: Incidental take attributable to maintenance, development, and rights-of-way expansion is not prohibited by this final 4(d) rule, provided conservation measures contained herein are followed when activities occur within the WNS zone.

25. *Comment:* Commenter(s) stated that the exception, as proposed and implemented via the interim rule, should be expanded to greater than 100-feet and should be clarified.

Our Response: Incidental take attributable to maintenance, development, and rights-of-way expansion is not prohibited by this final 4(d) rule, provided conservation measures contained herein are followed when activities occur within the WNS zone.

26. *Comment:* Commenter(s) stated that the exception for rights-of-way should be expanded to include new rights-of-way and transmission corridors.

Our Response: Incidental take attributable to maintenance, development, and rights-of-way expansion is not prohibited by this final 4(d) rule, provided conservation measures contained herein are followed when activities occur within the WNS zone.

27. *Comment:* Commenter(s) disagree with the Service's assertion that vegetation removal within or adjacent to rights-of-way is a small-scale alteration of habitat.

Our Response: It is within the context of the species range and potential for available habitat that right-of-way development, maintenance or expansion are small scale alterations of forest habitat. The extent of conversion from forest to other land cover types has been fairly consistent with conversion to forest (cropland reversion/plantings). Further, the recent past and projected amounts of forest loss to conversion from all sources was and is anticipated to be only a small percentage of the total amount of forest habitat. For example by 2060, 4 to 8 percent of forest area found in 2007 across the conterminous United States is expected to be lost (U.S Forest Service 2012, p. 12). We have not broadened the incidental prohibition related to habitat loss because WNS is the predominant threat to the species. Summer habitat does not now or in the future appear likely to be a limiting factor for the species; therefore, we have focused the protections on vulnerable individuals in summer habitat and protecting the winter habitat, where sensitivity to the effects of WNS is heightened.

28. *Comment:* Commenter(s) requested that the Service expand the rights-of-way exemption to include access roads and infrastructure required to deliver services.

Our Response: Incidental take attributable to maintenance, development, and rights-of-way expansion is not prohibited by this final 4(d) rule, provided conservation measures contained herein are followed when activities occur within the WNS zone. This includes related activities such as access road clearing and facilities related to delivery of services. In the case where tree removal is the activity in question, incidental take is not prohibited provided that the conservation measures herein are followed when those activities occur within the WNS zone.

29. *Comment:* Commenter suggested that the final 4(d) rule should prohibit all tree clearing activities related to the maintenance, repair, and creation of rights-of-way.

Our Response: The northern long-eared bat is not limited in terms of habitat availability for feeding, breeding, and sheltering in the summer (non-hibernating) months. We have carefully considered the value of habitat protection for the species. We have determined that protection of summer habitat is not required for species conservation except where trees are known to be occupied by northern long-eared bats when the young are non-volant (flightless) and for areas immediately surrounding hibernacula where they swarm and feed just prior to hibernation and when they emerge from hibernation in the spring.

Solar Energy

30. *Comment:* Commenter(s) requested that solar energy development be provided an exemption under the 4(d) rule.

Our Response: Solar energy developers will need to consider the impacts of their development and operations in light of the prohibitions of this rule. Incidental take outside of the WNS zone is not prohibited. Incidental take from tree-removal activities within the WNS zone is prohibited under specific conditions related to known hibernacula and known, occupied maternity roost trees (see Activities Involving Tree Removal section above for details).

Agriculture

31. *Comment:* Commenter(s) requested that agricultural activities be included in the suite of exempted activities under the 4(d) rule.

Our Response: We have substantially revised the prohibitions and exceptions in this final rule that may apply to agricultural activities. Agricultural producers/operators will need to consider the impacts of their activities in light of the prohibitions of this rule. Incidental take outside of the WNS zone is not prohibited. Incidental take from tree removal activities within the WNS zone is prohibited under specific conditions related to known hibernacula and known, occupied maternity roost trees (see Activities Involving Tree Removal, above, for details). This final rule has been restructured in a manner that it applies prohibitions where necessary and advisable for conservation of the species. Therefore, agricultural development and operations do not need to be specifically ''excepted'' in order to apply the rule's provisions.

