Water Quality Standard Non-Attainment

- Class B Water Quality Criteria
  - Benthic Macroinvertebrates (as compared to other class B streams)
  - 7ppm (75% saturation) Dissolved Oxygen
  - indigenous species as naturally occur
  - Elevated bacteria levels

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Stressors Identified in the Birch Stream TMDL and Urban Streams Study

- Toxics (Al, PAH's, benzidine)
- Propylene glycol (BOD/COD)
- Habitat Alteration and High Flows (stream destabilization and habitat impairment)
- Elevated Water temperature (hostile ambient condition affecting biotic community)
- Elevated nutrients (no water quality criteria in Maine but stimulates algal growth)

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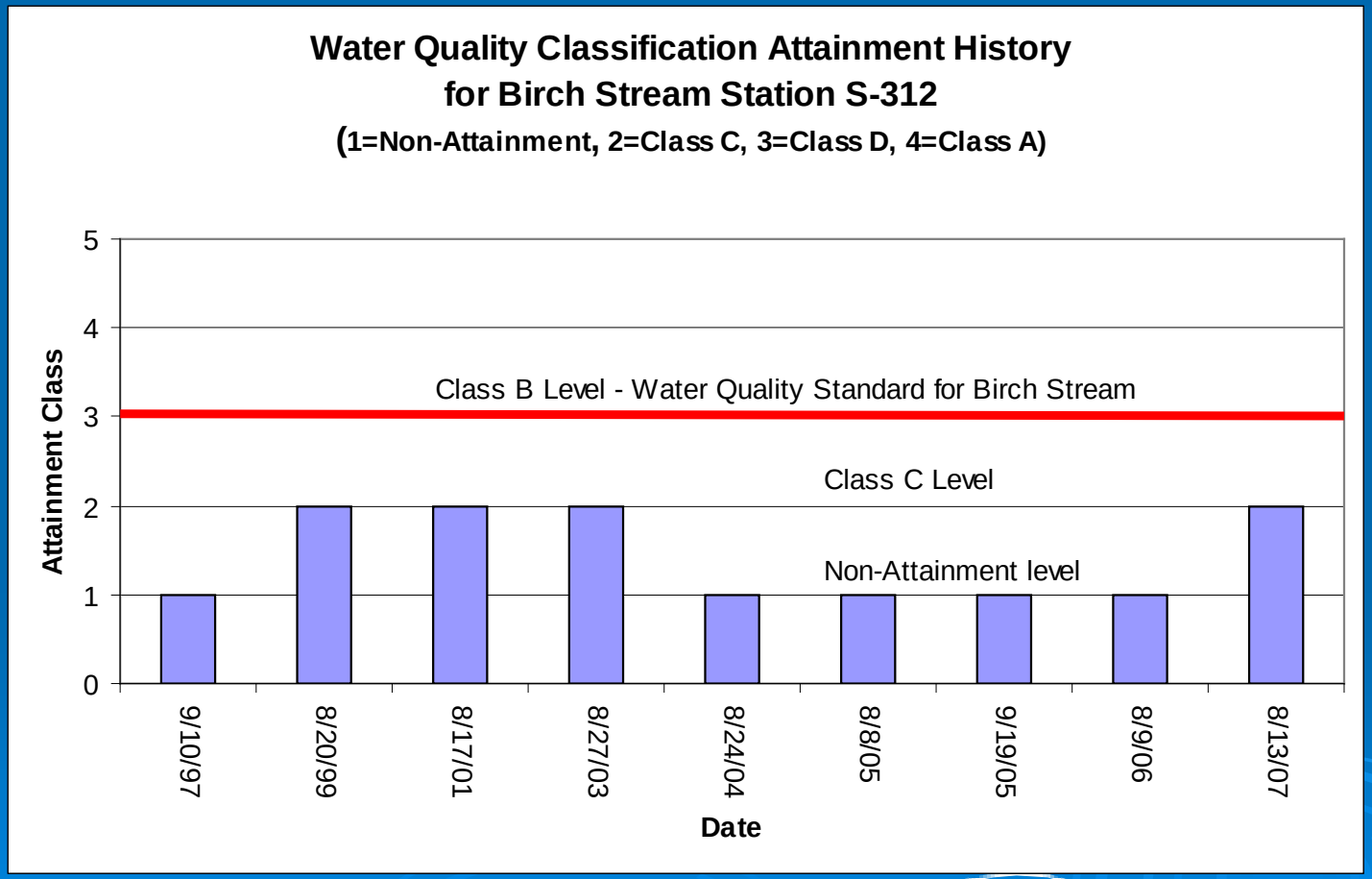
Benthic Macroinvertebrate Data History Station S-312



