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APPENDIX D

Watershed Analysis WiLMS Results

Date: 6/2/2016 Scenario: Harris Lake Watershed Current

Lake Id: Harris_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 1812.0 acre

Total Unit Runoff: 14.00 in.

Annual Runoff Volume: 2114.0 acre-ft

Lake Surface Area <As>: 536.0 acre

Lake Volume <V>: 12336.0 acre-ft

Lake Mean Depth <z>: 23.0 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 2359.7 acre-ft/year

Areal Water Load <qs>: 4.4 ft/year

Lake Flushing Rate <p>: 0.19 1/year

Water Residence Time: 5.23 year

Observed spring overturn total phosphorus (SPO): 17.1 mg/m³

Observed growing season mean phosphorus (GSM): 13.5 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
		----		----		-----		-----	----
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	4.0	0.10	0.30	0.50	0.4	0	0	0	1
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	7.0	0.05	0.10	0.25	0.2	0	0	0	1
Wetlands	607.0	0.10	0.10	0.10	18.0	25	25	25	25
Forest	1194.0	0.05	0.09	0.18	31.9	24	43	87	87
Lake Surface	536.0	0.10	0.30	1.00	47.7	22	65	217	217

POINT SOURCE DATA

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m ³ /year)	(kg/year)	(kg/year)	(kg/year)	

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.30	0.50	0.80	
# capita-years	48				
% Phosphorus Retained by Soil		98.0	90.0	80.0	
Septic Tank Loading (kg/year)		0.29	2.40	7.68	1.8

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	156.5	300.5	744.4	100.0
Total Loading (kg)	71.0	136.3	337.7	100.0
Areal Loading (lb/ac-year)	0.29	0.56	1.39	
Areal Loading (mg/m ² -year)	32.74	62.84	155.67	
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	108.1	151.7	249.3	98.2
Total NPS Loading (kg)	49.0	68.8	113.1	98.2

Phosphorus Prediction and Uncertainty Analysis Module

Date: 6/2/2016 Scenario: Harris Lake Watershed Current
 Observed spring overturn total phosphorus (SPO): 17.1 mg/m³
 Observed growing season mean phosphorus (GSM): 13.5 mg/m³
 Back calculation for SPO total phosphorus: 0.0 mg/m³
 Back calculation GSM phosphorus: 0.0 mg/m³
 % Confidence Range: 70%
 Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	10	19	46	6	44
Canfield-Bachmann, 1981 Natural Lake	9	14	26	1	7
Canfield-Bachmann, 1981 Artificial Lake	10	15	25	2	15
Rechow, 1979 General	2	5	12	-9	-67
Rechow, 1977 Anoxic	12	23	57	10	74
Rechow, 1977 water load<50m/year	4	7	18	-7	-52
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	9	17	42	0	0
Vollenweider, 1982 Combined OECD	8	14	29	-1	-7
Dillon-Rigler-Kirchner	6	11	28	-6	-35
Vollenweider, 1982 Shallow Lake/Res.	6	11	23	-4	-26
Larsen-Mercier, 1976	7	14	35	-3	-18
Nurnberg, 1984 Oxidic	5	11	26	-3	-22

Lake Phosphorus Model	Confidence		Parameter	Back	Model
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	11	37	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	4	40	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	43	FIT	1	GSM
Rechow, 1979 General	3	10	L	0	GSM
Rechow, 1977 Anoxic	14	45	FIT	0	GSM
Rechow, 1977 water load<50m/year	4	14	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	9	35	FIT	0	SPO
Vollenweider, 1982 Combined OECD	7	27	FIT	0	ANN
Dillon-Rigler-Kirchner	7	22	L qs p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	21	FIT	0	ANN
Larsen-Mercier, 1976	9	27	Pin	0	SPO
Nurnberg, 1984 Oxidic	6	22	FIT	0	ANN

Date: 5/26/2016 Scenario: Hiawatha Watershed Current

Lake Id: Hiawatha_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 781.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 911.2 acre-ft

Lake Surface Area <As>: 38 acre

Lake Volume <V>: 1222 acre-ft

Lake Mean Depth <z>: 32.2 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 928.6 acre-ft/year

Areal Water Load <qs>: 24.4 ft/year

Lake Flushing Rate <p>: 0.76 1/year

Water Residence Time: 1.32 year

Observed spring overturn total phosphorus (SPO): 18.4 mg/m³

Observed growing season mean phosphorus (GSM): 17.1 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	1	0.10	0.30	0.50	0.3	0	0	0	0
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	3	0.05	0.10	0.25	0.3	0	0	0	0
Wetlands	136	0.10	0.10	0.10	15.4	6	6	6	6
Forest	641	0.05	0.09	0.18	65.5	13	23	47	47
Lake Surface	38.0	0.10	0.30	1.00	12.9	2	5	15	15