Caves and Mines

32. *Comment:* Commenter(s) requested an exemption for show caves and cave tours.

Our Response: Hibernating bats are very sensitive to disturbance as discussed in greater detail under the Hibernacula section of this document. This final rule prohibits the incidental take of northern long-eared bats in hibernacula inside the WNS zone as well as the purposeful take (*e.g.,* purposefully harassing or killing) of northern long-eared bats in hibernacula both inside and outside of the WNS zone. When this species occupies caves or mines used by people regardless of the purpose, the provisions of this 4(d) rule apply. Show cave or mine activities inside the WNS zone that do not result in the incidental take of northern long-eared bats are not prohibited. In other words, if northern long-eared bats are not being disrupted from their normal hibernation behaviors (*e.g.,* by avoiding areas with hibernating bats, limiting noise and lighting in areas used by bats), we do not consider human use of the cave or mine to be a ''take'' of the bats.

33. *Comment:* Commenter(s) stated that an exemption should be made available for mining, mineral exploration, and coal extraction activities.

Our Response: Incidental take of northern long-eared bats that results from tree-removal activity, including mining operations, is prohibited in some circumstances (see Activities Involving Tree Removal, above). However, hibernating bats are very sensitive to disturbance, as discussed in greater detail under the Hibernacula section of this rule. This final rule prohibits the incidental take of northern long-eared bats in hibernacula inside the WNS zone as well as the purposeful take (*e.g.,* purposefully harassing or killing) of northern long-eared bats in hibernacula both inside and outside of the WNS zone. Inside the WNS zone, the take of northern long-eared bats in mines and man-made tunnels for mineral or coal extraction includes any activity that kills, injures, harms, or harasses the species. Mining, mineral exploration, and coal extraction activities will need to work with the Service to find alternative means to authorize take, such as through a section 10 permitting process or section 7 process where applicable. Mining activities inside the WNS zone that do not result in the incidental take of northern long-eared bats are not prohibited. In other words, if northern long-eared bats are not being killed, injured, or otherwise disrupted from their normal hibernation behaviors by the mining operations, we do not consider those activities to be a ''take'' of the bats.

34. *Comment:* Commenter(s) suggested that activities designed to reclaim abandoned mines or maintain cave environments for the benefit of wildlife species should be exempt under the 4(d) rule.

Our Response: We agree that beneficial reclamation and maintenance should be encouraged. However, exception from take prohibitions through a species-specific 4(d) rule is not the appropriate mechanism for authorizing this activity. Where abandoned mines and cave environments are in use by northern long-eared bats, take associated with maintenance is prohibited; however, we encourage project proponents to work with the Service to implement best management practices to avoid or minimize the effects of their actions in the interest of habitat improvement. We will work with project proponents to determine alternate ways to authorize activities, such as section 10 permits or section 7 incidental take authorization.

Mosquito Control

35. *Comment:* Commenter challenges the Service's assertion that chemicals used in mosquito control (malathion and others of comparable risk to mammals) pose a risk to northern long-eared bats; commenter further requests an exemption for mosquito control activities, especially where there is a public health risk.

Our Response: Please see the Environmental Contaminants section of this rule for details concerning our evaluation of the risks from pesticide applications. After careful consideration of the available information, we do not include in this rule a prohibition on the incidental take of northern long-eared bats as result of pesticide application provided the application is a ''lawful activity,'' that is, it must comply all applicable State laws. Any northern long-eared bat unlawfully taken pursuant to a State pesticide law would be a violation of this final 4(d) rule.

Adequacy and Clarity of 0.25 Mile Hibernacula Buffer

36. *Comment:* Commenter(s) suggested that this buffer is too restrictive for landowners.