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Model Variable	Middle (S-312)								
	1997	1999	2001	2003	2004	2005 (8)	2005 (9)	2006	2007
Total abundance of individuals	125	218	441	1237	194	294	1029	407	310
Generic richness	23	38	50	28	31	33	42	36	32
Plecoptera/Ephemeroptera abundance	0 / 0.3	0 / 5.3	0 / 53	0 / 25	0 / 4	0 / 1.3	0 / 1	0 / 3	0 / 25
Shannon-Weiner diversity index	2.22	3.53	4.17	3.05	3.45	3.45	3.2	3.65	3.98
Hilsenhoff biotic index	4.79	6.15	5.86	4.88	5.77	6.12	4.7	5.47	5.75
Relative abundance Chironomidae	0.29	0.61	0.53	0.37	0.35	0.79	0.15	0.53	0.56
EPT generic richness	4	5	7	5	3	4	6	3	4
EP generic richness / 14	0.07	0.14	0.21	0.07	0.07	0.07	0.14	0.07	0.07
Presence of Class A indicator taxa / 7	0	0	0	0	0	0	0	0	0
Five dominant taxa (%)	Simulium (56) Cricotopus (18) Erpobdella (11) Thieneman-nimia (4) Eukiefferiella (2)	Cricotopus (35) Conchapelopia (14) Nephelopsis (9) Simulium (8) Gyraulus (6)	Micopsectra (16) Baetis (12) Rheotanytarsus (10) Tanytarsus (9) Parataytarsus (7)	Simulium (45) Tanytarsus (14) Gyraulus (7) Conchapelopia (6) Rheotanytarsus (4) Polypedilum (4)	Gyraulus (22) Crocotopus (19) Nephelopsis (17) Simulium (9) Conchapelopia (8)	Micropsectra (35) Cricotopus (14) Polypedilum (7) Nanocladius (7) Rheotanytarsus (7)	Gyraulus (30) Nais (22) Gastropoda (12) Cricotopus (7) Hemerodromia (6)	Simulium (23) Rheotanytarsus (18) Nais (10) Cricotopus (8) Nephelopsis (6)	Conchapelopia (17) Nephelopsis (14) Gyraulus (10) Microspsectra (10) Baetis (8)
Model outcome (%)	NA (100)	NA (80)	Class C (100)	Class C	NA	Class C	NA	NA	Class C

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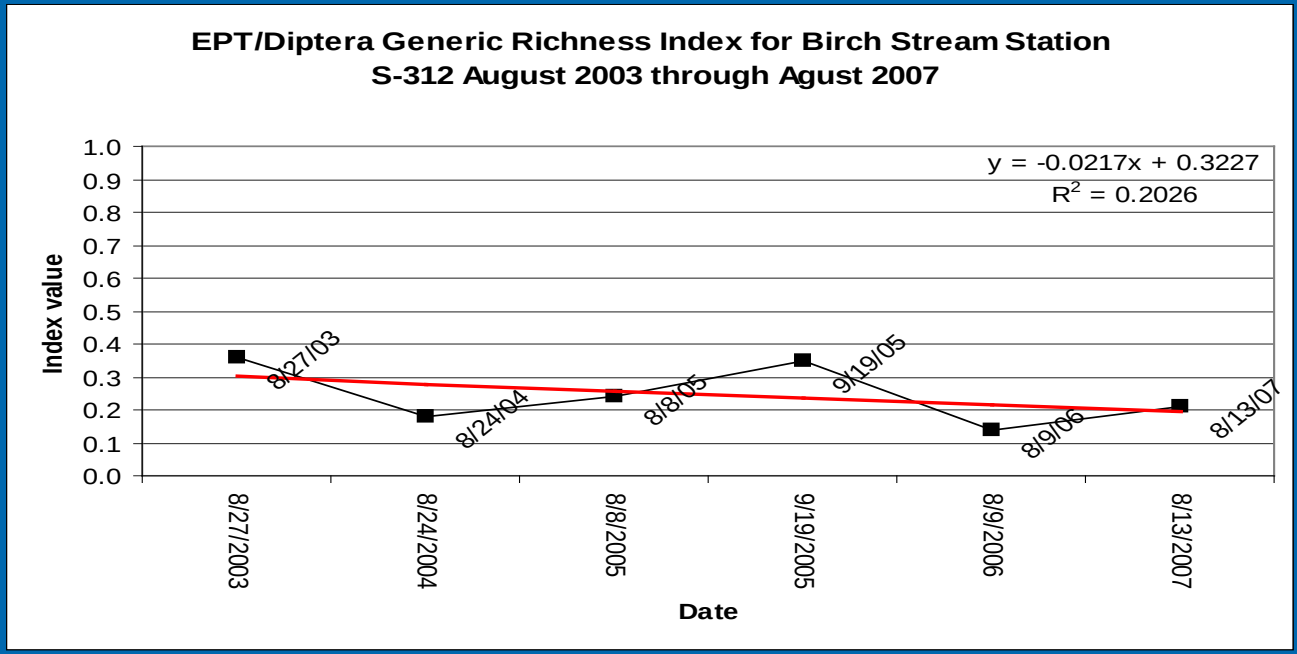

