Xcel Energy®
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1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

February 21, 2011

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Subject: **2010 Water Quality Monitoring Report For Big Falls Flowage (P-2390-01), Thornapple Flowage (P-2475) And Turtle-Flambeau Flowage (P-2390-02)**

Dear Secretary:

Enclosed are the results of the water quality monitoring that Northern States Power Company – Wisconsin (NSPW) conducted during the 2010 field season on the Big Falls and Thornapple Flowages. The samples were obtained after ice-out, in late July, and late August per the Federal Energy Regulatory Commission's license requirement to monitor long-term changes in water quality.

Also included in the report are the water quality sampling results for the Turtle-Flambeau Flowage (TFF) conducted by the Citizen's Self-help Lake Monitoring Program. The results of the TFF monitoring are being provided to you pursuant to Item J of the Water Quality Certificate of the Federal Energy Regulatory Commission's order amending the Big Falls license to include the Turtle-Flambeau Flowage.

The results for Big Falls and Thornapple are summarized for the past eight years. While there appears to be some variability in some of the parameters analyzed, for the most part, the results have been relatively consistent. The data collected in 2010 is consistent with data from the previous years' sampling. It should be noted that 2010 was characterized by significant precipitation and numerous runoff events throughout the year following several years of extreme drought.

The WDNR was provided 30 days to submit comments and to date no correspondence has been received. Should you have any questions regarding this report, feel free to contact Matthew Miller of this office at (715) 737-1353 or by electronic mail at matthew.j.miller@xcelenergy.com.

Sincerely,

William Zawacki
Director, Hydro Plants

Enclosure: Water Quality Monitoring Report

c: Mr. Jeff Scheirer (WDNR)

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1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

January 11, 2011

Mr. Jeff Scheirer
Wisconsin DNR
875 South 4th Avenue
Park Falls, WI 54552

Subject: **2010 Water Quality Monitoring Report For Big Falls Flowage (FERC Project #2390-01), Thornapple Flowage (FERC Project #2475) And Turtle-Flambeau Flowage (FERC Project 2390-02).**

Dear Mr. Scheirer:

Enclosed are the results of the water quality sampling that Northern States Power Company – Wisconsin (NSPW) conducted during the 2010 field season on Big Falls and Thornapple Flowages. The samples were taken after ice-out and in late July and August. The samples were acquired from the deepest point of the reservoirs immediately upstream from the boat restraining barriers. Northern Lake Service, Inc. of Crandon, WI performed the chlorophyll analysis and Xcel Energy's Chestnut Service Center performed the phosphorous analysis.

Also included in the report are the water quality sampling results for the Turtle-Flambeau Flowage (TFF) conducted by the Citizen's Self-help Lake Monitoring Program. The results of the TFF sampling are being provided to you pursuant to Item J of the Water Quality Certificate of the Federal Energy Regulatory Commission's order amending the Big Falls license to include the Turtle-Flambeau Flowage. The TFF results are also available on the WDNR's website.

The results for Big Falls and Thornapple are summarized for the past eight years. While there appears to be some variability in some of the parameters analyzed, for the most part, the results have been relatively consistent. The data collected in 2010 is consistent with data from the previous years' sampling. It should be noted that 2010 was characterized by significant precipitation and numerous runoff events throughout the summer and fall following several years of severe drought.

Please provide me with any comments that you might have by February 15, 2011 so that I may file the report with the Federal Energy Regulatory Commission. Should you have any questions concerning this report, feel free to contact me by telephone at (715) 737-1353 or by electronic mail at matthew.j.miller@xcelenergy.com.

Sincerely,

Matthew J. Miller

Matthew J. Miller
Hydro Licensing Specialist

Enclosure: 2010 Water Quality Monitoring Report

H:\References\All Plants\Water Quality Monitoring (BFS & THA)\Annual Reports\2011\20110111 Letter To DNR.doc

2010 Water Quality Monitoring Report for Big Falls Flowage (P-2390-01), Thornapple Flowage (P-2475) and Turtle Flambeau Flowage (P-2390-02)

Northern States Power Company – WI
An Xcel Energy Company

January 2011

Summary Of Total Phosphorous And Chlorophyll A

Data For The Big Falls And Thornapple Flowages

2003 - 2010

Summary of Water Quality Data for the Big Falls and Thornapple Flowages (2003 - 2010).

	Big Falls Flowage			Thornapple Flowage		
Date	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)
5/12/2003	0.03	0.7	0.03	0.04	0.5	0.04
7/28/2003	0.06	9.4	0.05	0.06	5.0	0.05
8/13/2003	0.03	5.9	0.06	0.07	10.7	0.06
5/5/2004	0.053	1.55	0.031	0.035	1.80	0.036
7/28/2004	0.037	3.10	0.084	0.050	4.60	0.049
8/25/2004	0.024	3.35	0.042	0.029	4.10	0.027
4/19/2005	0.050	0.50	0.057	0.055	0.70	0.051
7/25/2005	0.031	0.60	0.044	0.031	1.50	0.045
8/31/2005	0.020	1.50	0.092	0.029	2.75	0.030
4/26/2006	0.023	0.94	0.035	0.026	2.35	0.024
7/24/2006	0.029	0.50	0.099	0.035	4.03	0.041
8/23/2006	0.048	1.50	0.035	0.050	2.11	0.040
4/30/2007	0.028	1.95	0.067	0.039	4.50	0.033
7/31/2007	0.029	4.81	0.043	0.037	3.35	0.032
8/29/2007	0.052	4.45	0.027	0.049	2.93	0.033
4/30/2008	0.024	0.579	0.031	0.030	0.961	0.029
7/23/2008	0.032	2.80	0.043	0.041	11.0	0.051
8/26/2008	0.030	3.70	0.047	0.032	13.0	0.034
4/28/2009	0.030	5.5	0.033	0.040	11.0	0.033
7/28/2009	0.033	6.9	0.099	0.021	4.8	0.053
8/24/2009	0.021	5.0	0.032	0.023	3.6	0.075
4/28/2010	**0.025**	**4.2**	**0.048**	**0.029**	**7.2**	**0.016**
7/27/2010	**0.070**	**1.8**	**0.050**	**0.070**	**0.76**	**0.070**
8/31/2010	**0.050**	**3.8**	**0.060**	**0.010**	**0.69**	**0.060**
Average (Ice-out sample)	0.04	2.27	0.05	0.04	4.14	0.04
Average (July sample)	0.05	4.27	0.07	0.05	5.01	0.06
Average (August sample)	0.04	4.17	0.06	0.04	5.70	0.05

2010 Water Quality Laboratory Analysis

For The Big Falls And Thornapple Flowages

1518 Chestnut Avenue N
Minneapolis, MN 55403

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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Xcel Energy

Minneapolis Testing Laboratory Report

Report To: Hydro Operation
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFNP0410
Date of Report 5/25/2010

Sample Description: BOTTOM
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.:

LabWorks I.D. EG65236
Laboratory I.D.: 1081.25
Collection Date: 4/28/2010
Date Submitted: 4/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.048	mg/L P	CMK	0.001	EPA 365.3	5/4/2010

Comments related to sample number EG65236:

Xcel Energy

Minneapolis Testing Laboratory Report

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Fax: (612) 630-4367
Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Report To: Hydro Regulatory-WI
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFNP0410
Date of Report 5/25/2010

Sample Description: SURFACE
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.:

LabWorks I.D. EG65237
Laboratory I.D.: 1081.26
Collection Date: 4/28/2010
Date Submitted: 4/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	4.2	ug/L	NLS	0.5	SM 19th 10200 H	5/6/2010
Send Chlorophyll A	Completed		CMK			5/25/2010
Total Phosphorus	0.0252	mg/L P	CMK	0.001	EPA 365.3	5/4/2010

Comments related to sample number EG65237:

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Minneapolis, MN 55403

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Fax: (612) 630-4367
Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To:

Attention: ERAD- WI
Leroy Wilder
Matt Miller

Work Request # TANP0410
Date of Report 5/25/2010

Sample Description: BOTTOM
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.:

LabWorks I.D. EG65238
Laboratory I.D.: 1081.27
Collection Date: 4/28/2010
Date Submitted: 4/30/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.016	mg/L P	CMK	0.001	EPA 365.3	5/4/2010

Comments related to sample number EG65238:

Xcel Energy

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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To:

Attention: ERAD-WI
Leroy Wilder
Matt Miller

Work Request # TANP0410
Date of Report 5/25/2010

Sample Description: SURFACE
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.:

LabWorks I.D. EG65239
Laboratory I.D.: 1081.28
Collection Date: 4/28/2010
Date Submitted: 4/30/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	7.2	ug/L	NLS	0.5	SM 19th 10200 H	5/6/2010
Send Chlorophyll A	Completed		CMK			5/25/2010
Total Phosphorus	0.029	mg/L P	CMK	0.001	EPA 365.3	5/4/2010

Comments related to sample number EG65239:

