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APPENDIX D

Watershed Analysis WiLMS Results

Date: 3/6/2017 Scenario: Emmons Creek Current

Lake Id: Emmons Creek
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 16760.0 acre
Total Unit Runoff: 10.5 in.
Annual Runoff Volume: 14665.0 acre-ft
Lake Surface Area <As>: 0.0 acre
Lake Volume <V>: 0.0 acre-ft
Lake Mean Depth <z>: 0.00 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 14665.0 acre-ft/year
Areal Water Load <qs>: 0.00 ft/year
Lake Flushing Rate <p>: 0.00 1/year
Water Residence Time: 0.00 year
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 21.8 mg/m^3
% 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	6206	0.50	1.00	3.00	81.1	1256	2512	7535
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	2313	0.10	0.30	0.50	9.1	94	281	468
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)	82	0.05	0.10	0.25	0.1	2	3	8
Wetlands	1100	0.10	0.10	0.10	1.4	45	45	45
Forest	7058	0.05	0.09	0.18	8.3	143	257	514
Lake Surface	0.0	0.10	0.30	1.00	0.0	0	0	0

POINT SOURCE DATA

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

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

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	3391.8	6828.8	18893.5	100.0
Total Loading (kg)	1538.5	3097.5	8570.0	100.0
Areal Loading (lb/ac-year)	0.0	0.0	0.0	0.0
Areal Loading (mg/m^2-year)	0.0	0.0	0.0	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)	3391.8	6828.8	18893.5	100.0
Total NPS Loading (kg)	1538.5	3097.5	8570.0	100.0

Water and Nutrient Outflow Module

Date: 3/6/2017 Scenario: 61
Average Annual Surface Total Phosphorus: 21.8mg/m^3
Annual Discharge: 1.47E+004 AF => 1.81E+007 m^3
Annual Outflow Loading: 831.6 LB => 377.2 kg

Date: 3/2/2017 Scenario: Hartman Creek Current

Lake Id: Hartman Creek
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 5256.0 acre
Total Unit Runoff: 10.50 in.
Annual Runoff Volume: 4599.0 acre-ft
Lake Surface Area <As>: 0.0 acre
Lake Volume <V>: 0.0 acre-ft
Lake Mean Depth <z>: 0.00 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 4599.0 acre-ft/year
Areal Water Load <qs>: 0.00 ft/year
Lake Flushing Rate <p>: 0.00 1/year
Water Residence Time: 0.00 year
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 21.8 mg/m^3
% 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	1240.0	0.50	1.00	3.00	73.2	251	502	1505
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	415.0	0.10	0.30	0.50	7.3	17	50	84
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	0.30	0.50	0.80	0.1	0	0	1
Rural Res (>1 Ac)	52.0	0.05	0.10	0.25	0.3	1	2	5
Wetlands	490.0	0.10	0.10	0.10	2.9	20	20	20
Forest	3057.0	0.05	0.09	0.18	16.2	62	111	223
Lake Surface	0.0	0.10	0.30	1.00	0.0	0	0	0

POINT SOURCE DATA

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

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)	773.1	1512.1	4051.8	100.0
Total Loading (kg)	350.7	685.9	1837.9	100.0
Areal Loading (lb/ac-year)	0.00	0.00	0.00	
Areal Loading (mg/m^2-year)	0.00	0.00	0.00	
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)	773.1	1512.1	4051.8	100.0
Total NPS Loading (kg)	350.7	685.9	1837.9	100.0

Water and Nutrient Outflow Module

Date: 3/2/2017 Scenario: 60
Average Annual Surface Total Phosphorus: 21.8mg/m^3
Annual Discharge: 4.60E+003 AF => 5.67E+006 m^3
Annual Outflow Loading: 260.6 LB => 118.2 kg

Date: 3/6/2017 Scenario: Northeast Lower Chain Current

Lake Id: Northeast Lower Chain
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 730.0 acre
Total Unit Runoff: 10.5 in.
Annual Runoff Volume: 638.8 acre-ft
Lake Surface Area <As>: 431 acre
Lake Volume <V>: 11596 acre-ft
Lake Mean Depth <z>: 26.9 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 775.2 acre-ft/year
Areal Water Load <qs>: 1.8 ft/year
Lake Flushing Rate <p>: 0.07 1/year
Water Residence Time: 14.96 year
Observed spring overturn total phosphorus (SPO): 13 mg/m^3
Observed growing season mean phosphorus (GSM): 7.5 mg/m^3
% 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	171	0.50	1.00	3.00	44.2	35	69	208
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	107	0.10	0.30	0.50	8.3	4	13	22
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	26	0.30	0.50	0.80	3.4	3	5	8
Rural Res (>1 Ac)	100	0.05	0.10	0.25	2.6	2	4	10
Wetlands	182	0.10	0.10	0.10	4.7	7	7	7
Forest	144	0.05	0.09	0.18	3.4	3	5	10
Lake Surface	431.0	0.10	0.30	1.00	33.4	17	52	174