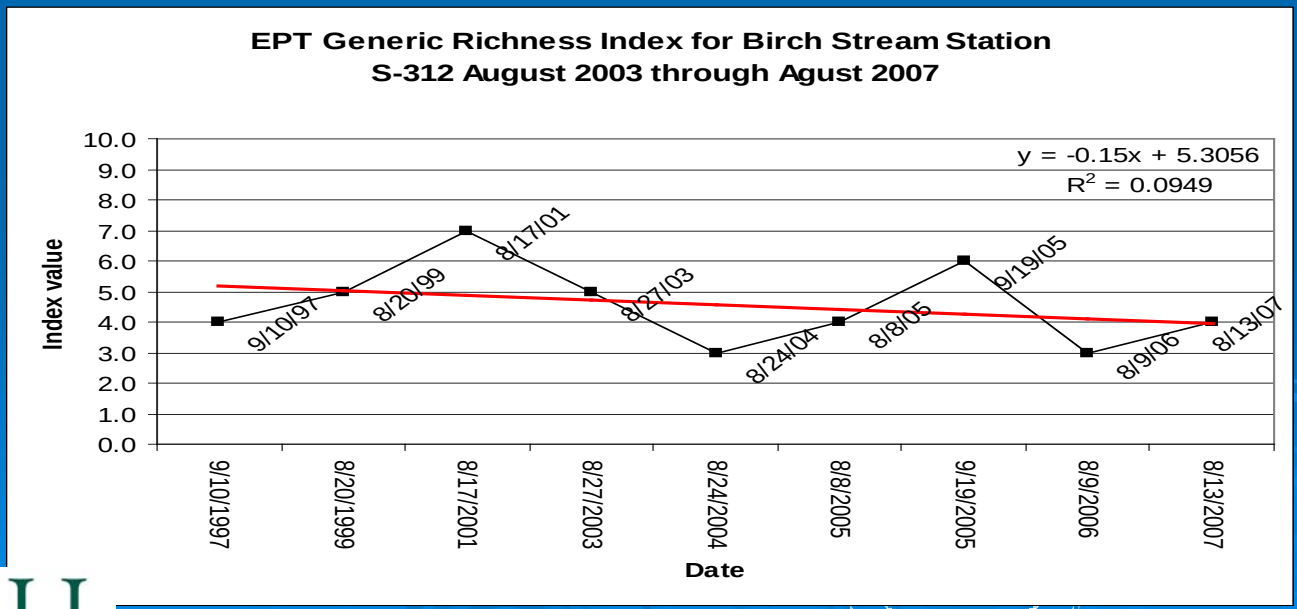

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