Xcel Energy

Minneapolis Testing Laboratory Report

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Contact: Christine Keefe
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Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
Laboratory Supervisor
612-630-4506

Xcel Energy

Minneapolis Testing Laboratory Report

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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Report To: Hydro Operation
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0710
Date of Report 8/17/2010

Sample Description: BOTTOM
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209022

LabWorks I.D. EG73452
Laboratory I.D.: 1122.23
Collection Date: 7/27/2010
Date Submitted: 7/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.05	mg/L P	KLZ	0.01	EPA 365.3	8/3/2010

Comments related to sample number EG73452:

Xcel Energy

Minneapolis Testing Laboratory Report

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Minneapolis, MN 55403

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Fax: (612) 630-4367
Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Report To: Hydro Regulatory-WI
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # WIHY0710
Date of Report 8/17/2010

Sample Description: SURFACE
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209022

LabWorks I.D. EG73451
Laboratory I.D.: 1122.22
Collection Date: 7/27/2010
Date Submitted: 7/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	1.8	ug/L	NLAKES	0.5	SM 19th 10200 H	8/11/2010
Send Chlorophyll A	sent		CMK			7/29/2010
Total Phosphorus	0.07	mg/L P	KLZ	0.01	EPA 365.3	8/3/2010

Comments related to sample number EG73451:

Xcel Energy

Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
Minneapolis, MN 55403

Phone: (612)630-4506
Fax: (612) 630-4367
Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Report To:

Attention: ERAD- WI
Leroy Wilder
Matt Miller

Work Request # WIHY0710
Date of Report 8/17/2010

Sample Description: BOTTOM
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209022

LabWorks I.D. EG73454
Laboratory I.D.: 1122.25
Collection Date: 7/27/2010
Date Submitted: 7/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.07	mg/L P	KLZ	0.01	EPA 365.3	8/3/2010

Comments related to sample number EG73454:

Xcel Energy

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Phone: (612)630-4506
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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To:

Attention: ERAD-WI
Leroy Wilder
Matt Miller

Work Request # WIHY0710
Date of Report 8/17/2010

Sample Description: SURFACE
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209022

LabWorks I.D. EG73453
Laboratory I.D.: 1122.24
Collection Date: 7/27/2010
Date Submitted: 7/29/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	0.76	ug/L	NLAKES	0.5	SM 19th 10200 H	8/11/2010
Send Chlorophyll A	sent		CMK			7/29/2010
Total Phosphorus	0.07	mg/L P	KLZ	0.01	EPA 365.3	8/3/2010

Comments related to sample number EG73453:

Xcel Energy

Minneapolis Testing Laboratory Report

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Contact: Christine Keefe
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Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
Laboratory Supervisor
612-630-4506

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Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Operation
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFTA3Q10
Date of Report 9/20/2010

Sample Description: BOTTOM
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209118

LabWorks I.D. EG76892
Laboratory I.D.: 1129.12
Collection Date: 8/31/2010
Date Submitted: 9/2/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.06	mg/L P	KLZ	0.01	EPA 365.3	9/17/2010

Comments related to sample number EG76892:

Xcel Energy

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Minneapolis, MN 55403

Phone: (612)630-4506
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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Enviromental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFTA3Q10
Date of Report 9/20/2010

Sample Description: SURFACE
Location: BIG FALLS FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209118

LabWorks I.D. EG76891
Laboratory I.D.: 1129.11
Collection Date: 8/31/2010
Date Submitted: 9/2/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	3.8	ug/L	NLS	0.041	SM 19th 10200 H	9/7/2010
Send Chlorophyll A	Completed		MJM			8/31/2010
Total Phosphorus	0.05	mg/L P	KLZ	0.01	EPA 365.3	9/17/2010

Comments related to sample number EG76891:

Xcel Energy

Minneapolis Testing Laboratory Report

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Contact: Christine Keefe
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Lab Certification WI ID:999071150

Report To: Hydro Regulatory-WI
Environmental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFTA3Q10
Date of Report 9/20/2010

Sample Description: BOTTOM
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209118

LabWorks I.D. EG76894
Laboratory I.D.: 1129.14
Collection Date: 8/31/2010
Date Submitted: 9/2/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Total Phosphorus	0.06	mg/L P	KLZ	0.01	EPA 365.3	9/17/2010

Comments related to sample number EG76894:

Xcel Energy

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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

Minneapolis Testing Laboratory Report

Report To: Hydro Regulatory-WI
Environmental Services-WI

Attention: Matt Miller
Leroy Wilder

Work Request # BFTA3Q10
Date of Report 9/20/2010

Sample Description: SURFACE
Location: THORNAPPLE FLOWAGE
Customer Sample I.D.:
Chain of Custody #.: 209118

LabWorks I.D. EG76893
Laboratory I.D.: 1129.13
Collection Date: 8/31/2010
Date Submitted: 9/2/2010

Constituent	Result	Units	Analyst	Reporting Limit (RL)	Analytical Method	Analysis Start Date
Chlorophyll-a	0.69	ug/L	NLS	0.041	SM 19th 10200 H	9/7/2010
Send Chlorophyll A	Completed		MJM			8/31/2010
Total Phosphorus	0.01	mg/L P	KLZ	0.01	EPA 365.3	9/17/2010

Comments related to sample number EG76893:

Xcel Energy

Minneapolis Testing Laboratory Report

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Contact: Christine Keefe
Lab Certification MN ID: 027-053-197
Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
Laboratory Supervisor
612-630-4506

Summary Of Dissolved Oxygen And Temperature

Data For The Big Falls Flowage

2003 - 2010

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2003.

Date: 5/19/2003
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 37 ft.
Weather Conditions: cloudy, S wind, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	16.1	8.50
2.0	16.1	8.61
4.0	16.1	8.73
6.0	16.1	8.68
8.0	16.1	8.68
10.0	16.1	8.68
12.0	16.1	8.66
14.0	16.1	8.65
16.0	16.1	8.65
18.0	16.1	8.68
20.0	16.1	8.63
22.0	16.1	8.65
24.0	16.1	8.65
26.0	16.1	8.66
28.0	16.1	8.66
30.0	16.1	8.65
32.0	16.1	8.67
34.0	16.1	8.67
36.0	16.1	8.67
38.0	16.1	8.63

Date: 7/28/2003
Secchi Disk (ft.): 6
Depth of Bottom Sample: 11.5 m
Weather Conditions: clear, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.3	7.83
2.0	25.8	7.82
4.0	25.2	7.58
6.0	25.0	7.42
8.0	25.0	7.35
10.0	24.9	7.28
12.0	24.8	7.06
14.0	24.8	6.91
16.0	24.7	6.91
18.0	24.6	6.88
20.0	24.5	6.78
22.0	24.4	6.70
24.0	24.3	6.62
26.0	24.2	6.44
28.0	23.7	6.12
30.0	23.1	5.67
32.0	22.8	5.44
34.0	22.6	4.95
36.0	21.9	4.45
38.0	21.3	3.95

Date: 8/13/2003
Secchi Disk (ft.): 6
Depth of Bottom Sample: 11 m
Weather Conditions: sunny, calm, 80 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.9	8.30
2.0	25.6	8.33
4.0	25.0	8.39
6.0	24.8	7.96
8.0	24.6	7.19
10.0	24.4	6.86
12.0	24.3	6.71
14.0	24.2	6.58
16.0	24.1	6.44
18.0	23.9	6.16
20.0	23.9	6.03
22.0	23.8	6.23
24.0	23.8	6.20
26.0	23.7	5.83
28.0	23.5	5.81
30.0	23.5	5.78
32.0	23.5	5.75
34.0	23.4	5.18
36.0	22.9	3.55

Could not sample earlier due to excessively high river flows

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2004.

Date: 5/5/2004
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11.5 m
Weather Conditions: cloudy, S wind, 50 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.4	10.1
2.0	12.4	10.4
4.0	12.4	10.4
6.0	12.4	10.2
8.0	12.3	10.3
10.0	12.2	10.4
12.0	12.1	10.4
14.0	12.1	10.6
16.0	12.1	10.6
18.0	12.0	10.6
20.0	11.9	10.5
22.0	11.8	10.3
24.0	11.7	10.3
26.0	11.6	10.3
28.0	11.6	10.3
30.0	11.6	10.2
32.0	11.6	10.2
34.0	11.6	10.2
36.0	11.5	10.2
38.0	11.3	10.1
40.0	11.3	9.7

Date: 7/28/2004
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 12 m
Weather Conditions: clear, S wind, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.2	7.4
2.0	24.2	8.0
4.0	24.1	8.1
6.0	24.0	8.1
8.0	24.0	7.6
10.0	23.9	7.1
12.0	23.9	6.4
14.0	23.7	6.1
16.0	23.5	6.0
18.0	23.3	5.7
20.0	23.1	5.6
22.0	23.0	5.3
24.0	22.8	5.1
26.0	22.7	4.9
28.0	22.5	4.1
30.0	22.4	4.4
32.0	22.2	4.2
34.0	22.0	3.9
36.0	21.7	3.2
38.0	20.4	1.1

Date: 8/25/2004
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 37 ft.
Weather Conditions: cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.2	8.9
2.0	21.2	8.9
4.0	19.8	8.8
6.0	19.7	8.8
8.0	19.6	8.7
10.0	19.6	8.7
12.0	19.6	8.6
14.0	19.6	8.5
16.0	19.6	8.4
18.0	19.5	8.3
20.0	19.4	8.4
22.0	19.2	8.3
24.0	19.2	8.2
26.0	19.0	8.2
28.0	18.8	7.8
30.0	18.7	7.8
32.0	18.4	7.4
34.0	18.2	7.2
36.0	17.9	5.4
38.0	17.6	4.4

Could not sample earlier due to excessively high river flows

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2005.