Our Response: The Service has determined that a protective buffer around known hibernacula is necessary and advisable for the conservation of the species. Please see the discussion under *Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula* of this rule for our explanation of the need for this buffer. As described in that section, we have prohibited incidental take of northern long-eared bats under specific tree-removal circumstances; however, that does not mean that all activities involving tree-removal activities within the 0.25-mile (0.4-km) buffer of hibernacula will result in take. For example, a timber harvest might be conducted within 0.25 miles (0.4 km) of a hibernaculum at a time when bats are unlikely to be roosting in trees within the buffer (*e.g.,* winter) that fully protects any bats in the hibernaculum as well as the hibernaculum's suitability for bats (*i.e.,* bat's access, microclimate), and does not significantly change the suitability of the habitat for foraging by northern long-eared bats or perhaps even improves prey availability. In such a case, the timber harvest, although closer than 0.25 miles (0.4 km) to the hibernaculum, is not likely to result in incidental take, so we would not recommend that the timber harvester seek authorization for incidental take pursuant to the Act. Further, while incidental take of northern long-eared bats within that buffer is prohibited (in the WNS zone), it may be authorized on a case-by-case basis with further coordination with the Service at a local level. Take may be authorized through section 10 or section 7 of the Act. In addition, it is our expectation that project modifications may be made that would protect the hibernaculum and allow for the project proponent's objectives to be met.

37. *Comment:* Commenter(s) seek clarification on whether the buffer and prohibition to clearcutting (within the buffer) is a year-round restriction.

Our Response: Yes, the protection of the hibernaculum and a buffer around it is a year round protective measure and applies to all types of tree-removal activities in the WNS zone.

38. *Comment:* Commenter(s) suggested that the buffer around hibernacula be limited to fall swarming and spring emergence when northern long-eared bats are present.

Our Response: We have determined that protective measures must be considered year-round for several reasons, including that habitat lost outside of the spring emergence and fall swarming period could affect the suitability of those habitats later during spring emergence or fall swarming. Further, we have included the buffer on hibernacula for several reasons beyond protecting foraging habitat during fall swarming and spring emergence. In particular, the buffer will help to protect the micro-climate characteristics of

hibernacula and other entrances used by bats that may not be reflected in the primary location information for hibernacula. For example, many caves or abandoned mines used may have entrances used by bats that are not reflected in the general location information for those sites that are used by people; a buffer helps to protect less prominent features that may be important to bats. Projects may be able to be planned or modified within those buffer areas to retain sufficient habitat and avoid harm; however, the Service considers coordination on a case-by-case basis to be important to assure necessary conservation.

39. *Comment:* Several commenter(s) suggested an increased buffer area around hibernacula would be more appropriate.

Our Response: We have revised the approach used in this final 4(d) rule to ensure that hibernating northern long-eared bats in the WNS zone are protected from incidental take independent of the buffer size used in the conservation measure. In addition, all northern long-eared bats both inside and outside of the WNS zone are protected from purposeful take (*e.g.,* killing or intentionally harassing northern long-eared bats), including while in hibernacula where they are most vulnerable. We have retained the 0.25-mile buffer (0.25-mile radius from known hibernacula entrance/access points used by bats) to further protect the hibernacula and associated forested habitat for several reasons (see discussion above under *Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula*).

40. *Comment:* Commenter(s) expressed concern with implementing measures when they do not have data/information on known hibernacula.

Our Response: The Service recognizes the challenges associated with data sharing and data management. Many states share data management concerns and guard data carefully. We encourage landowners to continue to work with your State natural resources and natural heritage staff to evaluate your ownership for the presence of these important resources. When seeking information on the presence of hibernacula within your project boundary, our expectation is that a project proponent will complete due diligence to determine available data. However, if information is not available, we recognize that the project proponent that has made reasonable efforts to determine whether there are known hibernacula on the property is in the position of not knowing if no data have been provided.

Maternity Roost Tree Restrictions

41. *Comment:* Commenter(s) expressed concerns about having adequate information to identify maternity roost trees.

Our Response: We recognize the challenges associated with data sharing. Please see response to Comment 40. While not required by this rule, the Service recommends summer surveys to definitively locate maternity roost trees.

42. *Comment:* Commenter(s) requested that we clarify that roost trees means maternity roost trees.

Our Response: We have made this final 4(d) rule specific to maternity roost trees.

43. *Comment:* Commenter(s) expressed disagreement with the 0.25 mile buffer around known, occupied roost trees. Some commented that this buffer was too small, while some commented that it was too large.