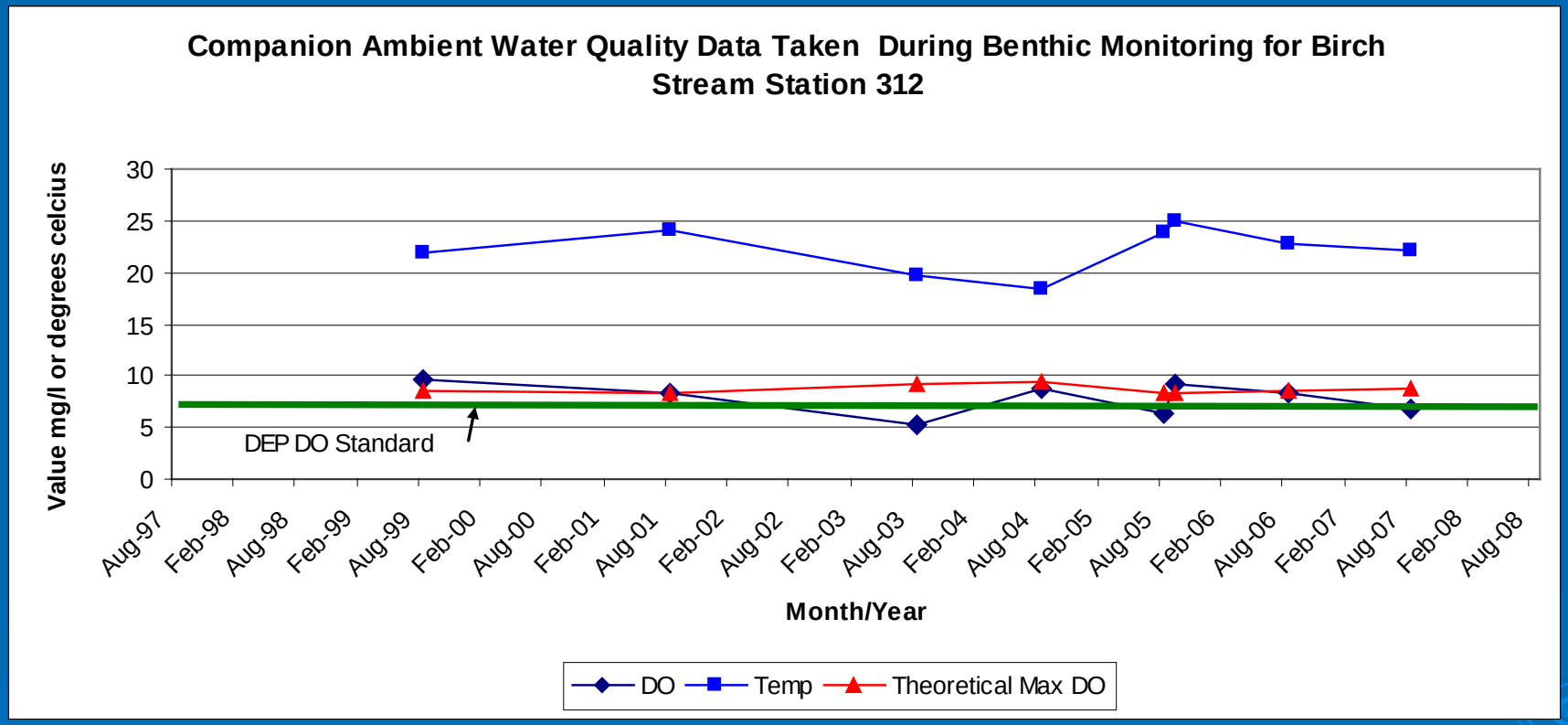
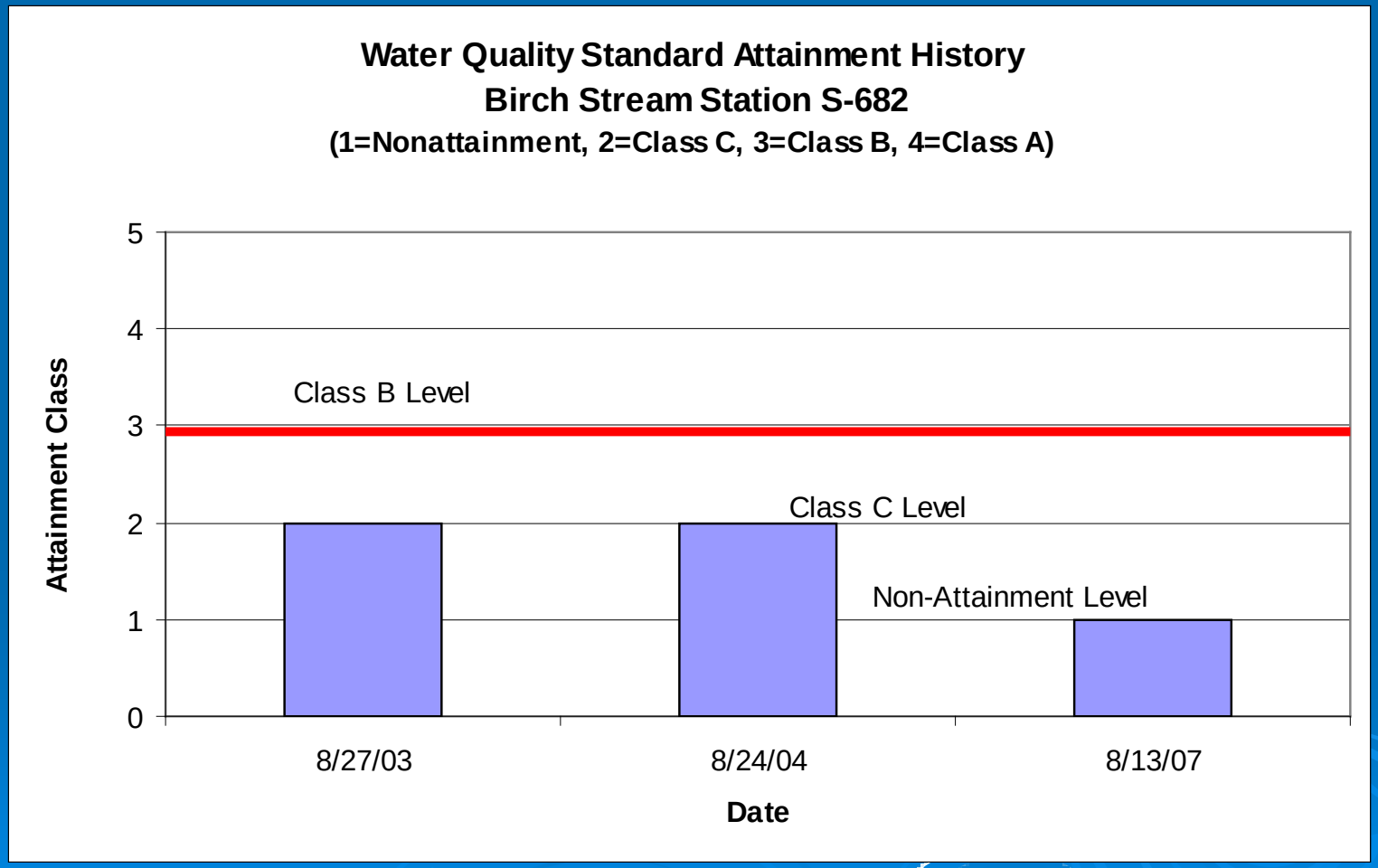

