

# D

## APPENDIX D

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### Watershed Analysis WiLMS Results

**Date: 12/26/2017 Scenario: Rest Lake Watershed Current**

Lake Id: Rest Lake

Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 7913.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 9231.8 acre-ft

Lake Surface Area <As>: 664 acre

Lake Volume <V>: 14217 acre-ft

Lake Mean Depth <z>: 21.4 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 157085.9 acre-ft/year

Areal Water Load <qs>: 236.6 ft/year

Lake Flushing Rate <p>: 11.05 1/year

Water Residence Time: 0.09 year **32.9 days**

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>

Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>

% 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	50	0.50	1.00	3.00	0.5	10	20	61	
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	
Pasture/Grass	910	0.10	0.30	0.50	2.6	37	110	184	
HD Urban (1/8 Ac)	2	1.00	1.50	2.00	0.0	1	1	2	
MD Urban (1/4 Ac)	5	0.30	0.50	0.80	0.0	1	1	2	
Rural Res (>1 Ac)	24	0.05	0.10	0.25	0.0	0	1	2	
Wetlands	2482	0.10	0.10	0.10	2.4	100	100	100	
Forest	4440	0.05	0.09	0.18	3.9	90	162	323	
Lake Surface	664.0	0.10	0.30	1.00	1.9	27	81	269	

**POINT SOURCE DATA**

Point Sources	Water Load (m <sup>3</sup> /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Stone Lake Subwatershed	182000000	0.0	3706	0.0	88.6

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	586.4	9221.2	2079.2	100.0
Total Loading (kg)	266.0	4182.7	943.1	100.0
Areal Loading (lb/ac-year)	0.88	13.89	3.13	0.0
Areal Loading (mg/m <sup>2</sup> -year)	98.99	1556.58	350.98	0.0
Total PS Loading (lb)	0.0	8170.2	0.0	88.6
Total PS Loading (kg)	0.0	3706.0	0.0	88.6
Total NPS Loading (lb)	527.2	873.2	1486.8	11.4
Total NPS Loading (kg)	239.1	396.1	674.4	11.4

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/26/2017 Scenario: 258

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	1	18	4	3	20
Canfield-Bachmann, 1981 Natural Lake	1	18	4	3	20
Canfield-Bachmann, 1981 Artificial Lake	1	17	4	2	13
Rechow, 1979 General	1	16	4	1	7
Rechow, 1977 Anoxic	1	19	4	4	26
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	1	16	4	1	7
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	2	16	5	8	105
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	1	12	3	4	52
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	1	18	4	3	20

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	7	29	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	52	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	49	FIT	1	GSM
Rechow, 1979 General	6	26	FIT	0	GSM
Rechow, 1977 Anoxic	7	30	Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	7	23	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	5	29	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	4	21	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	6	31	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/26/2017 Scenario: 230

Average Annual Surface Total Phosphorus: 15.3mg/m<sup>3</sup>

Annual Discharge: 1.57E+005 AF => 1.94E+008 m<sup>3</sup>

Annual Outflow Loading: 6255.8 LB => 2837.6 kg

**Date: 11/13/2017 Scenario: Island Lake Watershed Current**

Lake Id: Island Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 12859.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 15002.2 acre-ft  
 Lake Surface Area <As>: 918 acre  
 Lake Volume <V>: 12309 acre-ft  
 Lake Mean Depth <z>: 13.4 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 88541.1 acre-ft/year  
 Areal Water Load <qs>: 96.5 ft/year  
 Lake Flushing Rate <p>: 7.19 1/year  
 Water Residence Time: 0.14 year **51 days**  
 Observed spring overturn total phosphorus (SPO): 22 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 24.5 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High	
	(ac)	Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	16	0.50	1.00	3.00	0.3	3	6	19	
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	
Pasture/Grass	1184	0.10	0.30	0.50	5.9	48	144	240	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	
MD Urban (1/4 Ac)	2	0.30	0.50	0.80	0.0	0	0	1	
Rural Res (>1 Ac)	24	0.05	0.10	0.25	0.0	0	1	2	
Wetlands	5615	0.10	0.10	0.10	9.4	227	227	227	
Forest	6018	0.05	0.09	0.18	9.0	122	219	438	
Lake Surface	918.0	0.10	0.30	1.00	4.6	37	111	372	

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %	
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)		
Big Crooked Lake Subwatershed	1390000	0.0	39.9	0.0	1.6	
Boulder Lake Subwatershed	68600000	0.0	1292	0.0	53.3	
Whitney Lake Subwatershed	1600000	0.0	15.3	0.0	0.6	
Big Lake Subwatershed	18600000	0.0	366.3	0.0	15.1	

**SEPTIC TANK DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	965.7	5341.7	2864.3	100.0
Total Loading (kg)	438.0	2423.0	1299.2	100.0
Areal Loading (lb/ac-year)	1.05	5.82	3.12	0.0
Areal Loading (mg/m <sup>2</sup> -year)	117.91	652.21	349.72	0.0
Total PS Loading (lb)	0.0	3777.6	0.0	70.7
Total PS Loading (kg)	0.0	1713.5	0.0	70.7
Total NPS Loading (lb)	883.8	1318.4	2045.2	29.3
Total NPS Loading (kg)	400.9	598.0	927.7	29.3