Date: 4/19/2005
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11 m
Weather Conditions: prtly cldy, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.4	10.1
2.0	15.2	10.2
4.0	14.9	10.2
6.0	14.8	10.2
8.0	14.8	10.2
10.0	14.8	10.2
12.0	14.8	10.2
14.0	14.8	10.2
16.0	14.8	10.2
18.0	14.7	10.1
20.0	14.6	10.1
22.0	14.7	9.8
24.0	14.8	9.9
26.0	14.7	10.0
28.0	14.7	10.0
30.0	14.7	10.0
32.0	14.6	10.0
34.0	14.6	10.0
36.0	14.6	10.0
38.0	14.5	9.9
40.0	14.3	9.6

Date: 7/25/2005
Secchi Disk (ft.): 4
Depth of Bottom Sample: 12.5 m
Weather Conditions: cloudy, S wind, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.5	6.3
2.0	26.4	6.2
4.0	26.2	6.0
6.0	26.1	5.9
8.0	26.1	5.9
10.0	26.0	5.7
12.0	25.9	5.9
14.0	25.7	5.6
16.0	25.5	5.3
18.0	25.4	5.0
20.0	25.2	5.2
22.0	25.1	5.0
24.0	25.1	5.0
26.0	25.1	5.1
28.0	25.1	5.2
30.0	25.0	5.5
32.0	24.9	5.3
34.0	24.9	5.1
36.0	24.8	4.2
38.0	22.4	0.2

Date: 8/31/2005
Secchi Disk (ft.): 7
Depth of Bottom Sample: 37 ft.
Weather Conditions: Mstly sny, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.6	8.2
2.0	21.5	8.2
4.0	21.3	8.3
6.0	21.2	8.1
8.0	21.1	8.0
10.0	21.1	8.0
12.0	21.0	8.0
14.0	21.0	8.0
16.0	21.0	8.0
18.0	20.9	8.0
20.0	20.9	7.9
22.0	20.9	7.7
24.0	20.8	7.5
26.0	20.8	7.4
28.0	20.6	6.9
30.0	20.5	6.7
32.0	20.5	6.6
34.0	20.5	6.5
36.0	20.5	6.4
38.0	20.5	2.3

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2006.

Date: 4/26/2006
Secchi Disk (ft.): 4
Depth of Bottom Sample: 13 m
Weather Conditions: sunny, west wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.4	9.9
2.0	12.1	10.0
4.0	12.0	10.0
6.0	12.0	10.0
8.0	11.9	10.0
10.0	11.3	10.0
12.0	11.2	10.2
14.0	11.2	10.2
16.0	11.2	10.2
18.0	11.1	10.1
20.0	11.1	10.0
22.0	11.1	9.8
24.0	11.1	9.8
26.0	11.0	9.9
28.0	11.0	9.9
30.0	11.0	9.9
32.0	11.0	9.9
34.0	11.0	9.9
36.0	11.0	9.9
38.0	11.0	9.9
40.0	Bottom	Bottom

Date: 7/24/2006
Secchi Disk (ft.): 6
Depth of Bottom Sample: 15 m
Weather Conditions: Prtly cloudy, south wind at 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.9	7.6
2.0	25.4	7.5
4.0	25.2	7.3
6.0	25.1	7.2
8.0	25.0	6.9
10.0	24.9	6.8
12.0	24.8	6.4
14.0	24.7	6.1
16.0	24.5	5.8
18.0	24.5	5.6
20.0	24.2	6.1
22.0	24.0	6.4
24.0	24.0	6.4
26.0	23.9	6.3
28.0	23.8	6.3
30.0	23.8	6.2
32.0	23.8	5.9
34.0	23.7	5.5
36.0	21.8	0.6
38.0	Bottom	Bottom
40.0		

Date: 8/23/2006
Secchi Disk (ft.): 5
Depth of Bottom Sample: 38 ft.
Weather Conditions: Cloudy, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.3	8.3
2.0	23.3	8.3
4.0	23.1	8.2
6.0	23.1	8.1
8.0	23.1	8.1
10.0	23.1	8.1
12.0	23.1	8.0
14.0	23.0	7.9
16.0	22.9	7.5
18.0	22.8	7.1
20.0	22.7	7.0
22.0	22.7	7.0
24.0	22.5	6.8
26.0	22.3	6.3
28.0	22.2	6.0
30.0	22.1	5.8
32.0	22.1	5.8
34.0	22.0	5.6
36.0	22.0	5.3
38.0	22.0	5.1
40.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2007.

Date: 4/30/2007
Secchi Disk (ft.): 4
Depth of Bottom Sample: 12 m
Weather Conditions: Prtly cloudy, light wind

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.8	9.40
2.0	15.8	9.59
4.0	15.7	9.74
6.0	15.5	9.82
8.0	15.4	9.76
10.0	15.4	9.74
12.0	15.4	9.66
14.0	15.3	9.54
16.0	15.2	9.47
18.0	15.2	9.39
20.0	15.2	9.35
22.0	15.2	9.33
24.0	15.2	9.28
26.0	15.2	9.23
28.0	15.2	9.08
30.0	15.2	9.05
32.0	14.8	8.99
34.0	13.9	8.85
36.0	12.9	8.75
38.0	Bottom	Bottom
40.0		

Date: 7/31/2007
Secchi Disk (ft.): 7
Depth of Bottom Sample: 12 m
Weather Conditions: Mostly sunny, south wind at 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	28.1	7.43
2.0	27.8	7.46
4.0	27.4	7.41
6.0	27.3	7.30
8.0	27.2	7.28
10.0	27.1	6.82
12.0	27.0	6.68
14.0	26.9	6.47
16.0	26.8	6.26
18.0	26.8	6.08
20.0	26.6	5.45
22.0	26.4	5.18
24.0	26.3	5.15
26.0	26.0	4.85
28.0	25.8	4.78
30.0	25.5	4.27
32.0	25.4	4.00
34.0	24.0	0.43
36.0	Bottom	Bottom
38.0		
40.0		

Date: 8/29/2007
Secchi Disk (ft.): 6
Depth of Bottom Sample: 12 m
Weather Conditions: Mostly sunny N wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/Temperature profile was not taker due to equipment problems	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		
22.0		
24.0		
26.0		
28.0		
30.0		
32.0		
34.0		
36.0		
38.0		
40.0		

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2008.

Date: 4/30/2008
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 11 m
Weather Conditions: 50 F, sunny, south wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	5.8	11.8
2.0	5.9	11.8
4.0	5.7	11.9
6.0	5.7	11.9
8.0	5.7	11.9
10.0	5.7	11.9
12.0	5.7	11.9
14.0	5.7	11.9
16.0	5.7	11.9
18.0	5.7	11.9
20.0	5.7	11.9
22.0	5.7	11.9
24.0	5.7	11.9
26.0	5.7	11.9
28.0	5.7	11.9
30.0	5.7	11.9
32.0	5.7	11.9
34.0	5.7	11.8
36.0	5.7	11.8
38.0	5.7	6.0
40.0	Bottom	Bottom

Date: 7/23/2008
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 10 m
Weather Conditions: 73 F, sunny, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.7	7.60
2.0	24.4	7.58
4.0	24.2	7.58
6.0	24.1	7.50
8.0	24.0	7.36
10.0	23.9	7.31
12.0	23.8	7.27
14.0	23.7	7.27
16.0	23.7	7.19
18.0	23.7	7.09
20.0	23.5	6.95
22.0	23.5	6.84
24.0	23.5	6.75
26.0	23.3	6.06
28.0	23.3	6.05
30.0	23.2	5.61
32.0	23.1	5.34
34.0	23.1	4.82
36.0	Bottom	Bottom

Date: 8/26/2008
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11 m
Weather Conditions: 71 F, sunny, southe wind 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.7	7.04
2.0	22.5	6.95
4.0	22.3	6.91
6.0	22.3	6.77
8.0	22.3	6.31
10.0	22.2	6.39
12.0	21.9	6.71
14.0	21.8	6.82
16.0	21.8	6.93
18.0	21.7	6.91
20.0	21.7	6.80
22.0	21.6	6.80
24.0	21.6	6.82
26.0	21.6	6.91
28.0	21.6	6.91
30.0	21.5	6.82
32.0	21.5	6.81
34.0	21.4	6.83
36.0	21.4	6.71
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2009.