Companion Ambient Water Quality Data Taken During Benthic Monitoring for Birch Stream Station 312
Value mg/l or degrees celcius
30
25
20
15
10
5
0
DEP DO Standard
Aug-97
Feb-98
Aug-98
Feb-99
Aug-99
Feb-00
Aug-00
Feb-01
Aug-01
Feb-02
Aug-02
Feb-03
Aug-03
Feb-04
Aug-04
Feb-05
Aug-05
Feb-06
Aug-06
Feb-07
Aug-07
Feb-08
Aug-08
Month/Year
DO
Temp
Theoretical Max DO

Benthic Macroinvertebrate Data History Station S-682



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Model Variable	Upstream (S-682)		
	2003	2004	2007
Total abundance of individuals	276	174	334
Generic richness	36	33	35
Plecoptera/Ephemeroptera abundance	0 / 33	0 / 23	0 / 3
Shannon-Weiner diversity index	3.45	3.79	3.43
Hilsenhoff biotic index	5.51	5.07	5.78
Relative abundance Chironomidae	0.73	0.32	0.78
EPT generic richness	7	6	2
EP generic richness / 14	0.14	0.14	0.07
Presence of Class A indicator taxa / 7	0	0	0
Five dominant taxa (%)	Tanytarsus (35) Baetis (12) Rheotanytarsus (10) Conchapelopia (7) Polypedilum (6)	Hydropsyche (18) Simulium (14) Baetis (13) Cricotopus (9) Tanytarsus (9)	Tanytarsus (43) Rheotanytarsus (8) Nanocladius (7) Conchapelopia (6) Nephelopsis (4)
Model outcome (%)	Class C	Class C	NA