Our Response: In the interim 4(d) rule (80 FR 17974; April 2, 2015), the buffer around known, occupied roost trees applied only to some types of tree-removal activities (*e.g.,* forest management, rights-of-ways, prairie management) and excluded only clearcuts (and similar harvest methods). Given the relatively small percent of forest habitat anticipated to be impacted by forest management or conversion (see Forest Management and Forest Conversion, above of this rule for more details), we revised the buffer around the known maternity roost trees. As explained in more detail under *Conservation Measure 2: Tree Removal Near Known Maternity Roost Trees,* we have made the buffer more broadly applicable to all tree-removal activities, but have narrowed it in size to provide protection for the maternity roost tree, while minimizing the potential that the protective measure would serve as impediment to conducting new surveys. We have reduced the buffer around known, occupied maternity roost trees to a radius of 150 feet around the known, occupied maternity roost tree.

44. *Comment:* Commenter(s) stated that the Service should require surveys to determine where roost trees are located.

Our Response: The Act does not require a private landowner to survey his or her property to determine whether endangered or threatened wildlife and plants occupy their land. We encourage landowners to voluntarily seek additional information to conserve natural resources in their land use/land management actions; however, we will not require surveys to locate northern long-eared bats and maternity roost trees on private property.

Residential Housing Development

45. *Comment:* Commenter(s) requested that northern long-eared bat take be excepted for the purposes of residential housing development.

Our Response: Take resulting from removal of summer habitat (tree removal) is not prohibited provided the conservation measures set forth in this rule are followed when the habitat removal occurs within the WNS zone. The provisions of this final rule have been restructured to clarify prohibitions rather than rely on a list of excepted activities.

Wind Energy Development

46. *Comment:* Commenter(s) requested that northern long-eared bat take be excepted for the purposes of renewable energy development and operation (wind energy).

Our Response: Incidental take resulting from wind energy development and operation is not prohibited, provided that the conservation measures set forth in this rule are followed to protect hibernacula and known, occupied maternity roost trees. We strongly encourage voluntary conservation measures and best management practices such as feathering or elevated cut-in speeds to reduce impacts to northern long-eared bats and other bats; however, we have not prohibited incidental take attributable to wind energy in this final rule. Please see the Wind Energy Facilities section of this rule for additional details.

Natural Resource Management

47. *Comment:* Commenter(s) requested that northern long-eared bat take be excepted when activities are included in Department of Defense integrated natural resource management plans, providing for activities such as recreational activities, burns, and other temporary but insignificant effects on the northern long-eared bat.

Our Response: Incidental take resulting from activities described as recreational activities and beneficial wildlife habitat management/maintenance is not prohibited, provided that the conservation measures set forth in this rule are followed when the activity occurs inside the WNS zone. We have completed a section 7 analysis on the provisions of this final 4(d) rule to ensure that actions completed in accordance with the final rule are not likely to jeopardize the continued existence of the species. Where these resource management activities do not fit within the final rule, section 7 consultation would need to be

completed to authorize incidental take of the northern long-eared bat.

Compliance and Monitoring

48. *Comment:* Commenter(s) recommended that surveys be required and that landowners be required to report on their activities in order to receive the benefits of the 4(d) rule.

Our Response: While we welcome landowners' efforts to determine where bats may be located on their property, the Act does not require that a landowner survey his or her property to find species. We are not mandating that surveys be completed as part of this rule.

Alternate Section 4(d) Provisional Language

49. *Comment:* One organization commented on behalf of its members and 14 other environmental organizations (collectively referenced as ''the Center'') in support of the adoption of a different 4(d) rule and in opposition of the Service's proposed and the interim 4(d) rules.

Our Response: The remaining paragraphs (under the heading Summary of Comments and Recommendations on the Proposed and Interim4(d) Rules) pertain to the comments we received from the Center. With respect to the overarching comment that our 4(d) rule does not conserve the species, we believe that our final 4(d) rule provides for the ''necessary and advisable'' conservation of the species, as described herein. For further information, please see our Determination section, below.