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 11/13/2017 Scenario: 182

Observed spring overturn total phosphorus (SPO): 22.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 24.5 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	3	17	9	-8	-33
Canfield-Bachmann, 1981 Natural Lake	4	18	10	-7	-29
Canfield-Bachmann, 1981 Artificial Lake	4	17	10	-8	-33
Rechow, 1979 General	3	14	7	-11	-45
Rechow, 1977 Anoxic	3	19	10	-6	-24
Rechow, 1977 water load<50m/year	2	13	7	-12	-49
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	3	17	9	-5	-23
Vollenweider, 1982 Combined OECD	4	15	9	-8	-34
Dillon-Rigler-Kirchner	2	13	7	-9	-41
Vollenweider, 1982 Shallow Lake/Res.	3	12	7	-11	-47
Larsen-Mercier, 1976	3	16	9	-6	-27
Nurnberg, 1984 Oxidic	3	15	8	-10	-41

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	7	25	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	52	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	49	FIT	1	GSM
Rechow, 1979 General	6	21	FIT	0	GSM
Rechow, 1977 Anoxic	8	27	Pin	0	GSM
Rechow, 1977 water load<50m/year	5	19	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	26	FIT	0	ANN
Dillon-Rigler-Kirchner	5	19	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	20	FIT	0	ANN
Larsen-Mercier, 1976	7	22	P Pin	0	SPO
Nurnberg, 1984 Oxid	6	24	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 11/13/2017 Scenario: 157

Average Annual Surface Total Phosphorus: 24.5mg/m<sup>3</sup>

Annual Discharge: 8.85E+004 AF => 1.09E+008 m<sup>3</sup>

Annual Outflow Loading: 5628.3 LB => 2553.0 kg

**Date: 12/22/2017 Scenario: Spider Lake Watershed Current**

Lake Id: Spider Lake Surface  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 462.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 539.0 acre-ft

Lake Surface Area <As>: 283 acre

Lake Volume <V>: 5494 acre-ft

Lake Mean Depth <z>: 19.4 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 143354.2 acre-ft/year

Areal Water Load <qs>: 506.6 ft/year

Lake Flushing Rate <p>: 26.09 1/year

Water Residence Time: 0.04 year **14.6 days**

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>

Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>

% NPS Change: 0%

% PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	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	89	0.10	0.30	0.50	0.3	4	11	18
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	1	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	2	0.05	0.10	0.25	0.0	0	0	0
Wetlands	141	0.10	0.10	0.10	0.2	6	6	6
Forest	229	0.05	0.09	0.18	0.2	5	8	17
Lake Surface	283.0	0.10	0.30	1.00	0.9	11	34	115

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)	
Island Lake Subwatershed	109000000	0.0	2553	0.0	68.9
Manitowish Lake Subwatershed	67000000	0.0	1095.3	0.0	29.5

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0



**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	56.3	8174.2	342.7	100.0
Total Loading (kg)	25.6	3707.8	155.5	100.0
Areal Loading (lb/ac-year)	0.20	28.88	1.21	0.0
Areal Loading (mg/m <sup>2</sup> -year)	22.32	3237.51	135.74	0.0
Total PS Loading (lb)	0.0	8043.0	0.0	98.4
Total PS Loading (kg)	0.0	3648.3	0.0	98.4
Total NPS Loading (lb)	31.1	55.4	90.2	1.6
Total NPS Loading (kg)	14.1	25.1	40.9	1.6

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 254

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	19	1	4	26
Canfield-Bachmann, 1981 Natural Lake	0	19	1	4	26
Canfield-Bachmann, 1981 Artificial Lake	0	18	1	3	20
Rechow, 1979 General	0	16	1	1	7
Rechow, 1977 Anoxic	0	18	1	3	20
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	16	1	1	7
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	0	16	1	8	105
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	0	13	1	5	65
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	0	19	1	4	26

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	6	32	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	27	FIT	0	GSM
Rechow, 1977 Anoxic	6	30	Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	6	25	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	4	30	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	3	24	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	6	34	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 226

Average Annual Surface Total Phosphorus: 15.3mg/m<sup>3</sup>

Annual Discharge: 1.43E+005 AF => 1.77E+008 m<sup>3</sup>

Annual Outflow Loading: 5707.5 LB => 2588.9 kg

**Date: 12/22/2017 Scenario: Spider Lake Watershed Current**

Lake Id: Spider Lake Surface  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 462.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 539.0 acre-ft

Lake Surface Area <As>: 283 acre

Lake Volume <V>: 5494 acre-ft

Lake Mean Depth <z>: 19.4 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 143354.2 acre-ft/year

Areal Water Load <qs>: 506.6 ft/year

Lake Flushing Rate <p>: 26.09 1/year

Water Residence Time: 0.04 year **14.6 days**

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>

Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>

% NPS Change: 0%

% PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	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	89	0.10	0.30	0.50	0.3	4	11	18
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	1	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	2	0.05	0.10	0.25	0.0	0	0	0
Wetlands	141	0.10	0.10	0.10	0.2	6	6	6
Forest	229	0.05	0.09	0.18	0.2	5	8	17
Lake Surface	283.0	0.10	0.30	1.00	0.9	11	34	115

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)	
Island Lake Subwatershed	109000000	0.0	2553	0.0	68.9
Manitowish Lake Subwatershed	67000000	0.0	1095.3	0.0	29.5

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	56.3	8174.2	342.7	100.0
Total Loading (kg)	25.6	3707.8	155.5	100.0
Areal Loading (lb/ac-year)	0.20	28.88	1.21	0.0
Areal Loading (mg/m <sup>2</sup> -year)	22.32	3237.51	135.74	0.0
Total PS Loading (lb)	0.0	8043.0	0.0	98.4
Total PS Loading (kg)	0.0	3648.3	0.0	98.4
Total NPS Loading (lb)	31.1	55.4	90.2	1.6
Total NPS Loading (kg)	14.1	25.1	40.9	1.6