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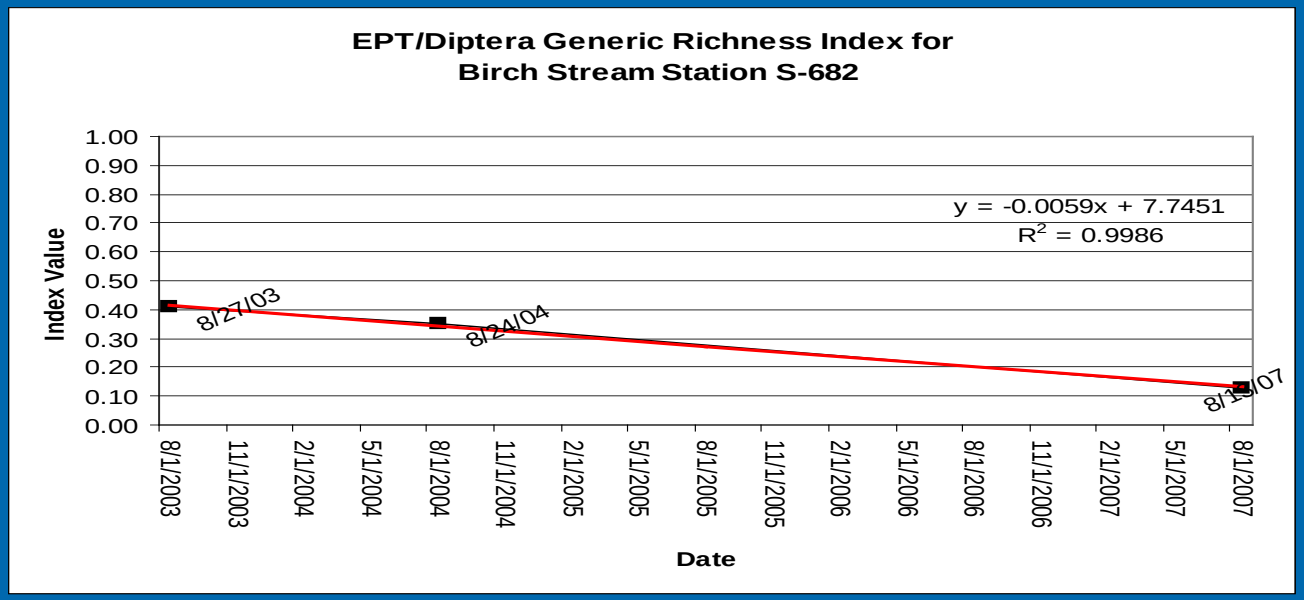

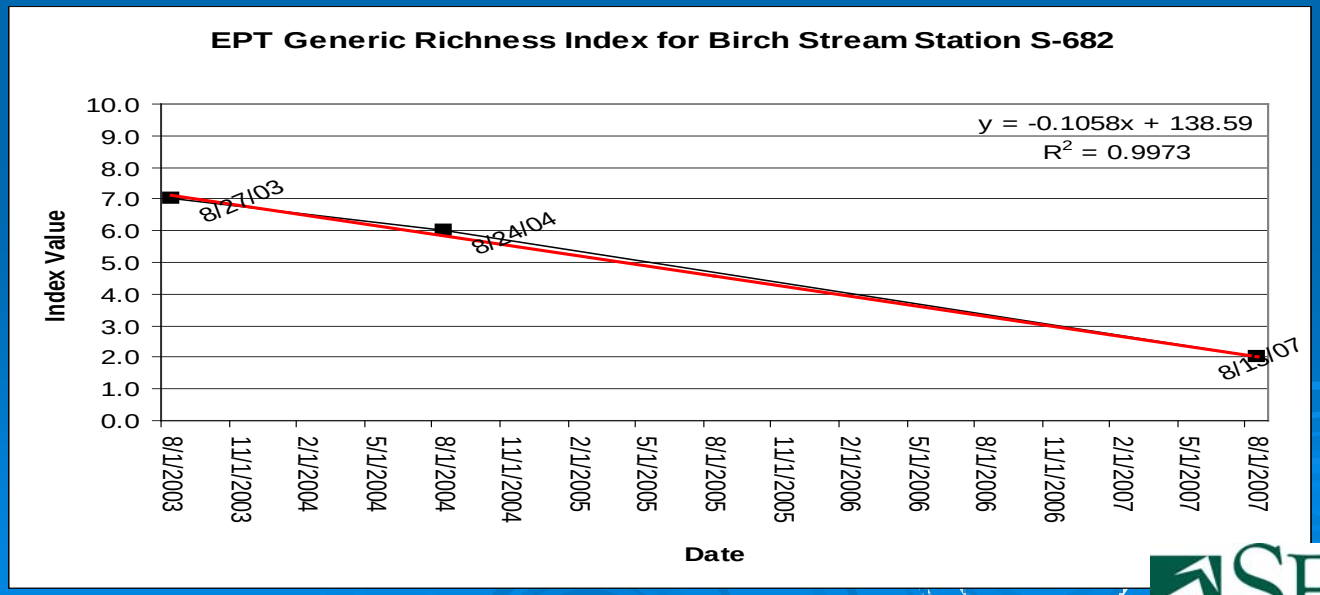

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DEP Diurnal Oxygen Study 2003/2004