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	0.0				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	158.4	344.9	970.2	100.0
Total Loading (kg)	71.8	156.4	440.1	100.0
Areal Loading (lb/ac-year)	0.37	0.80	2.25	0.0
Areal Loading (mg/m^2-year)	41.18	89.69	252.31	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)	119.9	229.5	585.7	100.0
Total NPS Loading (kg)	54.4	104.1	265.7	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/6/2017 Scenario: 90
Observed spring overturn total phosphorus (SPO): 13.0 mg/m^3
Observed growing season mean phosphorus (GSM): 7.5 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg 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	16	36	100	29	387
Canfield-Bachmann, 1981 Natural Lake	12	20	36	13	173
Canfield-Bachmann, 1981 Artificial Lake	14	21	33	14	187
Rechow, 1979 General	3	7	21	-1	-13
Rechow, 1977 Anoxic	20	45	125	38	507
Rechow, 1977 water load<50m/year	5	10	29	3	40
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	20	43	121	30	231
Vollenweider, 1982 Combined OECD	15	28	65	18	176
Dillon-Rigler-Kirchner	17	38	107	25	192
Vollenweider, 1982 Shallow Lake/Res.	11	22	56	12	117
Larsen-Mercier, 1976	15	34	95	21	162
Nurnberg, 1984 Oxic	14	31	88	24	320

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	20	77	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	58	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	7	60	FIT	1	GSM
Rechow, 1979 General	4	16	qs	0	GSM
Rechow, 1977 Anoxic	26	96	FIT	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	21	97	FIT	0	SPO
Vollenweider, 1982 Combined OECD	13	57	FIT	0	ANN
Dillon-Rigler-Kirchner	22	82	P L qs p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	11	47	FIT	0	ANN
Larsen-Mercier, 1976	20	72	P Pin	0	SPO
Nurnberg, 1984 Oxic	16	69	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/6/2017 Scenario: 63
Average Annual Surface Total Phosphorus: 7.5mg/m^3
Annual Discharge: 7.75E+002 AF => 9.56E+005 m^3
Annual Outflow Loading: 15.2 LB => 6.9 kg

Date: 3/6/2017 Scenario: East Lower Chain Current

Lake Id: East Lower Chain
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 114.0 acre
Total Unit Runoff: 10.5 in.
Annual Runoff Volume: 99.8 acre-ft
Lake Surface Area <As>: 74 acre
Lake Volume <V>: 1259 acre-ft
Lake Mean Depth <z>: 17.0 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 123.2 acre-ft/year
Areal Water Load <qs>: 1.7 ft/year
Lake Flushing Rate <p>: 0.10 1/year
Water Residence Time: 10.22 year
Observed spring overturn total phosphorus (SPO): 12.2 mg/m^3
Observed growing season mean phosphorus (GSM): 10.3 mg/m^3
% 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	23	0.10	0.30	0.50	18.2	1	3	5
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)	7	0.05	0.10	0.25	1.8	0	0	1
Wetlands	62	0.10	0.10	0.10	16.3	3	3	3
Forest	22	0.05	0.09	0.18	5.2	0	1	2
Lake Surface	74.0	0.10	0.30	1.00	58.5	3	9	30

POINT SOURCE DATA

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

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

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	15.5	33.9	86.9	100.0
Total Loading (kg)	7.0	15.4	39.4	100.0
Areal Loading (lb/ac-year)	0.21	0.46	1.17	0.0
Areal Loading (mg/m^2-year)	23.45	51.33	131.64	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)	8.9	14.1	20.9	100.0
Total NPS Loading (kg)	4.0	6.4	9.5	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/6/2017 Scenario: 89
Observed spring overturn total phosphorus (SPO): 12.2 mg/m^3
Observed growing season mean phosphorus (GSM): 10.3 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg 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	15	33	84	23	223
Canfield-Bachmann, 1981 Natural Lake	11	18	31	8	78
Canfield-Bachmann, 1981 Artificial Lake	12	18	29	8	78
Rechow, 1979 General	2	4	11	-6	-58
Rechow, 1977 Anoxic	16	35	90	25	243
Rechow, 1977 water load<50m/year	4	8	20	-2	-19
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	14	30	77	18	148
Vollenweider, 1982 Combined OECD	11	21	46	10	89
Dillon-Rigler-Kirchner	11	23	60	11	90
Vollenweider, 1982 Shallow Lake/Res.	8	17	38	6	53
Larsen-Mercier, 1976	11	24	62	12	98
Nurnberg, 1984 Oxic	9	19	49	9	87