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
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SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.3	0.5	0.8	
# capita-years	39				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.23	1.95	6.24	5.5

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	44.9	78.6	163.9	100.0
Total Loading (kg)	20.3	35.7	74.3	100.0
Areal Loading (lb/ac-year)	1.18	2.07	4.31	0.0
Areal Loading (mg/m ² -year)	132.32	231.87	483.30	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	41.0	64.1	116.2	94.5
Total NPS Loading (kg)	18.6	29.1	52.7	94.5

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/26/2016 Scenario: Hiawatha Watershed Current
 Observed spring overturn total phosphorus (SPO): 18.4 mg/m³
 Observed growing season mean phosphorus (GSM): 17.1 mg/m³
 Back calculation for SPO total phosphorus: 0.0 mg/m³
 Back calculation GSM phosphorus: 0.0 mg/m³
 % Confidence Range: 70%
 Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	8	14	30	-3	-18
Canfield-Bachmann, 1981 Natural Lake	10	16	29	-1	-6
Canfield-Bachmann, 1981 Artificial Lake	10	16	26	-1	-6
Rechow, 1979 General	6	11	24	-6	-35
Rechow, 1977 Anoxic	13	23	48	6	35
Rechow, 1977 water load<50m/year	8	13	28	-4	-23
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	9	16	34	-2	-11
Vollenweider, 1982 Combined OECD	9	14	25	-4	-23
Dillon-Rigler-Kirchner	6	10	21	-8	-43
Vollenweider, 1982 Shallow Lake/Res.	7	11	20	-7	-39
Larsen-Mercier, 1976	8	14	30	-4	-22
Nurnberg, 1984 Oxidic	7	13	27	-4	-23

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	9	25	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	5	46	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	46	FIT	1	GSM
Rechow, 1979 General	6	20	FIT	0	GSM
Rechow, 1977 Anoxic	14	40	FIT	0	GSM
Rechow, 1977 water load<50m/year	8	23	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	8	30	FIT	0	SPO
Vollenweider, 1982 Combined OECD	7	26	FIT	0	ANN
Dillon-Rigler-Kirchner	6	18	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	6	20	FIT	0	ANN
Larsen-Mercier, 1976	9	25	Pin	0	SPO
Nurnberg, 1984 Oxidic	7	24	FIT	0	ANN

Date: 2/3/2017 Scenario: Birch Lake Current

Lake Id: Birch Lake

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 3648.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 4256.0 acre-ft

Lake Surface Area <As>: 530 acre

Lake Volume <V>: 9786 acre-ft

Lake Mean Depth <z>: 18.5 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 4498.9 acre-ft/year

Areal Water Load <qs>: 8.5 ft/year

Lake Flushing Rate <p>: 0.46 1/year

Water Residence Time: 2.18 year

Observed spring overturn total phosphorus (SPO): 16.8 mg/m³

Observed growing season mean phosphorus (GSM): 18.6 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	
Pasture/Grass	522	0.10	0.30	0.50	25.2	21	63	106	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	
Rural Res (>1 Ac)	3	0.05	0.10	0.25	0.0	0	0	0	
Wetlands	976	0.10	0.10	0.10	15.7	39	39	39	
Forest	2147	0.05	0.09	0.18	31.1	43	78	156	
Lake Surface	530.0	0.10	0.30	1.00	25.6	21	64	214	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
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SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	112			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.67	5.60	17.92	2.2

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	278.3	553.7	1177.8	100.0
Total Loading (kg)	126.3	251.1	534.2	100.0
Areal Loading (lb/ac-year)	0.53	1.04	2.22	0.0
Areal Loading (mg/m ² -year)	58.86	117.09	249.08	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	229.6	399.5	665.4	97.8
Total NPS Loading (kg)	104.1	181.2	301.8	97.8

Phosphorus Prediction and Uncertainty Analysis Module

Date: 2/3/2017 Scenario: 55

Observed spring overturn total phosphorus (SPO): 16.8 mg/m³Observed growing season mean phosphorus (GSM): 18.6 mg/m³Back calculation for SPO total phosphorus: 0.0 mg/m³Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nuremberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low	Most Likely	High	Predicted	% Dif.
	Total P	Total P	Total P	-Observed	
	(mg/m ³)	(mg/m ³)	(mg/m ³)	(mg/m ³)	
Walker, 1987 Reservoir	10	20	43	1	5
Canfield-Bachmann, 1981 Natural Lake	11	19	32	0	0
Canfield-Bachmann, 1981 Artificial Lake	11	18	29	-1	-5
Rechow, 1979 General	4	8	17	-11	-59
Rechow, 1977 Anoxic	15	30	64	11	59
Rechow, 1977 water load<50m/year	6	13	27	-6	-32
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	10	21	44	4	24
Vollenweider, 1982 Combined OECD	10	17	31	-1	-6
Dillon-Rigler-Kirchner	6	12	25	-5	-30
Vollenweider, 1982 Shallow Lake/Res.	7	13	26	-5	-28
Larsen-Mercier, 1976	9	18	39	1	6
Nurnberg, 1984 Oxidic	6	12	26	-7	-38