- Designed to measure dissolved oxygen levels over a 24 hour period (production/respiration)
- Began in June 2003, last data taken March 2004
- Only 3 diurnal events recorded, June 2003 diurnal failed due to instrument fouling
- July data shows significant DO depression and flat DO, but battery failure in the sonde and lack of expected diurnal fluctuation makes this data unusual
- More natural diurnal patterns in August 2003 and March 2004

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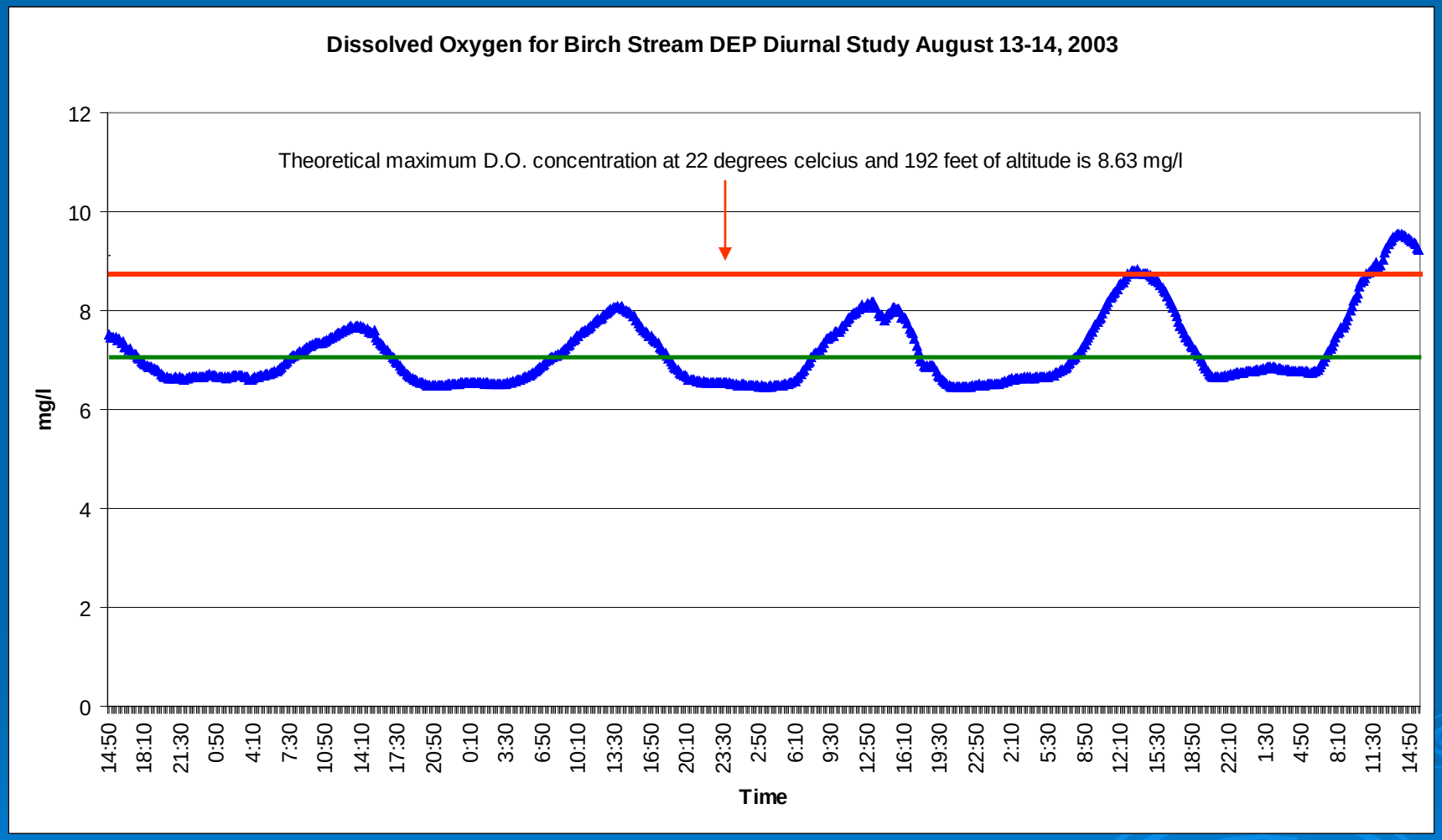