Date: 4/28/2009
Secchi Disk (ft.): 5.0
Depth of Bottom Sample (ft) 38
Weather Conditions: mostly sunny, wind NE @ 10
Temperature (F): 51

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	9.4	10.65
2.0	9.4	10.65
4.0	9.4	10.64
6.0	9.3	10.64
8.0	9.3	10.64
10.0	9.3	10.63
12.0	9.3	10.62
14.0	9.2	10.62
16.0	9.2	10.61
18.0	9.2	10.61
20.0	9.2	10.60
22.0	9.2	10.60
24.0	9.2	10.59
26.0	9.2	10.58
28.0	9.2	10.57
30.0	9.2	10.57
32.0	9.2	10.56
34.0	9.2	10.56
36.0	9.2	10.54
38.0	9.2	10.14
40.0	Bottom	Bottom

Date: 7/28/2009
Secchi Disk (ft.): 6.5
Depth of Bottom Sample (ft) 36
Weather Conditions: partly sunny, wind W @ 15
Temperature (F): 66

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.7	7.86
2.0	22.8	7.82
4.0	22.7	7.81
6.0	22.7	7.79
8.0	22.7	7.79
10.0	22.7	7.75
12.0	22.5	7.55
14.0	22.4	7.03
16.0	22.3	6.59
18.0	22.1	6.22
20.0	22.0	6.07
22.0	21.7	5.95
24.0	21.6	5.91
26.0	21.6	5.69
28.0	21.4	5.41
30.0	21.3	5.20
32.0	21.2	4.58
34.0	20.3	2.52
36.0	Bottom	Bottom

Date: 8/24/2009
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 36
Weather Conditions: sunny, wind S @ 10
Temperature (F): 80

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.0	8.61
2.0	20.8	8.70
4.0	20.0	8.55
6.0	19.9	8.38
8.0	19.7	7.69
10.0	19.5	7.26
12.0	19.3	7.29
14.0	19.2	7.51
16.0	19.0	7.71
18.0	18.8	8.33
20.0	18.7	8.19
22.0	18.7	8.22
24.0	18.7	8.19
26.0	18.7	8.17
28.0	18.5	7.95
30.0	18.5	7.93
32.0	18.5	7.92
34.0	18.5	7.84
36.0	18.4	7.48
38.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2010.

Date: 4/28/2010
Secchi Disk (ft.): 5.0
Depth of Bottom Sample (ft) 36
Weather Conditions: mostly sunny, light winds
Temperature (F): 50

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	14.8	10.79
2.0	14.2	10.52
4.0	14.1	10.41
6.0	14.0	10.23
8.0	14.0	10.10
10.0	13.9	10.04
12.0	13.8	9.94
14.0	13.8	9.87
16.0	13.7	9.85
18.0	13.4	9.70
20.0	13.2	9.63
22.0	13.1	9.52
24.0	13.1	9.57
26.0	13.0	9.53
28.0	13.0	9.44
30.0	13.0	9.33
32.0	13.0	9.20
34.0	13.0	9.19
36.0	12.9	9.12
38.0	Bottom	Bottom

Date: 7/27/2010
Secchi Disk (ft.): 3.0
Depth of Bottom Sample (ft) 36
Weather Conditions: cloudy, S wind @ 7
Temperature (F): 75

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.7	6.44
2.0	24.7	6.29
4.0	24.6	6.35
6.0	24.6	6.26
8.0	24.6	6.49
10.0	24.6	6.34
12.0	24.6	6.27
14.0	24.6	6.34
16.0	24.6	6.26
18.0	24.4	6.21
20.0	24.4	6.22
22.0	24.4	6.20
24.0	24.2	6.21
26.0	24.1	6.17
28.0	23.9	6.13
30.0	23.8	6.06
32.0	23.6	6.02
34.0	23.5	5.95
36.0	23.4	5.7
38.0	Bottom	Bottom

Date: 8/31/2010
Secchi Disk (ft.): 3.0
Depth of Bottom Sample: 36
Weather Conditions: partly cloudy, S wind @ 1(
Temperature (F): 79

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.2	6.70
2.0	24.2	6.68
4.0	24.2	6.68
6.0	24.2	6.67
8.0	24.2	6.66
10.0	24.2	6.66
12.0	24.2	6.66
14.0	24.2	6.66
16.0	24.1	6.63
18.0	24.0	6.60
20.0	24.0	6.59
22.0	24.0	6.60
24.0	24.0	6.60
26.0	24.0	6.58
28.0	24.0	6.60
30.0	24.0	6.59
32.0	23.9	6.59
34.0	23.9	6.55
36.0	23.8	6.34
38.0	Bottom	Bottom

Summary Of Dissolved Oxygen And Temperature

Data For The Thornapple Flowage

2003 - 2010

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2003.

Date:	5/19/2003
Secchi Disk (ft.):	4.5
Depth of Bottom Sample:	19 ft.
Weather Conditions:	cloudy, S wind, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.8	9.72
2.0	13.7	9.75
4.0	13.7	9.77
6.0	13.7	9.77
8.0	13.7	9.71
10.0	13.7	9.71
12.0	13.7	9.72
14.0	13.7	9.69
16.0	13.7	9.69
18.0	13.7	9.67
20.0	13.7	9.67

Could not sample earlier due to high river flows

Date:	7/28/2003
Secchi Disk (ft.):	6.5
Depth of Bottom Sample:	6 m
Weather Conditions:	clear, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.5	6.73
2.0	24.4	7.00
4.0	24.3	6.97
6.0	24.3	6.89
8.0	24.3	6.79
10.0	24.3	6.79
12.0	24.0	6.29
14.0	22.9	5.43
16.0	22.6	5.18
18.0	22.3	4.71
20.0	21.9	3.75

Date:	8/13/2003
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	clear, calm, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.5	8.73
2.0	24.3	8.78
4.0	24.2	8.68
6.0	24.0	8.00
8.0	23.7	7.55
10.0	23.4	5.95
12.0	23.4	5.79
14.0	23.2	6.03
16.0	23.0	4.68
18.0	22.5	2.62
20.0	22.1	1.34

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2004.

Date:	5/5/2004
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind, 60 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	10.0	10.1
2.0	10.0	10.3
4.0	10.0	10.4
6.0	10.0	10.6
8.0	10.0	10.6
10.0	9.9	10.6
12.0	9.9	10.6
14.0	9.9	10.6
16.0	9.8	10.6
18.0	9.8	10.6
20.0	9.8	10.3

Could not sample earlier due to high river flows

Date:	7/28/2004
Secchi Disk (ft.):	5
Depth of Bottom Sample:	19.5 ft
Weather Conditions:	partly sunny, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.2	7.6
2.0	23.2	7.6
4.0	22.6	7.1
6.0	22.1	6.5
8.0	21.9	6.2
10.0	21.9	6.2
12.0	21.8	6.2
14.0	21.3	5.8
16.0	21.1	6.2
18.0	20.4	2.4
20.0	19.2	0.9

Date:	8/25/2004
Secchi Disk (ft.):	5.5
Depth of Bottom Sample:	6 m
Weather Conditions:	overcast, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	20.4	9.4
2.0	20.3	9.2
4.0	20.2	9.0
6.0	20.1	8.8
8.0	19.9	8.4
10.0	19.8	8.4
12.0	19.5	8.0
14.0	19.4	7.9
16.0	19.4	7.9
18.0	19.3	7.7
20.0	18.6	5.9

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2005.

Date:	4/19/2005
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	cloudy, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	10.2	10.7
2.0	10.2	10.7
4.0	10.1	10.8
6.0	10.1	10.8
8.0	10.1	10.8
10.0	10.0	10.8
12.0	9.9	10.8
14.0	9.8	10.8
16.0	9.8	10.8
18.0	9.8	10.8
20.0	9.8	10.8

Date:	7/25/2005
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	Cldy, S wind, 82 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.4	7.4
2.0	25.0	7.0
4.0	24.7	6.7
6.0	24.5	6.4
8.0	24.4	6.0
10.0	23.8	5.2
12.0	23.5	5.3
14.0	23.3	4.8
16.0	23.2	4.6
18.0	22.3	0.8
20.0		

Date:	8/31/2005
Secchi Disk (ft.):	5.5
Depth of Bottom Sample:	6 m
Weather Conditions:	Sunny, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.4	8.1
2.0	21.9	7.9
4.0	21.5	7.7
6.0	21.4	7.4
8.0	21.3	7.4
10.0	21.3	7.4
12.0	21.3	7.3
14.0	21.2	7.3
16.0	21.2	7.2
18.0	21.2	7.2
20.0	21.2	7.1

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2006.