Lake Phosphorus Model	Confidence		Parameter	Back	Model
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	12	36	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	55	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	52	FIT	1	GSM
Rechow, 1979 General	5	14	FIT	0	GSM
Rechow, 1977 Anoxic	18	53	FIT	0	GSM
Rechow, 1977 water load<50m/year	7	23	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	10	40	FIT	0	SPO
Vollenweider, 1982 Combined OECD	8	31	FIT	0	ANN
Dillon-Rigler-Kirchner	7	21	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	6	25	FIT	0	ANN
Larsen-Mercier, 1976	11	32	P Pin	0	SPO
Nurnberg, 1984 Oxidic	6	23	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 2/3/2017 Scenario: 28
 Average Annual Surface Total Phosphorus: 18.6mg/m³
 Annual Discharge: 4.50E+003 AF => 5.55E+006 m³
 Annual Outflow Loading: 217.6 LB => 98.7 kg

Date: 3/13/2017 Scenario: Rainbow Lake Watershed Current

Lake Id: Rainbow_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 1469.0 acre

Total Unit Runoff: 14.00 in.

Annual Runoff Volume: 1713.8 acre-ft

Lake Surface Area <As>: 154.0 acre

Lake Volume <V>: 1713.8 acre-ft

Lake Mean Depth <z>: 11.1 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 7329.7 acre-ft/year

Areal Water Load <qs>: 47.6 ft/year

Lake Flushing Rate <p>: 4.28 1/year

Water Residence Time: 0.23 year

Observed spring overturn total phosphorus (SPO): 23.4 mg/m³

Observed growing season mean phosphorus (GSM): 25.5 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
		----		----		-----		-----	----
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	146.0	0.10	0.30	0.50	6.4	6	18	30	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	4.0	0.05	0.10	0.25	0.1	0	0	0	0
Wetlands	515.0	0.10	0.10	0.10	7.5	21	21	21	21
Forest	804.0	0.05	0.09	0.18	10.6	16	29	59	
Lake Surface	154.0	0.10	0.30	1.00	6.8	6	19	62	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Tamarack Lake SW	6840000.0	0.0	188.3	0.0	68.1

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.30	0.50	0.80	
# capita-years	32.0			
% Phosphorus Retained by Soil	98.0	90.0	80.0	
Septic Tank Loading (kg/year)	0.19	1.60	5.12	0.6

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	109.2	609.8	389.8	100.0
Total Loading (kg)	49.5	276.6	176.8	100.0
Areal Loading (lb/ac-year)	0.71	3.96	2.53	
Areal Loading (mg/m ² -year)	79.47	443.84	283.69	
Total PS Loading (lb)	0.0	415.1	0.0	68.1
Total PS Loading (kg)	0.0	188.3	0.0	68.1
Total NPS Loading (lb)	95.0	149.9	241.1	31.3
Total NPS Loading (kg)	43.1	68.0	109.4	31.3

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/13/2017 Scenario: Rainbow Lake Watershed Current
 Observed spring overturn total phosphorus (SPO): 23.4 mg/m³
 Observed growing season mean phosphorus (GSM): 25.5 mg/m³
 Back calculation for SPO total phosphorus: 0.0 mg/m³
 Back calculation GSM phosphorus: 0.0 mg/m³
 % Confidence Range: 70%
 Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	4	21	14	-5	-20
Canfield-Bachmann, 1981 Natural Lake	5	23	15	-3	-12
Canfield-Bachmann, 1981 Artificial Lake	5	21	14	-5	-20
Rechow, 1979 General	3	15	10	-11	-43
Rechow, 1977 Anoxic	5	26	17	1	4
Rechow, 1977 water load<50m/year	4	20	13	-6	-24
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	4	21	14	-2	-9
Vollenweider, 1982 Combined OECD	5	19	13	-5	-20
Dillon-Rigler-Kirchner	3	15	10	-8	-34
Vollenweider, 1982 Shallow Lake/Res.	3	15	10	-9	-37
Larsen-Mercier, 1976	4	21	13	-2	-9
Nurnberg, 1984 Oxidic	3	16	11	-10	-39