With respect to the Center's proposed 4(d) language, we note that the proposed language defines specific prohibitions and would make a regulatory determination of ''take'' to include a number of actions. These include cave and mine entry without implementing decontamination protocols; transporting equipment into caves and mines or between caves and mines between the WNS zone and non-WNS zone; cave and mine entry during hibernation periods; activities associated with hydraulic fracturing within 5 miles of a hibernaculum, within 1.5 miles of an occupied roost tree, or within 3 miles of an acoustic detection or bat capture record; noise disturbance activities within a 0.5-mile radius of a hibernaculum during the hibernation period; and disruption of water sources within hibernacula. With respect to protection of hibernacula, take of northern long-eared bats is prohibited. Establishing the causal connection between a variety of activities such as those the Center proposed to be defined as prohibitions is beyond the scope of this rule. We have addressed hibernacula protection provisions in this rule under the section entitled *Conservation Measure 1: Tree Removal Near Known Northern Long-eared Bat Hibernacula.* Protections in this final rule are adequate to protect the species.

In addition to the Center's suggested language for hibernacula prohibitions, they recommended language regarding prohibitions for prescribed burning and aerial spraying. Based on our analysis, we conclude that prescribed burning and aerial spraying do not have a measurable population-level impact on the species and regulation of those activities will not meaningfully impact the species' ability to recover. For further information on prescribed fire impacts, see Prescribed Fire above. For further information on aerial spraying of pesticides, please see the Environmental Contaminants section above.

The final prohibition suggested by the Center was the operation of utility-scale wind projects, specifically during the hours from dusk to sunrise during the fall swarming season, at low wind speeds, and within 5 miles of a hibernaculum. Incidental take resulting from the operation of wind energy facilities is not prohibited by this final 4(d) rule and a complete discussion of known impacts to the species may be found in the Wind Energy Facilities section above.

Finally, the Center provided suggested regulatory text for exemptions from prohibitions that included language for seasonal restrictions, clearing restrictions, mandatory measures for hibernacula protection (gate installation), water quality protection measures, and data collection and reporting requirements. We recognize the effort that has gone into the development of this alternative language. However, we have carefully considered the measures that are necessary for the protection of the species. Our final rule has been developed based on the Service's desire to implement protective measures that will make a meaningful impact on species conservation and recovery. As stated elsewhere in this document (see Determination section, below), we have provided regulatory flexibility while implementing protective measures where we have determined those measures to be necessary and advisable for conservation of the species.

Determination

Section 4(d) of the Act states that ''the Secretary shall issue such regulations as she deems 'necessary and advisable to provide for the conservation' '' of species listed as threatened species. Conservation is defined in the Act to mean ''to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Act] are no longer necessary.''

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, the Secretary may find that it is necessary and advisable not to include a taking prohibition, or to include a limited taking prohibition. See Alsea Valley Alliance v Lautenbacher, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); Washington Environmental Council v. National Marine Fisheries Service, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002). In addition, as affirmed in State of Louisiana v. Verity, 853 F. 2d 322 (5th Cir. 1988), the rule need not address all the threats to the species. As noted by Congress when the Act was initially enacted, ''once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him [her] with regard to the permitted activities for those species. [She] may, for example, permit taking, but not importation of such species,'' or she may choose to forbid both taking and importation but allow the transportation of such species, as long as the prohibitions, and exceptions to those prohibitions, will ''serve to conserve, protect, or restore the species concerned in accordance with the purposes of the Act'' (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Section 9 prohibitions make it illegal for any person subject to the jurisdiction of the United States to violate any regulation pertaining to any threatened species of fish or wildlife listed pursuant to section 4 of the Act and promulgated by the Secretary pursuant to authority provided by the Act. Under this final 4(d) rule, incidental take of the northern long-eared bat will not be prohibited outside the WNS zone. Incidental take also will not it be prohibited within the WNS zone, outside of hibernacula, provided that it occurs more than 0.25 miles (0.4 km) from a known hibernacula and does not result from an activity that cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius from the maternity tree, during the pup season (June 1 through July 31).

Accordingly, we have determined that this provision is necessary and advisable for the conservation of the northern long-eared bat as explained below.