Date:	4/26/2006
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	sunny, W wind @15 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.9	10.1
2.0	13.9	10.2
4.0	13.7	10.2
6.0	13.3	10.1
8.0	13.0	10.0
10.0	12.4	9.9
12.0	12.3	9.8
14.0	12.3	9.7
16.0	12.3	9.7
18.0	12.3	9.7
20.0	12.3	9.5
22.0	Bottom	Bottom

Date:	7/24/2006
Secchi Disk (ft.):	6
Depth of Bottom Sample:	5 m
Weather Conditions:	Mstly sunny, S wind@10mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.1	7.6
2.0	24.6	7.4
4.0	24.3	7.2
6.0	24.0	6.8
8.0	23.8	6.7
10.0	23.6	6.4
12.0	23.5	6.2
14.0	22.8	5.0
16.0	19.7	0.3
18.0	Bottom	Bottom

Date:	8/23/2006
Secchi Disk (ft.):	4
Depth of Bottom Sample:	6 m
Weather Conditions:	Cloudy, S wind@5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.3	9.6
2.0	24.1	9.4
4.0	23.6	8.6
6.0	23.3	7.9
8.0	23.3	7.8
10.0	23.2	7.6
12.0	23.2	7.4
14.0	23.1	7.0
16.0	23.0	6.7
18.0	22.9	5.6
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2007.

Date:	4/30/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	cldy, S wind @10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.3	11.26
2.0	14.7	11.27
4.0	14.4	11.33
6.0	14.3	11.32
8.0	14.3	11.28
10.0	14.1	11.28
12.0	14.0	11.20
14.0	13.9	11.13
16.0	13.8	10.90
18.0	13.1	10.43
20.0	Bottom	Bottom
22.0		

Date:	7/31/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	Sunny, S wind@5mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.1	8.50
2.0	26.7	8.31
4.0	25.9	7.54
6.0	25.8	7.35
8.0	25.8	7.27
10.0	25.7	7.22
12.0	25.7	7.04
14.0	25.5	6.81
16.0	25.5	6.79
18.0	25.1	6.27
20.0	24.7	5.78
22.0	Bottom	Bottom

Date:	8/29/2007
Secchi Disk (ft.):	5
Depth of Bottom Sample:	6 m
Weather Conditions:	Mstly sny, S wind@5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0	DO/Temperatures profiles were not taken	
4.0	due to equipment malfunction	
6.0		
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2008.

Date:	4/30/2008
Secchi Disk (ft.):	4
Depth of Bottom Sample:	NA
Weather Conditions:	55 F, sunny, south wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/temperature profile not taken	
8.0	due to problems with DO meter	
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		
22.0		

Date:	7/23/2008
Secchi Disk (ft.):	5
Depth of Bottom Sample:	5.5 m
Weather Conditions:	78 F, partly cloudy, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.1	7.56
2.0	24.7	7.43
4.0	24.2	7.27
6.0	23.5	6.95
8.0	23.1	6.70
10.0	23.1	6.70
12.0	22.9	6.46
14.0	22.4	5.48
16.0	21.8	4.36
18.0	21.6	4.12
20.0	Bottom	Bottom
22.0		

Date:	8/26/2008
Secchi Disk (ft.):	5
Depth of Bottom Sample:	5 m
Weather Conditions:	76 F, sunny, southeast wind @ 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.3	9.64
2.0	22.0	9.46
4.0	21.8	9.25
6.0	21.6	8.99
8.0	21.5	8.82
10.0	21.4	8.73
12.0	21.4	8.70
14.0	21.3	8.65
16.0	21.3	8.62
18.0	21.3	8.60
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for Thornapple Flowage in 2009.

Date:	4/28/2009
Secchi Disk (ft.):	5.5
Depth of Bottom Sample (ft):	20
Weather Conditions:	mostly sunny, wind NE @ 10
Temperature (F):	57

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	8.3	10.90
2.0	8.3	10.95
4.0	8.2	10.96
6.0	8.2	10.93
8.0	8.2	10.93
10.0	8.2	10.94
12.0	8.2	10.92
14.0	8.2	10.91
16.0	8.2	10.90
18.0	8.1	10.90
20.0	8.1	10.86
22.0	Bottom	Bottom

Date:	7/28/2009
Secchi Disk (ft.):	7
Depth of Bottom Sample (ft)	18
Weather Conditions:	cloudy, wind W @ 5
Temperature (F):	67

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.4	8.65
2.0	22.3	8.42
4.0	21.8	7.18
6.0	21.4	6.78
8.0	21.1	6.16
10.0	21.0	5.97
12.0	20.7	6.16
14.0	18.1	3.71
16.0	17.0	1.45
18.0	15.7	0.00
20.0	Bottom	Bottom

Date:	8/24/2009
Secchi Disk (ft.):	6.5
Depth of Bottom Sample (ft	18
Weather Conditions:	sunny, wind S @ 10-15
Temperature (F):	77

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.1	9.95
2.0	20.9	9.79
4.0	20.6	9.41
6.0	20.1	8.76
8.0	19.7	8.68
10.0	19.6	8.86
12.0	19.5	8.27
14.0	19.2	6.89
16.0	19.1	6.65
18.0	18.6	5.23
20.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for Thornapple Flowage in 2010.

Date:	4/28/2010
Secchi Disk (ft.):	5.0
Depth of Bottom Sample (ft):	20
Weather Conditions:	p. cloudy, S winds 5-10
Temperature (F):	59

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.8	11.90
2.0	13.7	11.74
4.0	12.6	11.83
6.0	12.4	11.70
8.0	12.3	12.02
10.0	12.2	12.01
12.0	11.8	10.50
14.0	11.5	10.63
16.0	11.2	10.44
18.0	11.2	10.37
20.0	11.2	10.25

Date:	7/27/2010
Secchi Disk (ft.):	3
Depth of Bottom Sample (ft)	20
Weather Conditions:	p. cloudy, S wind @ 5
Temperature (F):	84

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.4	4.46
2.0	25.0	4.44
4.0	24.6	4.37
6.0	24.5	4.38
8.0	24.5	4.37
10.0	24.5	4.30
12.0	24.3	4.23
14.0	24.3	4.23
16.0	24.2	4.35
18.0	24.2	4.37
20.0	24.2	4.3
22.0	Bottom	Bottom

Date:	8/31/2010
Secchi Disk (ft.):	3
Depth of Bottom Sample (ft	20
Weather Conditions:	cloudy, S wind @ 10
Temperature (F):	81

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.0	5.82
2.0	22.8	5.75
4.0	22.8	5.74
6.0	22.7	5.71
8.0	22.6	5.71
10.0	22.6	5.71
12.0	22.6	5.71
14.0	22.6	5.71
16.0	22.6	5.70
18.0	22.6	5.70
20.0	22.6	5.7
22.0	Bottom	Bottom

2010 Water Quality Fieldwork Data Sheets For

The Big Falls And Thornapple Flowages

Water Quality Sampling - Big Falls Flowage

Date: 4-28-10
Temperature: 50°
Weather Conditions: M. SUNNY - LIGHT WINDS
Depth of Bottom Sample: 38 FT
Secchi Disk Reading: 5 FT.

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	14.8	10.79
2	14.2	10.52
4	14.1	10.41
6	14.0	10.23
8	14.0	10.10
10	13.9	10.04
12	13.8	9.94
14	13.8	9.87
16	13.7	9.85
18	13.4	9.70
20	13.2	9.63
22	13.1	9.52
24	13.1	9.57
26	13.0	9.53
28	13.0	9.44
30	13.0	9.33
32	13.0	9.20
34	13.0	9.19
36	12.9	9.12
38	BOTTOM	BOTTOM
40		
42		
44		
46		

Remarks: - NO NAVIGATION HAZARDS
- NEAR RECORD LOW RIVER FLOWS
- 1 MATURE EAGLE ON NEST
- HEARD 1 LOON

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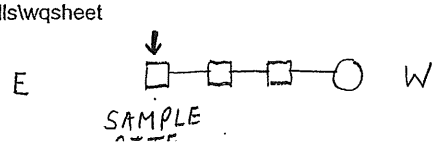

Water Quality Sampling - Thornapple Flowage

Date: 4-28-10
Temperature: 59°
Weather Conditions: P. CLOUDY, S WIND @ 5-10
Depth of Bottom Sample: 20 FT
Secchi Disk Reading: 5FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	13.8	11.90
2	13.7	11.74
4	12.6	11.83
6	12.4	11.70
8	12.3	12.02
10	12.2	12.01
12	11.8	10.50
14	11.5	10.63
16	11.2	10.44
18	11.2	10.37
20	11.2	10.25
22	BOTTOM	BOTTOM
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: - NO NAVIGATION HAZARDS
- NEAR RECORD LOW RIVER LEVELS
- 1 MATURE EAGLE ON NEST

Water Quality Sampling - Big Falls Flowage

Date: 7-27-10
Temperature: 75° F
Weather Conditions: Cloudy, S Wind 7 mph
Depth of Bottom Sample: 36 FT.
Secchi Disk Reading: 3.0