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 254

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 15.3 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	19	1	4	26
Canfield-Bachmann, 1981 Natural Lake	0	19	1	4	26
Canfield-Bachmann, 1981 Artificial Lake	0	18	1	3	20
Rechow, 1979 General	0	16	1	1	7
Rechow, 1977 Anoxic	0	18	1	3	20
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	16	1	1	7
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	0	16	1	8	105
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	0	13	1	5	65
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	0	19	1	4	26

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	6	32	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	27	FIT	0	GSM
Rechow, 1977 Anoxic	6	30	Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	6	25	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	4	30	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	3	24	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	6	34	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 226

Average Annual Surface Total Phosphorus: 15.3mg/m<sup>3</sup>

Annual Discharge: 1.43E+005 AF => 1.77E+008 m<sup>3</sup>

Annual Outflow Loading: 5707.5 LB => 2588.9 kg

**Date: 12/22/2017 Scenario: Fawn Lake Watershed Current**

Lake Id: Fawn Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 321.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 374.5 acre-ft  
 Lake Surface Area <As>: 73 acre  
 Lake Volume <V>: 442 acre-ft  
 Lake Mean Depth <z>: 6.1 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 3561.6 acre-ft/year  
 Areal Water Load <qs>: 48.8 ft/year  
 Lake Flushing Rate <p>: 8.06 1/year  
 Water Residence Time: 0.12 year **43.8 days**  
 Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 23.5 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	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	15	0.10	0.30	0.50	1.9	1	2	3
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)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	110	0.10	0.10	0.10	4.6	4	4	4
Forest	196	0.05	0.09	0.18	7.4	4	7	14
Lake Surface	73.0	0.10	0.30	1.00	9.1	3	9	30

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)	
Clear Lake Subwatershed	3890000	0.0	74.7	0.0	77.0

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	26.4	213.8	113.1	100.0
Total Loading (kg)	12.0	97.0	51.3	100.0
Areal Loading (lb/ac-year)	0.36	2.93	1.55	0.0
Areal Loading (mg/m <sup>2</sup> -year)	40.55	328.26	173.68	0.0
Total PS Loading (lb)	0.0	164.7	0.0	77.0
Total PS Loading (kg)	0.0	74.7	0.0	77.0
Total NPS Loading (lb)	19.9	29.6	48.0	23.0
Total NPS Loading (kg)	9.0	13.4	21.8	23.0

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 256

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 23.5 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	2	18	10	-6	-26
Canfield-Bachmann, 1981 Natural Lake	3	18	10	-6	-26
Canfield-Bachmann, 1981 Artificial Lake	3	17	10	-7	-30
Rechow, 1979 General	1	11	6	-13	-55
Rechow, 1977 Anoxic	2	19	10	-5	-21
Rechow, 1977 water load<50m/year	2	15	8	-9	-38
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	3	15	9	3	26
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	2	12	7	0	0
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	1	12	6	-12	-51

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	7	26	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	52	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	49	FIT	1	GSM
Rechow, 1979 General	4	17	FIT	0	GSM
Rechow, 1977 Anoxic	8	27	Pin	0	GSM
Rechow, 1977 water load<50m/year	6	22	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	5	26	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	4	20	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	4	19	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 228

Average Annual Surface Total Phosphorus: 23.5mg/m<sup>3</sup>

Annual Discharge: 3.56E+003 AF => 4.39E+006 m<sup>3</sup>

Annual Outflow Loading: 217.4 LB => 98.6 kg



**Date: 12/21/2017 Scenario: Wild Rice Lake Watershed Current**

Lake Id: Wild Rice Lake

Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 11775.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 13737.5 acre-ft

Lake Surface Area <As>: 396 acre

Lake Volume <V>: 4092 acre-ft

Lake Mean Depth <z>: 10.3 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 47668.2 acre-ft/year

Areal Water Load <qs>: 120.4 ft/year

Lake Flushing Rate <p>: 11.65 1/year

Water Residence Time: 0.09 year

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>

Observed growing season mean phosphorus (GSM): 22.3 mg/m<sup>3</sup>

% 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	167	0.50	1.00	3.00	6.1	34	68	203	
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0	
Pasture/Grass	1391	0.10	0.30	0.50	15.2	56	169	281	
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0	
MD Urban (1/4 Ac)	1	0.30	0.50	0.80	0.0	0	0	0	
Rural Res (>1 Ac)	38	0.05	0.10	0.25	0.1	1	2	4	
Wetlands	5425	0.10	0.10	0.10	19.7	220	220	220	
Forest	4753	0.05	0.09	0.18	15.6	96	173	346	
Lake Surface	396.0	0.10	0.30	1.00	4.3	16	48	160	

**POINT SOURCE DATA**

Point Sources	Water Load (m <sup>3</sup> /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Lower Gresham Lake Subwatershed	4380000	0.0	99.2	0.0	8.9
Trout Lake Subwatershed	35100000	0.0	298.6	0.0	26.8
East Ellerson Lake Subwatershed	739000	0.0	16.2	0.0	1.5
West Ellerson Lake Subwatershed	1410000	0.0	20.2	0.0	1.8