Although not fully protective of every individual, the conservation measures identified in this final rule help protect maternity colonies. This final species-specific rule under section 4(d) of the Act provides the flexibility for certain activities to occur that have not been the cause of the species' imperilment, while still promoting conservation of the species across its range.

The northern long-eared bat was listed as a threatened species under the Act, with an interim rule under section 4(d), on April 2, 2015 (80 FR 17974). At that time, the Service invited public comment on the interim 4(d) rule for 90 days, ending July 1, 2015. The Service had already received comments for 60 days on its proposed 4(d) rule (80 FR 2371; January 16, 2015). In total, the Service received approximately 40,500 comments on the proposed and interim 4(d) rules. For a complete discussion of the comments, as well as the Service's response to comments, see Summary of Comments and Recommendations on the Proposed and Interim 4(d) Rules, above.

Because the primary threat to the northern long-eared bat is a fungal disease known as WNS, the Service has tailored the final 4(d) rule to prohibit the take of northern long-eared bats from certain activities within areas where they are in decline, as a result of WNS, and within these areas we apply incidental take protection only to known, occupied maternity roost trees and known hibernacula. These protections will help to conserve the northern long-eared bat during its most vulnerable life stages (from birth to flight, or volancy) and during spring and fall swarming (near hibernacula).

In summary, this 4(d) rule is necessary and advisable to provide for the conservation of the northern long-eared bat because it provides for protection of known maternity roost trees and known hibernacula within the WNS zone. In addition, promulgation of this rule allows the conservation community to provide for species conservation where it can affect change, namely during the northern long-eared bat's most vulnerable life stages and where hibernation occurs. This final 4(d) rule allows the regulated public to manage lands in a manner that is lawful and compatible with species' survival, and it allows for protection of the species in a manner that the Secretary deems to be necessary and advisable for the conservation of the northern long-eared bat. By this rule, the Secretary deems that the prohibition of certain take, which is incidental to otherwise lawful activities that take bat habitat, is not necessary for the long-term survival of the species. Furthermore, she acknowledges the importance of addressing the threat of WNS as the primary measure to arrest and reverse the decline of the species. Nothing in this 4(d) rule affects other provisions of the Act, such as designation of critical habitat under section 4, recovery planning under section 4(f), and consultation requirements under section 7.

Required Determinations

Regulatory Planning and Review

(Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget will review all significant rules. OIRA has determined that this rule is not significant. Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this final 4(d) rule in a manner consistent with these requirements.

Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*)

Listing and status determinations under the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 *et seq.*), and any prohibitions or protective measures afforded the species under the Act are exempt from the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.,* as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996). However, as this final 4(d) rule is being promulgated following the final listing of the northern long-eared bat, we evaluate whether the Regulatory Flexibility Act applies to this rulemaking.

Under the Regulatory Flexibility Act, whenever an agency must publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities. Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for ''significant impact'' and a threshold for a ''substantial number of small entities.'' See 5 U.S.C. 605(b). Based on the information that is available to us at this time, we certify that this rule will not have a significant economic impact on a substantial number of small entities. The following discussion explains our rationale.

On April 2, 2015 (80 FR 17974), we published the final determination to list the northern long-eared bat as a threatened species and an interim 4(d) rule. That rule became effective on May 4, 2015, and the interim 4(d) rule will remain in effect until this final rule becomes effective (see **DATES**, above). The interim 4(d) rule generally applies the prohibitions of 50 CFR 17.31 and 17.32 to the northern long-eared bat, which means that the interim rule, among other things, prohibits the purposeful take of northern long-eared bats throughout the species' range, but the interim rule includes exceptions to the purposeful take prohibition. The exceptions for purposeful take are: (1) In instances of removal of northern long-eared bats from human structures (if actions comply with all applicable State regulations); and (2) for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. Under the interim rule, incidental take is not prohibited outside the WNS zone if the incidental take results from otherwise lawful activities. Inside the WNS zone, there are exceptions for incidental take for the following activities, subject to certain conditions: Implementation of forest management; maintenance and expansion of existing rights-of-way and transmission corridors; prairie management; minimal tree removal; and removal of hazardous trees for the protection of human life and property.