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	9	30	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	7	66	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	7	60	FIT	1	GSM
Rechow, 1979 General	6	22	FIT	0	GSM
Rechow, 1977 Anoxic	12	36	FIT	0	GSM
Rechow, 1977 water load<50m/year	9	29	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	8	34	FIT	0	SPO
Vollenweider, 1982 Combined OECD	7	32	FIT	0	ANN
Dillon-Rigler-Kirchner	7	21	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	25	FIT	0	ANN
Larsen-Mercier, 1976	10	29	P Pin	0	SPO
Nurnberg, 1984 Oxidic	6	25	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/13/2017 Scenario: 21
Average Annual Surface Total Phosphorus: 25.5mg/m³
Annual Discharge: 7.33E+003 AF => 9.04E+006 m³
Annual Outflow Loading: 485.9 LB => 220.4 kg

Date: 3/13/2017 Scenario: Tamarack Lake Watershed Current

Lake Id: Tamarack_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 869.0 acre

Total Unit Runoff: 14.00 in.

Annual Runoff Volume: 1013.8 acre-ft

Lake Surface Area <As>: 66.0 acre

Lake Volume <V>: 454.0 acre-ft

Lake Mean Depth <z>: 6.9 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 5543.5 acre-ft/year

Areal Water Load <qs>: 84.0 ft/year

Lake Flushing Rate <p>: 12.21 1/year

Water Residence Time: 0.08 year

Observed spring overturn total phosphorus (SPO): 23.7 mg/m³

Observed growing season mean phosphorus (GSM): 28.8 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
		----		----		-----		-----	----
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	110.0	0.10	0.30	0.50	8.9	4	13	22	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0	0
Wetlands	344.0	0.10	0.10	0.10	9.3	14	14	14	14
Forest	415.0	0.05	0.09	0.18	10.1	8	15	30	
Lake Surface	66.0	0.10	0.30	1.00	5.4	3	8	27	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Birch Lake Subwatershed	5550000.0	0.0	99.0	0.0	66.3

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.30	0.50	0.80	
# capita-years	0.0			
% Phosphorus Retained by Soil	98.0	90.0	80.0	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	64.9	329.4	205.3	100.0
Total Loading (kg)	29.4	149.4	93.1	100.0
Areal Loading (lb/ac-year)	0.98	4.99	3.11	
Areal Loading (mg/m ² -year)	110.23	559.38	348.65	
Total PS Loading (lb)	0.0	218.3	0.0	66.3
Total PS Loading (kg)	0.0	99.0	0.0	66.3
Total NPS Loading (lb)	59.0	93.5	146.4	33.7
Total NPS Loading (kg)	26.8	42.4	66.4	33.7

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/13/2017 Scenario: Tamarack Lake Watershed Current

Observed spring overturn total phosphorus (SPO): 23.7 mg/m³

Observed growing season mean phosphorus (GSM): 28.8 mg/m³

Back calculation for SPO total phosphorus: 0.0 mg/m³

Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	4	19	12	-10	-35
Canfield-Bachmann, 1981 Natural Lake	4	19	12	-10	-35
Canfield-Bachmann, 1981 Artificial Lake	4	17	11	-12	-42
Rechow, 1979 General	3	13	8	-16	-56
Rechow, 1977 Anoxic	4	19	12	-10	-35
Rechow, 1977 water load<50m/year	3	14	9	-15	-52
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	3	17	11	-7	-30
Vollenweider, 1982 Combined OECD	4	16	11	-10	-38
Dillon-Rigler-Kirchner	2	12	7	-12	-51
Vollenweider, 1982 Shallow Lake/Res.	3	12	8	-14	-53
Larsen-Mercier, 1976	3	17	11	-7	-30
Nurnberg, 1984 Oxidic	3	14	9	-15	-52

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	8	27	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	55	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	49	FIT	1	GSM
Rechow, 1979 General	6	19	FIT	0	GSM
Rechow, 1977 Anoxic	9	27	Pin	0	GSM
Rechow, 1977 water load<50m/year	6	20	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	6	28	FIT	0	SPO
Vollenweider, 1982 Combined OECD	6	27	FIT	0	ANN
Dillon-Rigler-Kirchner	5	17	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	20	FIT	0	ANN
Larsen-Mercier, 1976	8	23	P Pin	0	SPO
Nurnberg, 1984 Oxidic	6	22	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/13/2017 Scenario: 20

Average Annual Surface Total Phosphorus: 28.8mg/m³

Annual Discharge: 5.54E+003 AF => 6.84E+006 m³

Annual Outflow Loading: 415.1 LB => 188.3 kg

Date: 10/27/2017 Scenario: Rock Lake Current

Lake Id: Rock Lake

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 3498.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 4081.0 acre-ft

Lake Surface Area <As>: 126 acre

Lake Volume <V>: 1078 acre-ft

Lake Mean Depth <z>: 8.6 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 4138.8 acre-ft/year