**SEPTIC TANK DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	931.9	2454.1	2677.4	100.0
Total Loading (kg)	422.7	1113.2	1214.4	100.0
Areal Loading (lb/ac-year)	2.35	6.20	6.76	0.0
Areal Loading (mg/m <sup>2</sup> -year)	263.78	694.61	757.81	0.0
Total PS Loading (lb)	0.0	957.2	0.0	39.0
Total PS Loading (kg)	0.0	434.2	0.0	39.0
Total NPS Loading (lb)	896.6	1390.8	2324.0	61.0
Total NPS Loading (kg)	406.7	630.9	1054.2	61.0

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/21/2017 Scenario: 250

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 22.3 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	6	16	18	-6	-27
Canfield-Bachmann, 1981 Natural Lake	7	16	18	-6	-27
Canfield-Bachmann, 1981 Artificial Lake	6	15	17	-7	-31
Rechow, 1979 General	5	12	14	-10	-45
Rechow, 1977 Anoxic	6	17	18	-5	-22
Rechow, 1977 water load<50m/year	4	11	12	-11	-49
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	6	14	15	3	27
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	5	11	12	0	0
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	5	14	15	-8	-36

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	8	22	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	5	46	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	43	FIT	1	GSM
Rechow, 1979 General	6	17	FIT	0	GSM
Rechow, 1977 Anoxic	9	23	Pin	0	GSM
Rechow, 1977 water load<50m/year	6	15	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	6	23	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	5	18	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	7	21	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/21/2017 Scenario: 222

Average Annual Surface Total Phosphorus: 22.3mg/m<sup>3</sup>

Annual Discharge: 4.77E+004 AF => 5.88E+007 m<sup>3</sup>

Annual Outflow Loading: 2763.5 LB => 1253.5 kg

**Date: 12/22/2017 Scenario: Alder Lake Watershed Current**

Lake Id: Alder Lake  
 Watershed Id: 0  
**Hydrologic and Morphometric Data**  
 Tributary Drainage Area: 3048.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 3556.0 acre-ft  
 Lake Surface Area <As>: 265 acre  
 Lake Volume <V>: 2935 acre-ft  
 Lake Mean Depth <z>: 11.1 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 51347.4 acre-ft/year  
 Areal Water Load <qs>: 193.8 ft/year  
 Lake Flushing Rate <p>: 17.49 1/year  
 Water Residence Time: 0.06 year **22 days**  
 Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 20.5 mg/m<sup>3</sup>  
 % 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	54	0.50	1.00	3.00		1.5	11	22	66
Mixed AG	0.0	0.30	0.80	1.40		0.0	0	0	0
Pasture/Grass	324	0.10	0.30	0.50		2.7	13	39	66
HD Urban (1/8 Ac)	1	1.00	1.50	2.00		0.0	0	1	1
MD Urban (1/4 Ac)	2	0.30	0.50	0.80		0.0	0	0	1
Rural Res (>1 Ac)	24	0.05	0.10	0.25		0.1	0	1	2
Wetlands	1539	0.10	0.10	0.10		4.3	62	62	62
Forest	1104	0.05	0.09	0.18		2.8	22	40	80
Lake Surface	265.0	0.10	0.30	1.00		2.2	11	32	107

**POINT SOURCE DATA**

Point Sources	Water Load (m <sup>3</sup> /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Wild Rice Lake Subwatershed	58800000	0.0	1253.5	0.0	86.4

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	265.7	3199.6	848.7	100.0
Total Loading (kg)	120.5	1451.3	385.0	100.0
Areal Loading (lb/ac-year)	1.00	12.07	3.20	0.0
Areal Loading (mg/m <sup>2</sup> -year)	112.38	1353.34	358.96	0.0
Total PS Loading (lb)	0.0	2763.5	0.0	86.4
Total PS Loading (kg)	0.0	1253.5	0.0	86.4
Total NPS Loading (lb)	242.1	365.2	612.2	13.6
Total NPS Loading (kg)	109.8	165.7	277.7	13.6

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 251

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 20.5 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	2	20	5	-1	-5
Canfield-Bachmann, 1981 Natural Lake	2	20	6	-1	-5
Canfield-Bachmann, 1981 Artificial Lake	2	19	6	-2	-10
Rechow, 1979 General	1	16	4	-5	-24
Rechow, 1977 Anoxic	2	20	5	-1	-5
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	1	18	5	-3	-15
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	2	17	6	7	68
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	1	13	4	3	29
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	2	18	5	-3	-15

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	8	32	Tw	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	6	26	FIT	0	GSM
Rechow, 1977 Anoxic	8	31	Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	8	26	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	5	30	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	4	23	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	6	30	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 223

Average Annual Surface Total Phosphorus: 20.5mg/m<sup>3</sup>

Annual Discharge: 5.13E+004 AF => 6.33E+007 m<sup>3</sup>

Annual Outflow Loading: 2735.0 LB => 1240.6 kg

**Date: 12/22/2017 Scenario: Manitowish Lake Watershed Current**

Lake Id: Manitowish Lake

Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 1668.0 acre

Total Unit Runoff: 14 in.

Annual Runoff Volume: 1946.0 acre-ft

Lake Surface Area &lt;As&gt;: 500 acre

Lake Volume &lt;V&gt;: 11632 acre-ft

Lake Mean Depth &lt;z&gt;: 23.3 ft

Precipitation - Evaporation: 5.5 in.