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	24.7	6.44
2	24.7	6.29
4	24.6	6.35
6	24.6	6.26
8	24.6	6.49
10	24.6	6.34
12	24.6	6.27
14	24.6	6.34
16	24.6	6.26
18	24.4	6.21
20	24.4	6.22
22	24.4	6.20
24	24.2	6.21
26	24.1	6.17
28	23.9	6.13
30	23.8	6.06
32	23.6	6.02
34	23.5	5.95
36	23.4	5.73
38	Bottom	Bottom
40		
42		
44		
46		

Remarks:
Surface samples 11:10
Bottom sample 11:15
- NO NAVIGATION HAZARDS

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- SPOTTED 1 MATURE EAGLE PERCHED ON ISLAND NEAR NEST
- DISCHARGE ≈ 1350 CFS

Water Quality Sampling - Thornapple Flowage

Date: 7-27-10
Temperature: 84° F
Weather Conditions: P. Cloudy, Wind S 5 mph
Depth of Bottom Sample: 20 FT
Secchi Disk Reading: 3 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	25.4	4.46
2	25.0	4.44
4	24.6	4.37
6	24.5	4.38
8	24.5	4.37
10	24.5	4.30
12	24.3	4.23
14	24.3	4.23
16	24.2	4.35
18	24.2	4.37
20	24.2	4.34
22	BOTTOM	BOTTOM
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: NO NAVIGATION HAZARDS
SAMPLES TAKEN @ 3RD BUOY FROM WEST
- DISCHARGE ≈ 1400 CFS
- SAMPLE TAKEN @ 3RD BUOY FROM WEST

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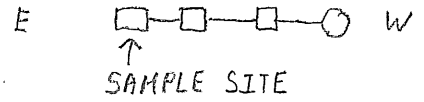

Water Quality Sampling - Big Falls Flowage

Date: 8-31-10
Temperature: 79°
Weather Conditions: P. CLOUDY, S WIND @ 10
Depth of Bottom Sample: 38' @ 0950 HRS
Secchi Disk Reading: 3'

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/L)
Surface	24.2	6.70
2	24.2	6.68
4	24.2	6.68
6	24.2	6.67
8	24.2	6.66
10	24.2	6.66
12	24.2	6.66
14	24.2	6.66
16	24.1	6.63
18	24.0	6.60
20	24.0	6.59
22	24.0	6.60
24	24.0	6.60
26	24.0	6.58
28	24.0	6.60
30	24.0	6.59
32	23.9	6.59
34	23.9	6.55
36	23.8	6.34
38	BOTTOM	BOTTOM
40		
42		
44		
46		

Remarks: - BOTH SURFACE SAMPLES COLLECTED @ 0952 HRS
- NO NAVIGATION HAZARDS
- DISCHARGE @ BIG FALLS =
- EAGLE (MATURE) PERCHED NEAR NEST
* 2ND NEST PRESENT

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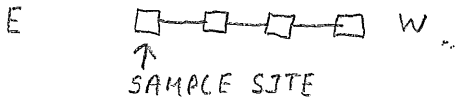


Water Quality Sampling - Thornapple Flowage

Date: 8-31-10
Temperature: 81
Weather Conditions: CLOUDY, S WIND @ 10
Depth of Bottom Sample: 22'
Secchi Disk Reading: 3'

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	23.0	5.82
2	22.8	5.75
4	22.8	5.74
6	22.7	5.71
8	22.6	5.71
10	22.6	5.71
12	22.6	5.71
14	22.6	5.71
16	22.6	5.70
18	22.6	5.70
20	22.6	5.70
22	BOTTOM	BOTTOM
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: - 2 NAVIGATION HAZARDS DOWNSTREAM OF BIG BEND + CLOSER TO WEST SIDE
- 1 MATURE BALD EAGLE PERCHED @ NEST SITE

2010 Water Quality Monitoring Report

(Developed by Citizens Self-Help Lake Monitoring Program)

Turtle-Flambeau Flowage (FERC Project No. 2390-02)

Lake Water Quality 2010 Annual Report

Turtle Flambeau Flowage
Iron County
Waterbody ID Number: 2294900

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

Site Name	Station ID
Turtle Flambeau Flowage - Deep Hole	263059

Date	SD (feet)	SD (meters)	Hit Bottom?	CHL	TP	TSI (SD)	TSI (Chl)	TSI (TP)	Lake Level	Staff Gauge	Clarity	Color	Perception
06/24/2010	6	1.8	NO	8.58	24	51	51	53	NORMAL		CLEAR	BROWN	2-Very minor aesthetic problems
07/11/2010	3	.9	NO			61			NORMAL		MURKY	BROWN	2-Very minor aesthetic problems
07/21/2010	5.5	1.7	NO	10.3	30	53	52	54	HIGH		MURKY	BROWN	2-Very minor aesthetic problems
08/24/2010	3	.9	NO			61			NORMAL		MURKY	BROWN	2-Very minor aesthetic problems
08/25/2010				8.69	44		51	57					
08/25/2010	3	.9	NO			61			HIGH		MURKY	BROWN	3-Enjoyment somewhat impaired (algae)
08/25/2010	3	.9	NO			61			NORMAL		MURKY	BROWN	2-Very minor aesthetic problems

06/24/2010		
Depth	Temp.	D.O.
FEET	DEGREES C	MG/L
0	21.6	7.34
3	21.5	7.33

07/11/2010		
Depth	Temp.	D.O.
FEET	DEGREES C	MG/L
1	23.4	5.82
3	23.4	5.42

07/21/2010		
Depth	Temp.	D.O.
FEET	DEGREES C	MG/L
0	23.6	6.63
3	23.6	6.62

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter (ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD),TSI(CHL),TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet; Temp = Temperature in degrees Fahrenheit; D.O. = Dissolved Oxygen in parts per million.

Wisconsin Department of Natural Resources * Wisconsin Lakes Partnership
Report Generated: 01/11/2011

06/24/2010		
Depth	Temp.	D.O.
FEET	DEGREES C	MG/L
6	21.4	7.37
9	21.3	7.39
12	21.1	7.38
15	20.5	7.25
20	16.4	4.25
25	12	3.22
30	11	1.15
35	10.9	.08
40	10.8	.11
45	11	.16

07/21/2010		
Depth	Temp.	D.O.
FEET	DEGREES C	MG/L
6	23.5	6.62
9	23.4	6.59
12	23.3	6.58
15	23.1	6.55
20	20.6	3.3
25	12.7	.04
30	11.5	.05
35	11	.06
40	10.9	.09
45	11.1	.15

08/24/2010		
Depth	Temp.	D.O.
5	21.9	7.18
10	21.7	7.02
15	21.3	6.87

08/25/2010		
Depth	Temp.	D.O.
0	21.3	6.17
3	20.7	5.91
6	20.6	5.57
9	20.6	5.55
12	20.5	5.56
15	20.5	5.55
20	20.2	4.96
25	18.1	2.36
30	11.8	.05
35	10.9	.06
40	10.7	.08
45	10.7	.13

Date	Lab Comment
06/24/2010	MATRIX DUPLICATE QC EXCEEDED

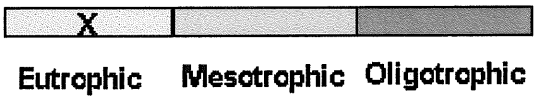
Date	Data Collectors	Project
06/24/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
07/11/2010	Zach Schultz- Neil Wallace	Iron County (Staff) Water Quality Monitoring
07/21/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter (ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD),TSI(CHL),TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet; Temp = Temperature in degrees Fahrenheit; D.O. = Dissolved Oxygen in parts per million.

Date	Data Collectors	Project
08/24/2010	Zach Schultz- Neil Wallace	Iron County (Staff) Water Quality Monitoring
08/25/2010	Data Collectors Unknown or Specified in Comments	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
08/25/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
08/25/2010	Zach Schultz- Neil Wallace	Iron County (Staff) Water Quality Monitoring

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter (ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD),TSI(CHL),TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet; Temp = Temperature in degrees Fahrenheit; D.O. = Dissolved Oxygen in parts per million.