Areal Water Load <qs>: 32.8 ft/year

Lake Flushing Rate <p>: 3.84 1/year

Water Residence Time: 0.26 year

Observed spring overturn total phosphorus (SPO): 23.7 mg/m³

Observed growing season mean phosphorus (GSM): 25.4 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	255	0.10	0.30	0.50	17.9	10	31	52	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	1	0.05	0.10	0.25	0.0	0	0	0	0
Wetlands	1728	0.10	0.10	0.10	40.4	70	70	70	70
Forest	1514	0.05	0.09	0.18	31.9	31	55	110	
Lake Surface	126.0	0.10	0.30	1.00	8.8	5	15	51	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
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SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years		34		
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.20	1.70	5.44	1.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	256.2	381.6	635.7	100.0
Total Loading (kg)	116.2	173.1	288.4	100.0
Areal Loading (lb/ac-year)	2.03	3.03	5.05	0.0
Areal Loading (mg/m ² -year)	227.91	339.43	565.51	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	244.5	344.1	511.3	99.0
Total NPS Loading (kg)	110.9	156.1	231.9	99.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 10/27/2017 Scenario: 146

Observed spring overturn total phosphorus (SPO): 23.7 mg/m³Observed growing season mean phosphorus (GSM): 25.4 mg/m³Back calculation for SPO total phosphorus: 0.0 mg/m³Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nuremberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low	Most Likely	High	Predicted	% Dif.
	Total P	Total P	Total P	-Observed	
	(mg/m ³)	(mg/m ³)	(mg/m ³)	(mg/m ³)	
Walker, 1987 Reservoir	16	23	39	-2	-8
Canfield-Bachmann, 1981 Natural Lake	17	24	38	-1	-4
Canfield-Bachmann, 1981 Artificial Lake	16	22	33	-3	-12
Rechow, 1979 General	10	14	24	-11	-43
Rechow, 1977 Anoxic	19	29	48	4	16
Rechow, 1977 water load<50m/year	15	22	36	-3	-12
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	16	23	39	-1	-4
Vollenweider, 1982 Combined OECD	14	20	30	-5	-20
Dillon-Rigler-Kirchner	10	15	25	-9	-38
Vollenweider, 1982 Shallow Lake/Res.	11	16	25	-9	-37
Larsen-Mercier, 1976	15	22	37	-2	-8
Nurnberg, 1984 Oxidic	11	16	26	-9	-35

Lake Phosphorus Model	Confidence		Parameter	Back	Model
	Lower	Upper			
	Bound	Bound	Fit?	Calculation	Type
				(kg/year)	
Walker, 1987 Reservoir	15	36	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	7	69	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	7	63	FIT	1	GSM
Rechow, 1979 General	9	22	FIT	0	GSM
Rechow, 1977 Anoxic	19	44	FIT	0	GSM
Rechow, 1977 water load<50m/year	14	34	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	13	40	FIT	0	SPO
Vollenweider, 1982 Combined OECD	11	35	FIT	0	ANN
Dillon-Rigler-Kirchner	10	23	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	9	28	FIT	0	ANN
Larsen-Mercier, 1976	15	33	P Pin	0	SPO
Nurnberg, 1984 Oxidic	9	26	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 10/27/2017 Scenario: 107
Average Annual Surface Total Phosphorus: 25.4mg/m³
Annual Discharge: 4.14E+003 AF => 5.11E+006 m³
Annual Outflow Loading: 273.6 LB => 124.1 kg

Date: 10/27/2017 Scenario: North Turtle Lake Current

Lake Id: North Turtle Lake

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 2095.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 2444.2 acre-ft

Lake Surface Area <As>: 368 acre

Lake Volume <V>: 7813 acre-ft

Lake Mean Depth <z>: 21.2 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 12385.2 acre-ft/year

Areal Water Load <qs>: 33.7 ft/year

Lake Flushing Rate <p>: 1.59 1/year

Water Residence Time: 0.63 year

Observed spring overturn total phosphorus (SPO): 20.3 mg/m³

Observed growing season mean phosphorus (GSM): 17.3 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	184	0.10	0.30	0.50	4.9	7	22	37	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	3	0.05	0.10	0.25	0.0	0	0	0	0
Wetlands	971	0.10	0.10	0.10	8.6	39	39	39	39
Forest	937	0.05	0.09	0.18	7.4	19	34	68	
Lake Surface	368.0	0.10	0.30	1.00	9.7	15	45	149	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Rock Lake Subwatershed	5110000	0.0	124	0.0	27.0
Lake Helen Subwatershed	104000	0.0	2	0.0	0.4
Tamarack Lake Subwatershed	6840000	0.0	188	0.0	41.0