Hydraulic Loading: 54312.1 acre-ft/year

Areal Water Load &lt;qs&gt;: 108.6 ft/year

Lake Flushing Rate &lt;p&gt;: 4.67 1/year

Water Residence Time: 0.21 year **77 days**Observed spring overturn total phosphorus (SPO): 20.9 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 17.1 mg/m<sup>3</sup>

% NPS Change: 0%

% PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High	
	(ac)	Loading (kg/ha-year)				Loading (kg/year)			
Row Crop AG	57	0.50	1.00	3.00		1.6	12	23	69
Mixed AG	0.0	0.30	0.80	1.40		0.0	0	0	0
Pasture/Grass	207	0.10	0.30	0.50		1.8	8	25	42
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)	16	0.05	0.10	0.25		0.0	0	1	2
Wetlands	629	0.10	0.10	0.10		1.8	25	25	25
Forest	759	0.05	0.09	0.18		2.0	15	28	55
Lake Surface	500.0	0.10	0.30	1.00		4.3	20	61	202

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %	
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)		
Little Star Lake Subwatershed	1010000	0.0	10.8	0.0	0.8	
Alder Lake Subwatershed	63300000	0.0	1240.6	0.0	87.7	

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	179.2	3117.4	872.6	100.0
Total Loading (kg)	81.3	1414.1	395.8	100.0
Areal Loading (lb/ac-year)	0.36	6.23	1.75	0.0
Areal Loading (mg/m <sup>2</sup> -year)	40.17	698.84	195.61	0.0
Total PS Loading (lb)	0.0	2758.8	0.0	88.5
Total PS Loading (kg)	0.0	1251.4	0.0	88.5
Total NPS Loading (lb)	134.6	224.8	426.5	11.5
Total NPS Loading (kg)	61.0	101.9	193.5	11.5

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 253

Observed spring overturn total phosphorus (SPO): 20.9 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 17.1 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	1	15	4	-2	-12
Canfield-Bachmann, 1981 Natural Lake	1	16	5	-1	-6
Canfield-Bachmann, 1981 Artificial Lake	1	15	5	-2	-12
Rechow, 1979 General	1	14	4	-3	-18
Rechow, 1977 Anoxic	1	18	5	1	6
Rechow, 1977 water load<50m/year	1	12	3	-5	-29
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	1	15	4	-6	-29
Vollenweider, 1982 Combined OECD	1	14	5	-5	-26
Dillon-Rigler-Kirchner	1	12	3	-9	-43
Vollenweider, 1982 Shallow Lake/Res.	1	11	3	-8	-42
Larsen-Mercier, 1976	1	14	4	-7	-33
Nurnberg, 1984 Oxidic	1	15	4	-2	-12



Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	6	24	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	5	46	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	43	FIT	1	GSM
Rechow, 1979 General	5	22	FIT	0	GSM
Rechow, 1977 Anoxic	7	28	Pin	0	GSM
Rechow, 1977 water load<50m/year	4	19	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	5	26	FIT	0	SPO
Vollenweider, 1982 Combined OECD	4	25	FIT	0	ANN
Dillon-Rigler-Kirchner	5	19	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	3	20	FIT	0	ANN
Larsen-Mercier, 1976	5	21	Pin	0	SPO
Nurnberg, 1984 Oxid	5	25	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 225

Average Annual Surface Total Phosphorus: 17.1mg/m<sup>3</sup>

Annual Discharge: 5.43E+004 AF => 6.70E+007 m<sup>3</sup>

Annual Outflow Loading: 2414.7 LB => 1095.3 kg

,

**Date: 12/22/2017      Scenario: Little Star Lake Watershed Current**

Lake Id: Little Star Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 599.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 698.8 acre-ft  
 Lake Surface Area <As>: 261 acre  
 Lake Volume <V>: 8098 acre-ft  
 Lake Mean Depth <z>: 31.0 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 818.5 acre-ft/year  
 Areal Water Load <qs>: 3.1 ft/year  
 Lake Flushing Rate <p>: 0.10 1/year    **36.5 days**  
 Water Residence Time: 9.89 year  
 Observed spring overturn total phosphorus (SPO): 11.9 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 11.2 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	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	124	0.10	0.30	0.50	23.0	5	15	25
HD Urban (1/8 Ac)	1	1.00	1.50	2.00	0.9	0	1	1
MD Urban (1/4 Ac)	2	0.30	0.50	0.80	0.6	0	0	1
Rural Res (>1 Ac)	18	0.05	0.10	0.25	1.1	0	1	2
Wetlands	123	0.10	0.10	0.10	7.6	5	5	5
Forest	331	0.05	0.09	0.18	18.4	7	12	24
Lake Surface	261.0	0.10	0.30	1.00	48.4	11	32	106

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /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		0.0		
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	62.3	144.4	359.5	100.0
Total Loading (kg)	28.3	65.5	163.1	100.0
Areal Loading (lb/ac-year)	0.24	0.55	1.38	0.0
Areal Loading (mg/m <sup>2</sup> -year)	26.76	62.03	154.40	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)	39.0	74.6	126.7	100.0
Total NPS Loading (kg)	17.7	33.8	57.5	100.0

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 252

Observed spring overturn total phosphorus (SPO): 11.9 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 11.2 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	9	20	50	9	80
Canfield-Bachmann, 1981 Natural Lake	8	14	24	3	27
Canfield-Bachmann, 1981 Artificial Lake	9	15	24	4	36
Rechow, 1979 General	2	5	12	-6	-54
Rechow, 1977 Anoxic	10	23	57	12	107
Rechow, 1977 water load<50m/year	3	6	16	-5	-45
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	8	19	48	7	59
Vollenweider, 1982 Combined OECD	7	15	31	3	26
Dillon-Rigler-Kirchner	7	15	38	3	25
Vollenweider, 1982 Shallow Lake/Res.	5	11	26	-1	-9
Larsen-Mercier, 1976	7	16	39	4	34
Nurnberg, 1984 Oxidic	6	14	34	3	27