This final 4(d) rule does not generally apply the prohibitions of 50 CFR 17.31 to the northern long-eared bat. This rule continues to prohibit purposeful take of

northern long-eared bats throughout the species' range, except in certain cases, including in instances of removal of northern long-eared bats from human structures and for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. After May 3, 2016, a permit pursuant to section 10(a)(1)(A) of the Act is required for the capture and handling of northern long-eared bats. Under this rule, incidental take is still not prohibited outside the WNS zone. Within the WNS zone, incidental take is prohibited only if: (1) Actions result in the incidental take of northern long-eared bats in hibernacula; (2) actions result in the incidental take of northern long-eared bats by altering a known hibernaculum's entrance or interior environment if the alteration impairs an essential behavioral pattern, including sheltering northern long-eared bats; or (3) tree-removal activities result in the incidental take of northern long-eared bats when the activity either occurs within 0.25 mile (0.4 kilometer) of a known hibernaculum, or cuts or destroys known, occupied maternity roost trees or any other trees within a 150-foot (45-meter) radius from the maternity roost tree during the pup season (June 1 through July 31). This approach allows more flexibility to affected entities and individuals in conducting activities within the WNS zone. Under this rule, we individually set forth prohibitions on possession and other acts with unlawfully taken northern long-eared bats, and on import and export of northern long-eared bats. These prohibitions were included in the interim 4(d) through the general application of the prohibitions of 50 CFR 17.31 to the northern long-eared bat. Under this rule, take of the northern long-eared bat is also not prohibited for the following: Removal of hazardous trees for protection of human life and property; take in defense of life; and take by an employee or agent of the Service, of the National Marine Fisheries Service, or of a State conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the Service. Regarding these three exceptions, take in defense of life was not included in the interim 4(d) rule, but the other two exceptions were, either through the general application of 50 CFR 17.31 or through a specific exception included in the interim 4(d) rule. Therefore, this final 4(d) rule will result in less restrictive regulations under the Act than those set forth in the interim 4(d) rule.

We completed an analysis of the forested land area that may be impacted by this rulemaking. There are approximately 400,000,000 acres (161,874,256 ha) of forested habitat across the range of the northern long-eared bat, which includes 37 States and the District of Columbia. This rule may restrict land use activities on approximately 200,000 acres (80,937 ha). This area constitutes less than 0.05 percent of all forested habitat across the extensive range of the northern long-eared bat. Any impact in this very small portion of forested habitat is not expected to affect a substantial number of entities in any given sector, nor result in a significant economic impact on any given entity. For the above reasons, we certify that the final rule will not have a significant economic impact on a substantial number of small entities. Therefore, a final regulatory flexibility analysis is not required.

Energy Supply, Distribution, or Use—Executive Order 13211

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. For reasons discussed within this final rule, we believe that the rule will not have any effect on energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*), we make the following findings:

(1) This final rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or Tribal governments, or the private sector, and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or [T]ribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and [T]ribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or Tribal governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

(2) This final 4(d) rule will result in less restrictive regulations under the Act, as it pertains to the northern long-eared bat, than would otherwise exist without a 4(d) rule or under the interim 4(d) rule. As a result, we do not believe that this rule will significantly or uniquely affect small government entities. Therefore, a Small Government Agency Plan is not required.

Takings

In accordance with Executive Order 12630, this final rule will not have significant takings implications. We have determined that the rule has no potential takings of private property implications as defined by this Executive Order because this 4(d) rule will result in less-restrictive regulations under the Act than would otherwise exist. A takings implication assessment is not required.

Federalism

In accordance with Executive Order 13132, this final 4(d) rule does not have significant Federalism effects. A federalism summary impact statement is not required. This rule will not have substantial direct effects on the State, on the relationship between the Federal Government and the State, or on the distribution of power and responsibilities among the various levels of government.