SEPTIC TANK DATA

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	89			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.53	4.45	14.24	1.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	179.0	1011.9	679.6	100.0
Total Loading (kg)	81.2	459.0	308.3	100.0
Areal Loading (lb/ac-year)	0.49	2.75	1.85	0.0
Areal Loading (mg/m ² -year)	54.52	308.22	206.99	0.0
Total PS Loading (lb)	0.0	692.2	0.0	68.4
Total PS Loading (kg)	0.0	314.0	0.0	68.4
Total NPS Loading (lb)	145.0	211.4	319.9	30.6
Total NPS Loading (kg)	65.8	95.9	145.1	30.6

Phosphorus Prediction and Uncertainty Analysis Module

Date: 10/27/2017 Scenario: 148

Observed spring overturn total phosphorus (SPO): 20.3 mg/m³

Observed growing season mean phosphorus (GSM): 17.3 mg/m³

Back calculation for SPO total phosphorus: 0.0 mg/m³

Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low	Most Likely	High	Predicted	% Dif.
	Total P	Total P	Total P	-Observed	
	(mg/m ³)	(mg/m ³)	(mg/m ³)	(mg/m ³)	
Walker, 1987 Reservoir	3	17	11	0	0
Canfield-Bachmann, 1981 Natural Lake	4	19	13	2	12
Canfield-Bachmann, 1981 Artificial Lake	4	18	13	1	6
Rechow, 1979 General	2	13	9	-4	-23
Rechow, 1977 Anoxic	4	24	16	7	40
Rechow, 1977 water load<50m/year	3	16	11	-1	-6
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	3	18	12	-2	-10
Vollenweider, 1982 Combined OECD	4	16	11	-3	-16
Dillon-Rigler-Kirchner	2	14	9	-6	-30
Vollenweider, 1982 Shallow Lake/Res.	3	12	9	-7	-37
Larsen-Mercier, 1976	3	17	11	-3	-15
Nurnberg, 1984 Oxidic	2	14	9	-3	-17

Lake Phosphorus Model	Confidence		Parameter	Back	Model
	Lower	Upper			
	Bound	Bound	Fit?	Calculation	Type
				(kg/year)	
Walker, 1987 Reservoir	7	24	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	55	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	52	FIT	1	GSM
Rechow, 1979 General	5	19	FIT	0	GSM
Rechow, 1977 Anoxic	10	33	FIT	0	GSM
Rechow, 1977 water load<50m/year	7	23	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	6	29	FIT	0	SPO
Vollenweider, 1982 Combined OECD	6	27	FIT	0	ANN
Dillon-Rigler-Kirchner	6	20	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	20	FIT	0	ANN
Larsen-Mercier, 1976	8	23	P Pin	0	SPO
Nurnberg, 1984 Oxidic	5	22	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 10/27/2017 Scenario: 109
Average Annual Surface Total Phosphorus: 17.3mg/m³
Annual Discharge: 1.24E+004 AF => 1.53E+007 m³
Annual Outflow Loading: 557.8 LB => 253.0 kg

Date: 1/3/2018 Scenario: South Turtle Watershed Current

Lake Id: South Turtle Lake_DirectWS_Only

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 1967.0 acre

Total Unit Runoff: 14.00 in.

Annual Runoff Volume: 2294.8 acre-ft

Lake Surface Area <As>: 488.0 acre

Lake Volume <V>: 6794.0 acre-ft

Lake Mean Depth <z>: 13.9 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 2518.5 acre-ft/year

Areal Water Load <qs>: 5.2 ft/year

Lake Flushing Rate <p>: 0.37 1/year

Water Residence Time: 2.70 year

Observed spring overturn total phosphorus (SPO): 24.0 mg/m³

Observed growing season mean phosphorus (GSM): 22.6 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	248.0	0.10	0.30	0.50	18.9	10	30	50	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	11.0	0.05	0.10	0.25	0.3	0	0	1	
Wetlands	665.0	0.10	0.10	0.10	16.9	27	27	27	27
Forest	1043.0	0.05	0.09	0.18	23.8	21	38	76	
Lake Surface	488.0	0.10	0.30	1.00	37.1	20	59	197	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
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SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.30	0.50	0.80	
# capita-years	100.0				
% Phosphorus Retained by Soil		98.0	90.0	80.0	
Septic Tank Loading (kg/year)		0.60	5.00	16.00	3.1

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	173.3	352.1	810.6	100.0
Total Loading (kg)	78.6	159.7	367.7	100.0
Areal Loading (lb/ac-year)	0.36	0.72	1.66	
Areal Loading (mg/m ² -year)	39.81	80.87	186.18	
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	128.5	210.4	339.9	96.9
Total NPS Loading (kg)	58.3	95.5	154.2	96.9