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	11	40	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	13	45	FIT	0	GSM
Rechow, 1977 water load<50m/year	3	13	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	9	40	FIT	0	SPO
Vollenweider, 1982 Combined OECD	7	29	FIT	0	ANN
Dillon-Rigler-Kirchner	9	30	L q s p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	5	23	FIT	0	ANN
Larsen-Mercier, 1976	9	31	P Pin	0	SPO
Nurnberg, 1984 Oxid	7	28	FIT	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 224

Average Annual Surface Total Phosphorus: 11.2mg/m<sup>3</sup>

Annual Discharge: 8.18E+002 AF => 1.01E+006 m<sup>3</sup>

Annual Outflow Loading: 23.8 LB => 10.8 kg

**Date: 12/22/2017 Scenario: Stone Lake Watershed Current**

Lake Id: Stone Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 315.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 367.5 acre-ft  
 Lake Surface Area <As>: 145 acre  
 Lake Volume <V>: 1681 acre-ft  
 Lake Mean Depth <z>: 11.6 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 147489.2 acre-ft/year  
 Areal Water Load <qs>: 1017.2 ft/year  
 Lake Flushing Rate <p>: 87.74 1/year  
 Water Residence Time: 0.01 year **3.6 days**  
 Observed spring overturn total phosphorus (SPO): 19.1 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 21.3 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	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	34	0.10	0.30	0.50	0.2	1	4	7
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)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	123	0.10	0.10	0.10	0.2	5	5	5
Forest	158	0.05	0.09	0.18	0.2	3	6	12
Lake Surface	145.0	0.10	0.30	1.00	0.6	6	18	59

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)	
Fawn Lake Subwatershed	4390000	0.0	98.6	0.0	3.6
Spider Lake Subwatershed	177000000	0.0	2588.9	0.0	95.2

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	34.0	5996.4	180.9	100.0
Total Loading (kg)	15.4	2720.0	82.0	100.0
Areal Loading (lb/ac-year)	0.23	41.35	1.25	0.0
Areal Loading (mg/m <sup>2</sup> -year)	26.28	4635.30	139.83	0.0
Total PS Loading (lb)	0.0	5924.9	0.0	98.8
Total PS Loading (kg)	0.0	2687.5	0.0	98.8
Total NPS Loading (lb)	21.1	32.8	51.5	1.2
Total NPS Loading (kg)	9.6	14.9	23.4	1.2

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/22/2017 Scenario: 257

Observed spring overturn total phosphorus (SPO): 19.1 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 21.3 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	15	0	-6	-28
Canfield-Bachmann, 1981 Natural Lake	0	14	0	-7	-33
Canfield-Bachmann, 1981 Artificial Lake	0	14	0	-7	-33
Rechow, 1979 General	0	12	0	-9	-42
Rechow, 1977 Anoxic	0	13	0	-8	-38
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	10	0	-11	-52
Walker, 1977 General	0	13	0	-6	-31
Vollenweider, 1982 Combined OECD	0	13	1	-7	-35
Dillon-Rigler-Kirchner	0	14	0	-5	-26
Vollenweider, 1982 Shallow Lake/Res.	0	10	0	-10	-50
Larsen-Mercier, 1976	0	14	0	-5	-26
Nurnberg, 1984 Oxidic	0	14	0	-7	-33

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	5	26	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	4	40	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	4	40	FIT	1	GSM
Rechow, 1979 General	4	21	qs	0	GSM
Rechow, 1977 Anoxic	4	22	P Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	4	16	FIT	0	GSM
Walker, 1977 General	4	24	FIT	0	SPO
Vollenweider, 1982 Combined OECD	3	24	Tw	0	ANN
Dillon-Rigler-Kirchner	5	24	L qs p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	3	19	Tw	0	ANN
Larsen-Mercier, 1976	5	23	Pin p	0	SPO
Nurnberg, 1984 Oxid	4	25	L qs	0	ANN

### Water and Nutrient Outflow Module

Date: 12/22/2017 Scenario: 229

Average Annual Surface Total Phosphorus: 21.3mg/m<sup>3</sup>

Annual Discharge: 1.47E+005 AF => 1.82E+008 m<sup>3</sup>

Annual Outflow Loading: 8170.2 LB => 3706.0 kg

Date: 12/26/2017 Scenario: Vance Lake Current

Lake Id: Vance Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 94.0 acre  
 Total Unit Runoff: 14.00 in.  
 Annual Runoff Volume: 109.7 acre-ft  
 Lake Surface Area <As>: 30.0 acre  
 Lake Volume <V>: 196 acre-ft  
 Lake Mean Depth <z>: 6.5 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 157401.8 acre-ft/year  
 Areal Water Load <qs>: 5246.7 ft/year  
 Lake Flushing Rate <p>: 803.07 1/year  
 Water Residence Time: 0.00 year 0.45 days  
 Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 17.3 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High	
	(ac)	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	15.0	0.10	0.30	0.50	0.1	1	2	3	
HD Urban (1/8 Ac)	2.0	1.00	1.50	2.00	0.0	1	1	2	
MD Urban (1/4 Ac)	3.0	0.30	0.50	0.80	0.0	0	1	1	
Rural Res (>1 Ac)	7.0	0.05	0.10	0.25	0.0	0	0	1	
Wetlands	35.0	0.10	0.10	0.10	0.0	1	1	1	
Forest	32.0	0.05	0.09	0.18	0.0	1	1	2	
Lake Surface	30.0	0.10	0.30	1.00	0.1	1	4	12	