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	19	66	Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	6	52	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	6	52	FIT	1	GSM
Rechow, 1979 General	2	9	L qs	0	GSM
Rechow, 1977 Anoxic	20	70	FIT	0	GSM
Rechow, 1977 water load<50m/year	5	16	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	15	64	FIT	0	SPO
Vollenweider, 1982 Combined OECD	10	42	FIT	0	ANN
Dillon-Rigler-Kirchner	13	47	P L qs p	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	8	34	FIT	0	ANN
Larsen-Mercier, 1976	14	48	P Pin	0	SPO
Nurnberg, 1984 Oxic	10	40	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/6/2017 Scenario: 62
Average Annual Surface Total Phosphorus: 10.3mg/m^3
Annual Discharge: 1.23E+002 AF => 1.52E+005 m^3
Annual Outflow Loading: 3.3 LB => 1.5 kg

Date: 3/7/2017 Scenario: Mid Lower Chain Current

Lake Id: Mid Lower Chain
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 54.0 acre
Total Unit Runoff: 10.50 in.
Annual Runoff Volume: 47.3 acre-ft
Lake Surface Area <As>: 84.0 acre
Lake Volume <V>: 2032.0 acre-ft
Lake Mean Depth <z>: 24.2 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 1870.4 acre-ft/year
Areal Water Load <qs>: 22.3 ft/year
Lake Flushing Rate <p>: 0.92 1/year
Water Residence Time: 1.09 year
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 13.0 mg/m^3
% 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	5.0	0.50	1.00	3.00	6.3	1	2	6
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	8.0	0.10	0.30	0.50	3.0	0	1	2
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	0.30	0.50	0.80	1.3	0	0	1
Rural Res (>1 Ac)	4.0	0.05	0.10	0.25	0.5	0	0	0
Wetlands	29.0	0.10	0.10	0.10	3.7	1	1	1
Forest	6.0	0.05	0.09	0.18	0.7	0	0	0
Lake Surface	84.0	0.10	0.30	1.00	31.7	3	10	34

POINT SOURCE DATA

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m^3/year)	(kg/year)	(kg/year)	(kg/year)	
NE Upper Chain Subwatershed	1911999.0	0.0	14.0	0.0	43.5
East Lower Chain Subwatershed	303999.0	0.0	3	0.0	9.3

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)	14.0	70.9	97.8	100.0
Total Loading (kg)	6.4	32.2	44.3	100.0
Areal Loading (lb/ac-year)	0.17	0.84	1.16	
Areal Loading (mg/m^2-year)	18.69	94.58	130.46	
Total PS Loading (lb)	0.0	37.5	0.0	52.9
Total PS Loading (kg)	0.0	17.0	0.0	52.9
Total NPS Loading (lb)	6.5	10.9	22.8	47.1
Total NPS Loading (kg)	3.0	5.0	10.4	47.1

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/7/2017 Scenario: 92
Observed spring overturn total phosphorus (SPO): 0.0 mg/m^3
Observed growing season mean phosphorus (GSM): 13.0 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg 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	2	9	12	-4	-31
Canfield-Bachmann, 1981 Natural Lake	2	9	12	-4	-31
Canfield-Bachmann, 1981 Artificial Lake	2	9	11	-4	-31
Rechow, 1979 General	1	5	7	-8	-62
Rechow, 1977 Anoxic	2	11	15	-2	-15
Rechow, 1977 water load<50m/year	1	6	8	-7	-54
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	2	7	10	1	15
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	1	6	7	-1	-15
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxic	1	6	8	-7	-54

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	4	13	Pin	0	GSM
Canfield-Bachmann, 1981 Natural Lake	3	26	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	3	26	FIT	1	GSM
Rechow, 1979 General	2	7	FIT	0	GSM
Rechow, 1977 Anoxic	5	15	P Pin	0	GSM
Rechow, 1977 water load<50m/year	2	9	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	3	12	FIT	0	ANN
Dillon-Rigler-Kirchner	N/A	N/A	N/A	N/A	N/A
Vollenweider, 1982 Shallow Lake/Res.	2	10	FIT	0	ANN
Larsen-Mercier, 1976	N/A	N/A	N/A	N/A	N/A
Nurnberg, 1984 Oxic	2	9	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/7/2017 Scenario: 65
Average Annual Surface Total Phosphorus: 13mg/m^3
Annual Discharge: 1.87E+003 AF => 2.31E+006 m^3
Annual Outflow Loading: 63.3 LB => 28.7 kg