Phosphorus Prediction and Uncertainty Analysis Module

Date: 1/3/2018 Scenario: 76

Observed spring overturn total phosphorus (SPO): 24.0 mg/m³

Observed growing season mean phosphorus (GSM): 22.6 mg/m³

Back calculation for SPO total phosphorus: 0.0 mg/m³

Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low	Most Likely	High	Predicted -Observed (mg/m ³)	% Dif.
	Total P (mg/m ³)	Total P (mg/m ³)	Total P (mg/m ³)		
Walker, 1987 Reservoir	12	24	55	1	4
Canfield-Bachmann, 1981 Natural Lake	11	19	34	-4	-18
Canfield-Bachmann, 1981 Artificial Lake	12	19	31	-4	-18
Rechow, 1979 General	3	6	14	-17	-75
Rechow, 1977 Anoxic	16	32	75	9	40
Rechow, 1977 water load<50m/year	6	11	26	-12	-53
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	11	22	52	-2	-8
Vollenweider, 1982 Combined OECD	10	18	35	-5	-21
Dillon-Rigler-Kirchner	6	13	29	-11	-46
Vollenweider, 1982 Shallow Lake/Res.	7	14	29	-9	-39
Larsen-Mercier, 1976	10	19	45	-5	-21
Nurnberg, 1984 Oxidic	6	12	28	-11	-49

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	14	45	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	55	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	55	FIT	1	GSM
Rechow, 1979 General	3	11	FIT	0	GSM
Rechow, 1977 Anoxic	19	60	FIT	0	GSM
Rechow, 1977 water load<50m/year	7	21	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	11	44	FIT	0	SPO
Vollenweider, 1982 Combined OECD	9	34	FIT	0	ANN
Dillon-Rigler-Kirchner	7	24	L	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	7	27	FIT	0	ANN
Larsen-Mercier, 1976	12	36	P Pin	0	SPO
Nurnberg, 1984 Oxidic	6	24	FIT	0	ANN

Date: 5/16/2019 Scenario: Circle Lily Watershed Current

Lake Id: CircleLily_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 5652.3 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 6594.4 acre-ft

Lake Surface Area <As>: 235 acre

Lake Volume <V>: 4431 acre-ft

Lake Mean Depth <z>: 18.9 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 6702.1 acre-ft/year

Areal Water Load <qs>: 28.5 ft/year

Lake Flushing Rate <p>: 1.51 1/year

Water Residence Time: 0.66 year

Observed spring overturn total phosphorus (SPO): 20.4 mg/m³

Observed growing season mean phosphorus (GSM): 19.8 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low ----	Most Likely Loading (kg/ha-year)	High ----	Loading %	Low -----	Most Likely Loading (kg/year)	High ----
Row Crop AG	4.1	0.50	1.00	3.00	0.6	1	2	5
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	540.9	0.10	0.30	0.50	22.5	22	66	109
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	0.9	0.30	0.50	0.80	0.1	0	0	0
Rural Res (>1 Ac)	15.9	0.05	0.10	0.25	0.2	0	1	2
Wetlands	2301.2	0.10	0.10	0.10	31.9	93	93	93
Forest	2789.3	0.05	0.09	0.18	34.8	56	102	203
Lake Surface	235.0	0.10	0.30	1.00	9.8	10	29	95

POINT SOURCE DATA

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m ³ /year)	(kg/year)	(kg/year)	(kg/year)	

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.3	0.5	0.8	
# capita-years	17				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.10	0.85	2.72	0.3

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	402.0	644.3	1125.4	100.0
Total Loading (kg)	182.3	292.3	510.5	100.0
Areal Loading (lb/ac-year)	1.71	2.74	4.79	0.0
Areal Loading (mg/m ² -year)	191.73	307.32	536.77	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	380.8	579.5	909.7	99.7
Total NPS Loading (kg)	172.7	262.9	412.6	99.7

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/16/2019 Scenario: Circle Lily Watershed Current
 Observed spring overturn total phosphorus (SPO): 20.4 mg/m³
 Observed growing season mean phosphorus (GSM): 19.8 mg/m³
 Back calculation for SPO total phosphorus: 0.0 mg/m³
 Back calculation GSM phosphorus: 0.0 mg/m³
 % Confidence Range: 70%
 Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	12	19	33	-1	-5
Canfield-Bachmann, 1981 Natural Lake	14	21	33	1	5
Canfield-Bachmann, 1981 Artificial Lake	14	20	30	0	0
Rechow, 1979 General	9	14	24	-6	-30
Rechow, 1977 Anoxic	18	28	50	8	40
Rechow, 1977 water load<50m/year	11	18	32	-2	-10
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	13	21	37	1	5
Vollenweider, 1982 Combined OECD	12	18	28	-2	-10
Dillon-Rigler-Kirchner	7	12	21	-8	-39
Vollenweider, 1982 Shallow Lake/Res.	9	14	23	-6	-30
Larsen-Mercier, 1976	12	19	34	-1	-5
Nurnberg, 1984 Oxidic	10	15	27	-5	-25