**POINT SOURCE DATA**

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m <sup>3</sup> /year)	(kg/year)	(kg/year)	(kg/year)	
Rest Lake Subwatershed	1.9E+008	0.0	2837.6	0.0	99.6

**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**



<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	11.5	6278.1	49.0	100.0
Total Loading (kg)	5.2	2847.7	22.2	100.0
Areal Loading (lb/ac-year)	0.38	209.27	1.63	
Areal Loading (mg/m <sup>2</sup> -year)	42.83	23456.48	183.04	
Total PS Loading (lb)	0.0	6255.8	0.0	99.6
Total PS Loading (kg)	0.0	2837.6	0.0	99.6
Total NPS Loading (lb)	8.8	14.3	22.2	0.4
Total NPS Loading (kg)	4.0	6.5	10.1	0.4

### Phosphorus Prediction and Uncertainty Analysis Module

Date: 12/26/2017 Scenario: 259

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>

Observed growing season mean phosphorus (GSM): 17.3 mg/m<sup>3</sup>

Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>

Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	15	0	-2	-12
Canfield-Bachmann, 1981 Natural Lake	0	14	0	-3	-17
Canfield-Bachmann, 1981 Artificial Lake	0	14	0	-3	-17
Rechow, 1979 General	0	12	0	-5	-29
Rechow, 1977 Anoxic	0	13	0	-4	-23
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	2	0	-15	-87
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	0	14	0	5	58
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	0	11	0	2	23
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	0	15	0	-2	-12

<b>Lake Phosphorus Model</b>	<b>Confidence</b>	<b>Confidence</b>	<b>Parameter</b>	<b>Back</b>	<b>Model</b>
	Lower	Upper	Fit?	Calculation	Type
	Bound	Bound		(kg/year)	
Walker, 1987 Reservoir	5	26	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	4	40	L p	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	4	40	FIT	1	GSM
Rechow, 1979 General	4	21	qs	0	GSM
Rechow, 1977 Anoxic	4	22	P Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	1	3	FIT	0	GSM

Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	4	27	Tw	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	3	21	Tw	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxic	4	27	L qs	0	ANN

### Water and Nutrient Outflow Module

Date: 12/26/2017 Scenario: 233

Average Annual Surface Total Phosphorus: 17.3mg/m<sup>3</sup>

Annual Discharge: 1.57E+005 AF => 1.94E+008 m<sup>3</sup>

Annual Outflow Loading: 7073.5 LB => 3208.5 kg

**Date: 12/26/2017 Scenario: Sturgeon Lake Watershed Current**

Lake Id: Sturgeon Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 1033.0 acre  
 Total Unit Runoff: 14.00 in.  
 Annual Runoff Volume: 1205.2 acre-ft  
 Lake Surface Area <As>: 32.0 acre  
 Lake Volume <V>: 151 acre-ft  
 Lake Mean Depth <z>: 4.7 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 158498.2 acre-ft/year  
 Areal Water Load <qs>: 4953.1 ft/year  
 Lake Flushing Rate <p>: 1049.66 1/year  
 Water Residence Time: 0.00 year **0.35 days**  
 Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 19.0 mg/m<sup>3</sup>  
 % 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	148.0	0.10	0.30	0.50	0.6	6	18	30
HD Urban (1/8 Ac)	1.0	1.00	1.50	2.00	0.0	0	1	1
MD Urban (1/4 Ac)	3.0	0.30	0.50	0.80	0.0	0	1	1
Rural Res (>1 Ac)	9.0	0.05	0.10	0.25	0.0	0	0	1
Wetlands	364.0	0.10	0.10	0.10	0.5	15	15	15
Forest	508.0	0.05	0.09	0.18	0.6	10	19	37
Lake Surface	32.0	0.10	0.30	1.00	0.1	1	4	13

**POINT SOURCE DATA**

Point Sources	Water Load (m <sup>3</sup> /year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %
Vance Lake Subwatershed	1.9E+008	0.0	3208.5	0.0	98.3

**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**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	73.3	7198.4	214.6	100.0
Total Loading (kg)	33.2	3265.2	97.3	100.0
Areal Loading (lb/ac-year)	2.29	224.95	6.71	
Areal Loading (mg/m <sup>2</sup> -year)	256.73	25213.75	751.56	
Total PS Loading (lb)	0.0	7073.5	0.0	98.3
Total PS Loading (kg)	0.0	3208.5	0.0	98.3
Total NPS Loading (lb)	70.4	116.4	186.0	1.7
Total NPS Loading (kg)	32.0	52.8	84.4	1.7

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/26/2017 Scenario: 260

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 19.0 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	17	0	-2	-11
Canfield-Bachmann, 1981 Natural Lake	0	16	0	-3	-16
Canfield-Bachmann, 1981 Artificial Lake	0	16	0	-3	-16
Rechow, 1979 General	0	14	0	-5	-26
Rechow, 1977 Anoxic	0	15	0	-4	-21
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	3	0	-16	-84
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	0	15	1	6	63
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	0	12	1	3	32
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	0	17	0	-2	-11

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	6	29	z Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	5	46	L p	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	46	FIT	1	GSM
Rechow, 1979 General	4	24	qs	0	GSM
Rechow, 1977 Anoxic	5	25	P Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	1	5	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	4	28	Tw	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	3	22	Tw	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	5	31	L qs	0	ANN