Date: 3/9/2017 Scenario: Upper Chain & Southwest Lower Chain Current

Lake Id: Upper Chain & Southwest Lower Chain
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 550.0 acre
Total Unit Runoff: 10.50 in.
Annual Runoff Volume: 481.3 acre-ft
Lake Surface Area <As>: 189.0 acre
Lake Volume <V>: 4827.0 acre-ft
Lake Mean Depth <z>: 25.5 ft
Precipitation - Evaporation: 3.8 in.
Hydraulic Loading: 28169.2 acre-ft/year
Areal Water Load <qs>: 149.0 ft/year
Lake Flushing Rate <p>: 5.84 1/year
Water Residence Time: 0.17 year
Observed spring overturn total phosphorus (SPO): 15.1 mg/m^3
Observed growing season mean phosphorus (GSM): 12.9 mg/m^3
% 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	20	0.50	1.00	3.00	1.1	4	8	24
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	57	0.10	0.30	0.50	0.9	2	7	12
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)	11	0.05	0.10	0.25	0.1	0	0	1
Wetlands	167	0.10	0.10	0.10	0.9	7	7	7
Forest	295	0.05	0.09	0.18	1.4	6	11	21
Lake Surface	189.0	0.10	0.30	1.00	3.0	8	23	76

POINT SOURCE DATA

Point Sources	Water Load	Low	Most Likely	High	Loading %
	(m^3/year)	(kg/year)	(kg/year)	(kg/year)	
Mid Lower Chain Subwatershed	1911999.0	0.0	14.0	0.0	1.8
Hartman Creek Subwatershed	1.2E+007	0.0	254.0	0.0	33.4
Emmons Creek Subwatershed	2.0E+007	0.0	436.0	0.0	57.4

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)	59.4	1675.3	312.3	100.0
Total Loading (kg)	27.0	759.9	141.7	100.0
Areal Loading (lb/ac-year)	0.31	8.86	1.65	
Areal Loading (mg/m^2-year)	35.24	993.53	185.22	
Total PS Loading (lb)	0.0	1552.0	0.0	92.6
Total PS Loading (kg)	0.0	704.0	0.0	92.6
Total NPS Loading (lb)	42.6	72.7	143.7	7.4
Total NPS Loading (kg)	19.3	33.0	65.2	7.4

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/9/2017 Scenario: 95
Observed spring overturn total phosphorus (SPO): 15.1 mg/m^3
Observed growing season mean phosphorus (GSM): 12.9 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg 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	1	16	3	3	23
Canfield-Bachmann, 1981 Natural Lake	1	17	4	4	31
Canfield-Bachmann, 1981 Artificial Lake	1	16	4	3	23
Rechow, 1979 General	1	15	3	2	16
Rechow, 1977 Anoxic	1	19	4	6	47
Rechow, 1977 water load<50m/year	0	11	2	-2	-16
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	1	16	3	1	7
Vollenweider, 1982 Combined OECD	1	15	4	1	7
Dillon-Rigler-Kirchner	0	14	3	-1	-7
Vollenweider, 1982 Shallow Lake/Res.	1	11	3	-3	-21
Larsen-Mercier, 1976	1	15	3	0	0
Nurnberg, 1984 Oxic	1	17	3	4	31

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	6	26	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	5	49	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	5	46	FIT	1	GSM
Rechow, 1979 General	5	25	FIT	0	GSM
Rechow, 1977 Anoxic	7	30	Pin	0	GSM
Rechow, 1977 water load<50m/year	4	18	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	5	28	FIT	0	SPO
Vollenweider, 1982 Combined OECD	4	27	FIT	0	ANN
Dillon-Rigler-Kirchner	5	22	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	3	20	FIT	0	ANN
Larsen-Mercier, 1976	6	24	Pin	0	SPO
Nurnberg, 1984 Oxic	5	29	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/9/2017 Scenario: 68
Average Annual Surface Total Phosphorus: 12.9mg/m^3
Annual Discharge: 2.82E+004 AF => 3.47E+007 m^3
Annual Outflow Loading: 943.3 LB => 427.9 kg