Civil Justice Reform

In accordance with Executive Order 12988, the Office of the Solicitor has determined that this final rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain collections of information that require approval by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have prepared a final environmental assessment, as defined under the authority of the National Environmental Policy Act of 1969. For information on how to obtain a copy of the final environmental assessment, see **ADDRESSES**, above. The final environmental assessment will also be available on the Internet at *http://www.regulations.gov* and at *http://www.fws.gov/midwest/Endangered.*

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

In October 2013, Tribes and multi-tribal organizations were sent letters inviting them to begin consultation and coordination with the service on the proposal to list the northern long-eared bat. In August 2014, several Tribes and multi-tribal organizations were sent an additional letter regarding the Service's intent to extend the deadline for making a final listing determination by 6 months. A conference call was also held with Tribes to explain the listing process and discuss any concerns. Following publication of the proposed rule, the Service established three interagency teams (biology of the northern long-eared bat, non-WNS threats, and conservation measures) to ensure that States, Tribes, and other Federal agencies were able to provide input into various aspects of the listing rule and potential conservation measures for the species. Invitations for inclusion in these teams were sent to Tribes within the range of the northern long-eared bat and a few tribal representatives participated on those teams. Two additional conference calls (in January and March 2015) were held with Tribes to outline the proposed species-specific 4(d) rule and to answer questions. Through this coordination, some Tribal representatives expressed concern about how listing the northern long-eared bat may impact forestry practices, housing development programs, and other activities on Tribal lands.

References Cited

A complete list of references cited in this document is available on the Internet at *http://www.regulations.gov* and upon request from the Twin Cities Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are the staff members of the Midwest Region of the U.S. Fish and Wildlife Service.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

■ 2. Amend § 17.40 by revising paragraph (o) to read as follows:

§ 17.40 Special rules—mammals.

* * * * *

(o) Northern long-eared bat (*Myotis septentrionalis*). The provisions of this rule are based upon the occurrence of white-nose syndrome (WNS), a disease affecting many U.S. bat populations. The term ''WNS zone'' identifies the set of counties within the range of the northern long-eared bat within 150 miles of the boundaries of U.S. counties or Canadian districts where the fungus *Pseudogymnoascus destructans* (*Pd*) or WNS has been detected. For current information regarding the WNS zone, contact your local Service ecological services field office. Field office contact information may be obtained from the Service regional offices, the addresses of which are listed in 50 CFR 2.2.

(1) *Prohibitions.* The following prohibitions apply to the northern long-eared bat:

(i) Purposeful take of northern long-eared bat, including capture, handling, or other activities.

(ii) Within the WNS zone:

(A) Actions that result in the incidental take of northern long-eared bats in known hibernacula.

(B) Actions that result in the incidental take of northern long-eared bats by altering a known hibernaculum's entrance or interior environment if it impairs an essential behavioral pattern, including sheltering northern long-eared bats.

(C) Tree-removal activities that result in the incidental take of northern long-eared bats when the activity:

(*1*) Occurs within 0.25 mile (0.4 kilometer) of a known hibernaculum; or

(*2*) Cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot (45-meter) radius from the maternity roost tree, during the pup season (June 1 through July 31).

(iii) Possession and other acts with unlawfully taken northern long-eared bats. It is unlawful to possess, sell, deliver, carry, transport, or ship, by any means whatsoever, any northern long-eared bat that was taken in violation of this section or State laws.

(iv) Import and export.

(2) *Exceptions from prohibitions.* (i) Any person may take a northern long-eared bat in defense of his own life or the lives of others, including for public health monitoring purposes.

(ii) Any person may take a northern long-eared bat that results from the removal of hazardous trees for the protection of human life and property.

(iii) Any person may take a northern long-eared bat by removing it from human structures, but only if the actions comply with all applicable State regulations.

(iv) Purposeful take that results from actions relating to capture, handling, and related activities for northern long-eared bats by individuals permitted to

conduct these same activities for other species of bat until May 3, 2016.

(v) All of the provisions of § 17.32 apply to the northern long-eared bat.

(vi) Any employee or agent of the Service, of the National Marine Fisheries Service, or of a State conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his agency for such purposes, may, when acting in the course of his official duties, take northern long-eared bats covered by an approved cooperative agreement to carry out conservation programs.

* * * * *

Dated: January 7, 2016.

Karen Hyun,

Acting Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2016–00617 Filed 1–13–16; 8:45 am]

BILLING CODE 4333–15–P