### Water and Nutrient Outflow Module

Date: 12/26/2017 Scenario: 234

Average Annual Surface Total Phosphorus: 19mg/m<sup>3</sup>

Annual Discharge: 1.58E+005 AF => 1.96E+008 m<sup>3</sup>

Annual Outflow Loading: 7848.6 LB => 3560.1 kg

**Date: 12/26/2017 Scenario: Benson Lake Watershed Current**

Lake Id: Benson Lake  
 Watershed Id: 0

**Hydrologic and Morphometric Data**

Tributary Drainage Area: 212.0 acre  
 Total Unit Runoff: 14 in.  
 Annual Runoff Volume: 247.3 acre-ft  
 Lake Surface Area <As>: 33 acre  
 Lake Volume <V>: 237 acre-ft  
 Lake Mean Depth <z>: 7.2 ft  
 Precipitation - Evaporation: 5.5 in.  
 Hydraulic Loading: 159162.2 acre-ft/year  
 Areal Water Load <qs>: 4823.1 ft/year  
 Lake Flushing Rate <p>: 671.57 1/year  
 Water Residence Time: 0.00 year  
 Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>  
 Observed growing season mean phosphorus (GSM): 23.2 mg/m<sup>3</sup>  
 % NPS Change: 0%  
 % PS Change: 0%

**NON-POINT SOURCE DATA**

Land Use	Acre (ac)	Low Loading (kg/ha-year)	Most Likely Loading (kg/ha-year)	High Loading (kg/ha-year)	Loading %	Low Loading (kg/year)	Most Likely Loading (kg/year)	High 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	47	0.10	0.30	0.50	0.2	2	6	10
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)	2	0.05	0.10	0.25	0.0	0	0	0
Wetlands	82	0.10	0.10	0.10	0.1	3	3	3
Forest	81	0.05	0.09	0.18	0.1	2	3	6
Lake Surface	33.0	0.10	0.30	1.00	0.1	1	4	13

**POINT SOURCE DATA**

Point Sources	Water Load (m <sup>3</sup> /year)	Low Loading (kg/year)	Most Likely Loading (kg/year)	High Loading (kg/year)	Loading %
Sturgeon Lake Subwatershed	196000000	0.0	3560.1	0.0	99.6

**SEPTIC TANK DATA**

Description	Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)	0.3	0.5	0.8	
# capita-years	0.0			
% Phosphorus Retained by Soil	98	90	80	
Septic Tank Loading (kg/year)	0.00	0.00	0.00	0.0

**TOTALS DATA**

<b>Description</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Loading %</b>
Total Loading (lb)	18.2	7884.0	71.2	100.0
Total Loading (kg)	8.2	3576.2	32.3	100.0
Areal Loading (lb/ac-year)	0.55	238.91	2.16	0.0
Areal Loading (mg/m <sup>2</sup> -year)	61.67	26778.45	241.77	0.0
Total PS Loading (lb)	0.0	7848.6	0.0	99.6
Total PS Loading (kg)	0.0	3560.1	0.0	99.6
Total NPS Loading (lb)	15.2	26.6	41.7	0.4
Total NPS Loading (kg)	6.9	12.1	18.9	0.4

**Phosphorus Prediction and Uncertainty Analysis Module**

Date: 12/26/2017 Scenario: 261

Observed spring overturn total phosphorus (SPO): 0.0 mg/m<sup>3</sup>Observed growing season mean phosphorus (GSM): 23.2 mg/m<sup>3</sup>Back calculation for SPO total phosphorus: 0.0 mg/m<sup>3</sup>Back calculation GSM phosphorus: 0.0 mg/m<sup>3</sup>

% Confidence Range: 70%

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

<b>Lake Phosphorus Model</b>	<b>Low</b>	<b>Most Likely</b>	<b>High</b>	<b>Predicted</b>	<b>% Dif.</b>
	Total P	Total P	Total P	-Observed	
	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	(mg/m <sup>3</sup> )	
Walker, 1987 Reservoir	0	18	0	-5	-22
Canfield-Bachmann, 1981 Natural Lake	0	18	0	-5	-22
Canfield-Bachmann, 1981 Artificial Lake	0	17	0	-6	-26
Rechow, 1979 General	0	15	0	-8	-34
Rechow, 1977 Anoxic	0	16	0	-7	-30
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	0	3	0	-20	-86
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	0	16	0	4	34
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	0	13	0	1	9
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxidic	0	18	0	-5	-22

Lake Phosphorus Model	Confidence		Parameter Fit?	Back Calculation (kg/year)	Model Type
	Lower Bound	Upper Bound			
Walker, 1987 Reservoir	6	31	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	52	L p	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	49	FIT	1	GSM
Rechow, 1979 General	5	26	qs	0	GSM
Rechow, 1977 Anoxic	5	27	P Pin	0	GSM
Rechow, 1977 water load<50m/year	N/A	N/A	N/A	N/A	N/A
Rechow, 1977 water load>50m/year	1	5	FIT	0	GSM
Walker, 1977 General	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Combined OECD	4	31	Tw	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	3	25	Tw	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxid	5	32	L qs	0	ANN

### Water and Nutrient Outflow Module

Date: 12/26/2017 Scenario: 235

Average Annual Surface Total Phosphorus: 23.2mg/m<sup>3</sup>

Annual Discharge: 1.59E+005 AF => 1.96E+008 m<sup>3</sup>

Annual Outflow Loading: 9583.6 LB => 4347.1 kg