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	12	30	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	7	60	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	58	FIT	1	GSM
Rechow, 1979 General	9	22	FIT	0	GSM
Rechow, 1977 Anoxic	18	44	FIT	0	GSM
Rechow, 1977 water load<50m/year	11	29	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	11	37	FIT	0	SPO
Vollenweider, 1982 Combined OECD	9	32	FIT	0	ANN
Dillon-Rigler-Kirchner	8	19	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	7	25	FIT	0	ANN
Larsen-Mercier, 1976	13	30	P Pin	0	SPO
Nurnberg, 1984 Oxidic	9	26	FIT	0	ANN

Date: 5/16/2019 Pardee Lake Watershed Current

Lake Id: Pardee_WS_Current

Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 1896.1 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 2212.1 acre-ft

Lake Surface Area <As>: 213 acre

Lake Volume <V>: 2561 acre-ft

Lake Mean Depth <z>: 12.0 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 2309.7 acre-ft/year

Areal Water Load <qs>: 10.8 ft/year

Lake Flushing Rate <p>: 0.90 1/year

Water Residence Time: 1.11 year

Observed spring overturn total phosphorus (SPO): 17.6 mg/m³

Observed growing season mean phosphorus (GSM): 21 mg/m³

% NPS Change: 0%

% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low	Most Likely	High	Loading %	Low	Most Likely	High	
		Loading (kg/ha-year)				Loading (kg/year)			
		----		----		-----		-----	----
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	0
Pasture/Grass	129.3	0.10	0.30	0.50	14.1	5	16	26	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0	0
Rural Res (>1 Ac)	0.7	0.05	0.10	0.25	0.0	0	0	0	0
Wetlands	946.7	0.10	0.10	0.10	34.5	38	38	38	38
Forest	819.4	0.05	0.09	0.18	26.9	17	30	60	
Lake Surface	213.0	0.10	0.30	1.00	23.3	9	26	86	

POINT SOURCE DATA

Point Sources	Water Load (m ³ /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
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SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.3	0.5	0.8	
# capita-years	27				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.16	1.35	4.32	1.2

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	151.9	244.9	473.5	100.0
Total Loading (kg)	68.9	111.1	214.8	100.0
Areal Loading (lb/ac-year)	0.71	1.15	2.22	0.0
Areal Loading (mg/m ² -year)	79.96	128.88	249.15	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	132.6	184.9	273.9	98.8
Total NPS Loading (kg)	60.1	83.9	124.2	98.8

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/16/2019 Pardee Lake Watershed Current

Observed spring overturn total phosphorus (SPO): 17.6 mg/m³

Observed growing season mean phosphorus (GSM): 21.0 mg/m³

Back calculation for SPO total phosphorus: 0.0 mg/m³

Back calculation GSM phosphorus: 0.0 mg/m³

% Confidence Range: 70%

Nurnberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m ³)	Most Likely Total P (mg/m ³)	High Total P (mg/m ³)	Predicted -Observed (mg/m ³)	% Dif.
Walker, 1987 Reservoir	13	22	42	1	5
Canfield-Bachmann, 1981 Natural Lake	14	20	34	-1	-5
Canfield-Bachmann, 1981 Artificial Lake	14	19	30	-2	-10
Rechow, 1979 General	5	8	16	-13	-62
Rechow, 1977 Anoxic	18	30	57	9	43
Rechow, 1977 water load<50m/year	9	15	30	-6	-29
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	13	21	40	3	17
Vollenweider, 1982 Combined OECD	12	17	30	-2	-10
Dillon-Rigler-Kirchner	7	10	20	-8	-45
Vollenweider, 1982 Shallow Lake/Res.	9	14	24	-5	-26
Larsen-Mercier, 1976	12	19	37	1	6
Nurnberg, 1984 Oxidic	7	12	22	-9	-43

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	14	37	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	58	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	55	FIT	1	GSM
Rechow, 1979 General	5	14	FIT	0	GSM
Rechow, 1977 Anoxic	19	49	FIT	0	GSM
Rechow, 1977 water load<50m/year	9	26	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	11	38	FIT	0	SPO
Vollenweider, 1982 Combined OECD	9	31	FIT	0	ANN
Dillon-Rigler-Kirchner	7	17	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	7	25	FIT	0	ANN
Larsen-Mercier, 1976	13	31	P Pin	0	SPO
Nurnberg, 1984 Oxidic	7	21	FIT	0	ANN