Turtle Flambeau Flowage - Deep Hole 2010 Results



Turtle Flambeau Flowage - Deep Hole was sampled **5** different days during the 2010 season. Parameters sampled included:

- water clarity
- temperature
- dissolved oxygen
- total phosphorus
- chlorophyll

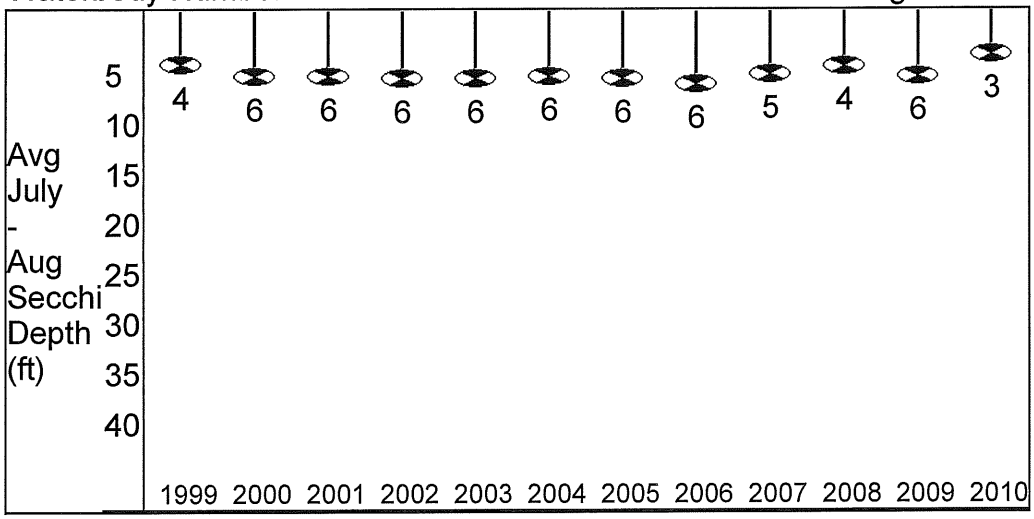
The average summer (July-Aug) secchi disk reading for Turtle Flambeau Flowage - Deep Hole (Iron County, WBIC: 2294900) was 3.42 feet. The average for the Northwest Georegion was 13.4 feet. Typically the summer (July-Aug) water was reported as **MURKY** and **BROWN**. This suggests that the secchi depth may have been mostly impacted by suspended sediments, tiny particles of soil or organic matter that are suspended in the water. Shallow lakes are often turbid because wind stirs up sediment from the bottom. High suspended sediments are often found in flowages and impoundments where precipitation runoff from the watershed transports solids via an incoming stream.

Chemistry data was collected on Turtle Flambeau Flowage - Deep Hole. The average summer Chlorophyll was 9.5 µg/l (compared to a Northwest Georegion summer average of 19 µg/l). The summer Total Phosphorus average was 37 µg/l. Lakes that have more than 20 µg/l and impoundments that have more than 30 µg/l of total phosphorus may experience noticable algae blooms.

The overall Trophic State Index (based on chlorophyll) for Turtle Flambeau Flowage - Deep Hole was 52. The TSI suggests that Turtle Flambeau Flowage - Deep Hole was **eutrophic**. This TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.

Turtle Flambeau Flowage
Iron County
Waterbody Number: 2294900

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



Past secchi averages in feet (July and August only).

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1999	4.3	4.25	4.25	1
2000	5.6	4.7	6.5	2
2001	5.5	5.3	5.6	2
2002	5.8	5.5	6	3
2003	5.8	5.5	6	2
2004	5.5	5	6	2
2005	5.8	5	6.5	2
2006	6.3	6	6.5	2
2007	5.3	5	5.5	2
2008	4.5	4.5	4.5	2
2009	5.5	5	6	2
2010	3.4	3	5.5	6

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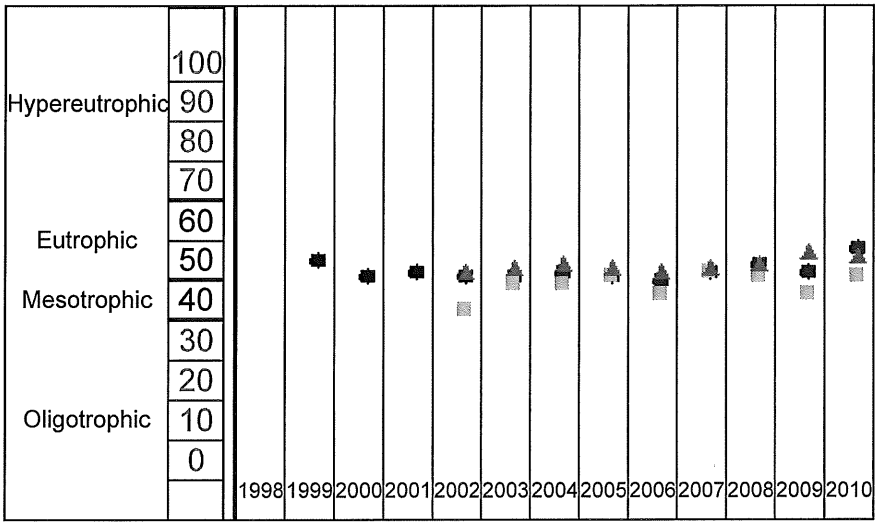
Trophic State Index Graph



Monitoring Station: Turtle Flambeau Flowage - Deep Hole, Iron County
Past Summer (July-August) Trophic State Index (TSI) averages.

● = Secchi ■ = Chlorophyll ▲ = Total Phosphorus

TSI(Chl) = TSI(TP) = TSI (Sec)	It is likely that algae dominate light attenuation.
TSI(Chl) > TSI(Sec)	Large particulates, such as Aphanizomenon flakes dominate
TSI(TP) = TSI(Sec) > TSI (Chl)	Non-algal particulate or color dominate light attenuation
TSI(Sec) = TSI(Chl) >= TSI (TP)	The algae biomass in your lake is limited by phosphorus
TSI(TP) > TSI(Chl) = TSI (Sec)	Zooplankton grazing, nitrogen, or some factor other than phosphorus is limiting algae biomass

TSI	TSI Description
TSI < 30	Classical oligotrophy: clear water, many algal species, oxygen throughout the year in bottom water, cold water, oxygen-sensitive fish species in deep lakes. Excellent water quality.
TSI 30-40	Deeper lakes still oligotrophic, but bottom water of some shallower lakes will become oxygen-depleted during the summer.
TSI 40-50	Water moderately clear, but increasing chance of low dissolved oxygen in deep water during the summer.
TSI 50-60	Lakes becoming eutrophic: decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.
TSI 60-70	Blue-green algae become dominant and algal scums are possible, extensive plant overgrowth problems possible.
TSI 70-80	Becoming very eutrophic. Heavy algal blooms possible throughout summer, dense plant beds, but extent limited by light penetration (blue-green algae block sunlight).
TSI > 80	Algal scums, summer fishkills, few plants, rough fish dominant. Very poor water quality.

Trophic state index (TSI) is determined using a mathematical formula (Wisconsin has its own version). The TSI is a score from 0 to 110, with lakes that are less fertile having a low TSI. We base the overall TSI on the Chlorophyll TSI when we have Chlorophyll data. If we don't have chemistry data, we use TSI Secchi. We do this rather than averaging, because the TSI is used to predict biomass. This makes chlorophyll the best indicator. Visit Bob Carlson's website, dipin.kent.edu/tsi.htm, for more info.

Lake Water Quality 2010 Annual Report

Turtle Flambeau Flowage
Iron County
Waterbody ID Number: 2294900

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

Site Name	Station ID
Turtle Flambeau Flowage - Sc Basin	263050

Date	SD (feet)	SD (meters)	Hit Bottom?	CHL	TP	TSI (SD)	TSI (Chl)	TSI (TP)	Lake Level	Staff Gauge	Clarity	Color	Perception
06/24/2010				9.33	30		52	54					
06/24/2010	4.25	1.3	NO			56			NORMAL				
07/01/2010				9.13	31		52	55					
07/21/2010	3	.9	NO			61			HIGH				
08/02/2010				13.3	36		54	56					
08/25/2010	3	.9	NO			61			HIGH				

Date	Lab Comment
06/24/2010	MATRIX DUPLICATE QC EXCEEDED
07/01/2010	MATRIX DUPLICATE QC EXCEEDED

Date	Data Collectors	Project
06/24/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
06/24/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
07/01/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
07/21/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
08/02/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
08/25/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
09/01/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter (ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD),TSI(CHL),TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet; Temp = Temperature in degrees Fahrenheit; D.O. = Dissolved Oxygen in parts per million.

Wisconsin Department of Natural Resources * Wisconsin Lakes Partnership
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Turtle Flambeau Flowage - Sc Basin 2010 Results

Eutrophic Mesotrophic Oligotrophic

Turtle Flambeau Flowage - Sc Basin was sampled **6** different days during the 2010 season. Parameters sampled included:

- water clarity
- total phosphorus
- chlorophyll

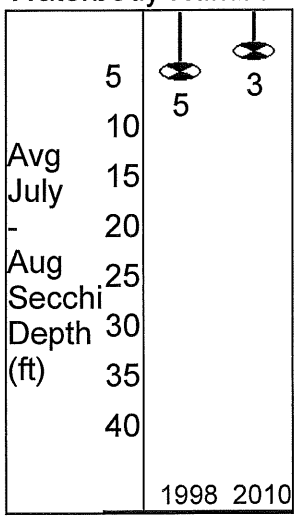
The average summer (July-Aug) secchi disk reading for Turtle Flambeau Flowage - Sc Basin (Iron County, WBIC: 2294900) was 3 feet. The average for the Northwest Georegion was 13.4 feet.

Chemistry data was collected on Turtle Flambeau Flowage - Sc Basin. The average summer Chlorophyll was 11.2 µg/l (compared to a Northwest Georegion summer average of 19 µg/l). The summer Total Phosphorus average was 33.5 µg/l. Lakes that have more than 20 µg/l and impoundments that have more than 30 µg/l of total phosphorus may experience noticable algae blooms.

The overall Trophic State Index (based on chlorophyll) for Turtle Flambeau Flowage - Sc Basin was 53. The TSI suggests that Turtle Flambeau Flowage - Sc Basin was **eutrophic**. This TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.

Turtle Flambeau Flowage
Iron County
Waterbody Number: 2294900

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



Past secchi averages in feet (July and August only).

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1998	4.9	4.8	4.9	2
2010	3	3	3	2

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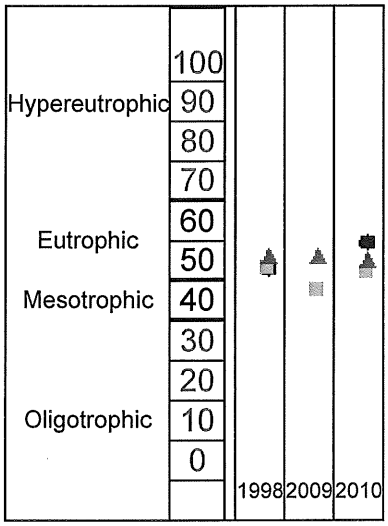
Trophic State Index Graph



Monitoring Station: Turtle Flambeau Flowage - Sc Basin, Iron County

Past Summer (July-August) Trophic State Index (TSI) averages.

● = Secchi ■ = Chlorophyll ▲ = Total Phosphorus

TSI(Chl) = TSI(TP) = TSI (Sec)	It is likely that algae dominate light attenuation.
TSI(Chl) > TSI(Sec)	Large particulates, such as Aphanizomenon flakes dominate
TSI(TP) = TSI(Sec) > TSI (Chl)	Non-algal particulate or color dominate light attenuation
TSI(Sec) = TSI(Chl) >= TSI (TP)	The algae biomass in your lake is limited by phosphorus
TSI(TP) > TSI(Chl) = TSI (Sec)	Zooplankton grazing, nitrogen, or some factor other than phosphorus is limiting algae biomass

TSI	TSI Description
TSI < 30	Classical oligotrophy: clear water, many algal species, oxygen throughout the year in bottom water, cold water, oxygen-sensitive fish species in deep lakes. Excellent water quality.
TSI 30-40	Deeper lakes still oligotrophic, but bottom water of some shallower lakes will become oxygen-depleted during the summer.
TSI 40-50	Water moderately clear, but increasing chance of low dissolved oxygen in deep water during the summer.
TSI 50-60	Lakes becoming eutrophic: decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.
TSI 60-70	Blue-green algae become dominant and algal scums are possible, extensive plant overgrowth problems possible.
TSI 70-80	Becoming very eutrophic. Heavy algal blooms possible throughout summer, dense plant beds, but extent limited by light penetration (blue-green algae block sunlight).
TSI > 80	Algal scums, summer fishkills, few plants, rough fish dominant. Very poor water quality.

Trophic state index (TSI) is determined using a mathematical formula (Wisconsin has its own version). The TSI is a score from 0 to 110, with lakes that are less fertile having a low TSI. We base the overall TSI on the Chlorophyll TSI when we have Chlorophyll data. If we don't have chemistry data, we use TSI Secchi. We do this rather than averaging, because the TSI is used to predict biomass. This makes chlorophyll the best indicator. Visit Bob Carlson's website, dipin.kent.edu/tsi.htm, for more info.

Lake Water Quality 2010 Annual Report

Turtle Flambeau Flowage
Iron County
Waterbody ID Number: 2294900

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

Site Name	Station ID
Turtle Flambeau Flowage - SW Basin	263048

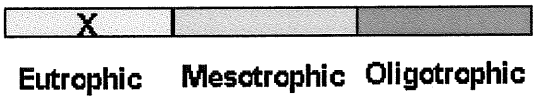
Date	SD (feet)	SD (meters)	Hit Bottom?	CHL	TP	TSI (SD)	TSI (Chl)	TSI (TP)	Lake Level	Staff Gauge	Clarity	Color	Perception
03/15/2010					118			65					
06/24/2010				7.74	22		50	52					
06/24/2010	6	1.8	NO			51			NORMAL				
07/01/2010				5.75	28		48	54					
07/21/2010	4.5	1.4	NO			55			HIGH				
08/01/2010				13.8	31		55	55					
08/25/2010	4	1.2	NO			57			HIGH				

Date	Data Collectors	Project
03/15/2010	USGS	TURTLE FLAMBEAU FLOWAGE TRADE LAKE PROPERTY: Turtle Flambeau Flowage Water Quality Monitoring
06/24/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
06/24/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
07/01/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
07/21/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
08/01/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring
08/25/2010	James Leever	Citizen Lake Monitoring - Water Quality - Turtle Flambeau Flowage; Deep Hole
09/01/2010	JAMES KREITLOW	Turtle Flambeau Flowage Monitoring

SD = Secchi depth measured in feet converted to meters; Chl = Chlorophyll a in micrograms per liter (ug/l); TP = Total phosphorus in ug/l, surface sample only; TSI(SD),TSI(CHL),TSI(TP) = Trophic state index based on SD, CHL, TP respectively; Depth measured in feet; Temp = Temperature in degrees Fahrenheit; D.O. = Dissolved Oxygen in parts per million.

Wisconsin Department of Natural Resources * Wisconsin Lakes Partnership
Report Generated: 01/11/2011

Turtle Flambeau Flowage - SW Basin 2010 Results



Turtle Flambeau Flowage - SW Basin was sampled **7** different days during the 2010 season. Parameters sampled included:

- water clarity
- total phosphorus
- chlorophyll

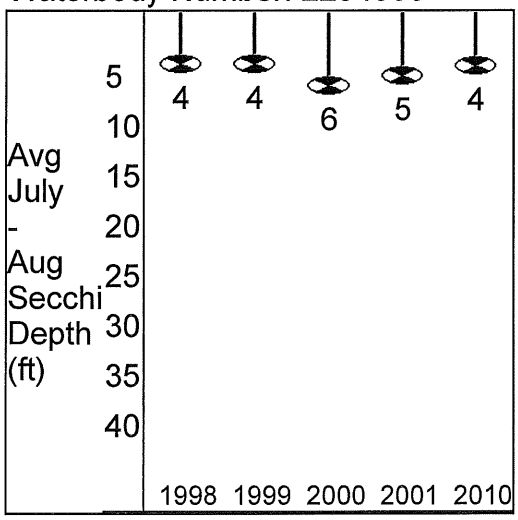
The average summer (July-Aug) secchi disk reading for Turtle Flambeau Flowage - SW Basin (Iron County, WBIC: 2294900) was 4.25 feet. The average for the Northwest Georegion was 13.4 feet.

Chemistry data was collected on Turtle Flambeau Flowage - SW Basin. The average summer Chlorophyll was 9.8 µg/l (compared to a Northwest Georegion summer average of 19 µg/l). The summer Total Phosphorus average was 29.5 µg/l. Lakes that have more than 20 µg/l and impoundments that have more than 30 µg/l of total phosphorus may experience noticable algae blooms.

The overall Trophic State Index (based on chlorophyll) for Turtle Flambeau Flowage - SW Basin was 52. The TSI suggests that Turtle Flambeau Flowage - SW Basin was **eutrophic**. This TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.

Turtle Flambeau Flowage
Iron County
Waterbody Number: 2294900

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

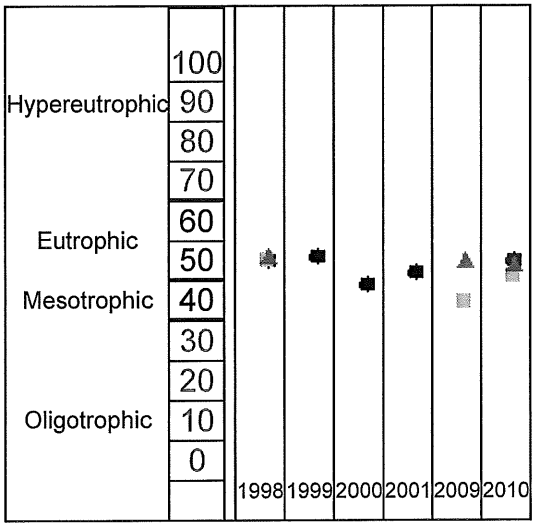


Past secchi averages in feet (July and August only).

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1998	4.2	3.5	4.9	2
1999	4.1	4	4.2	3
2000	6.4	6.25	6.5	4
2001	5.4	5.4	5.4	1
2010	4.3	4	4.5	2

Report Generated: 01/11/2011

Trophic State Index Graph



Monitoring Station: Turtle Flambeau Flowage - SW Basin, Iron County
Past Summer (July-August) Trophic State Index (TSI) averages.

● = Secchi ■ = Chlorophyll ▲ = Total Phosphorus

TSI(Chl) = TSI(TP) = TSI (Sec)	It is likely that algae dominate light attenuation.
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