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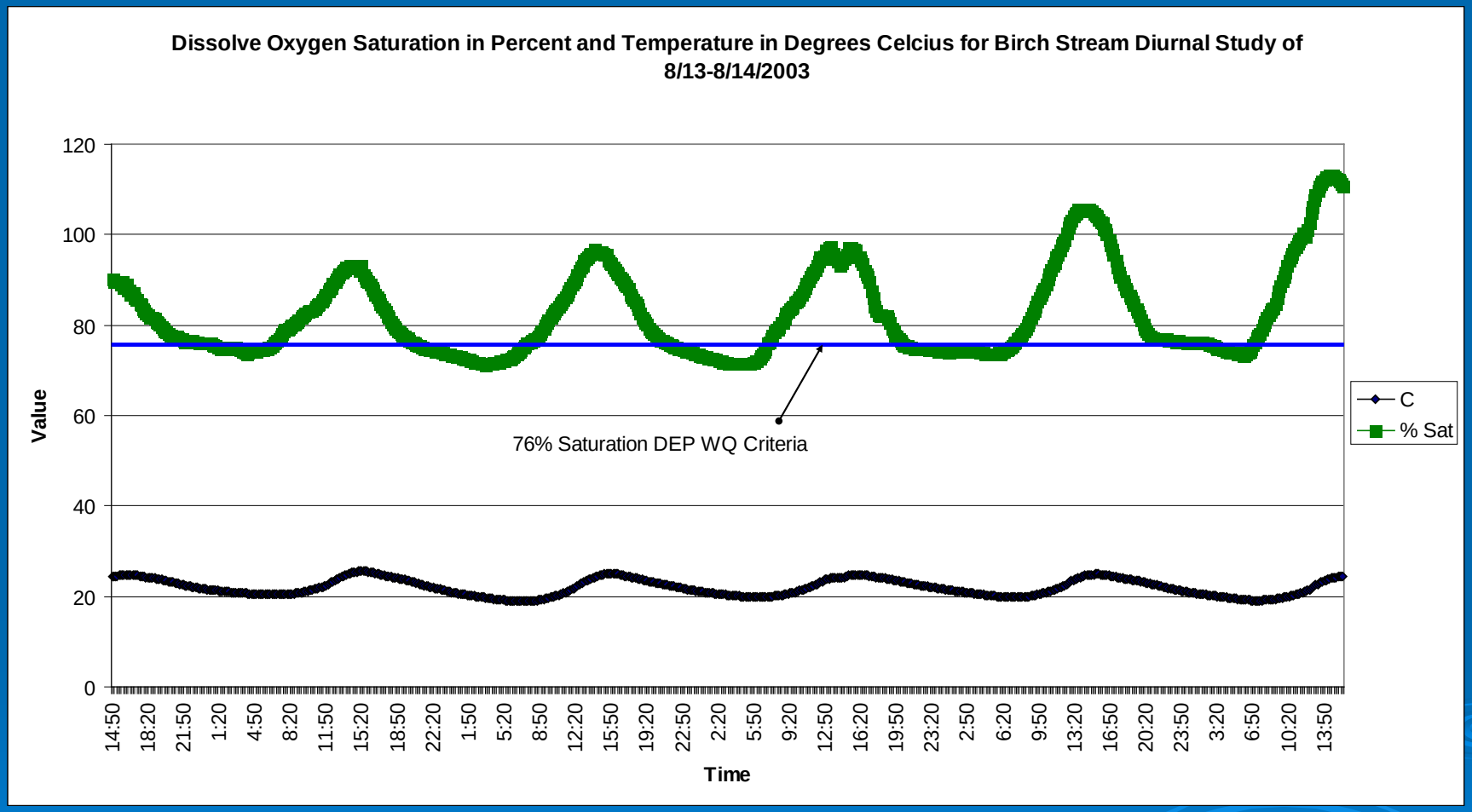

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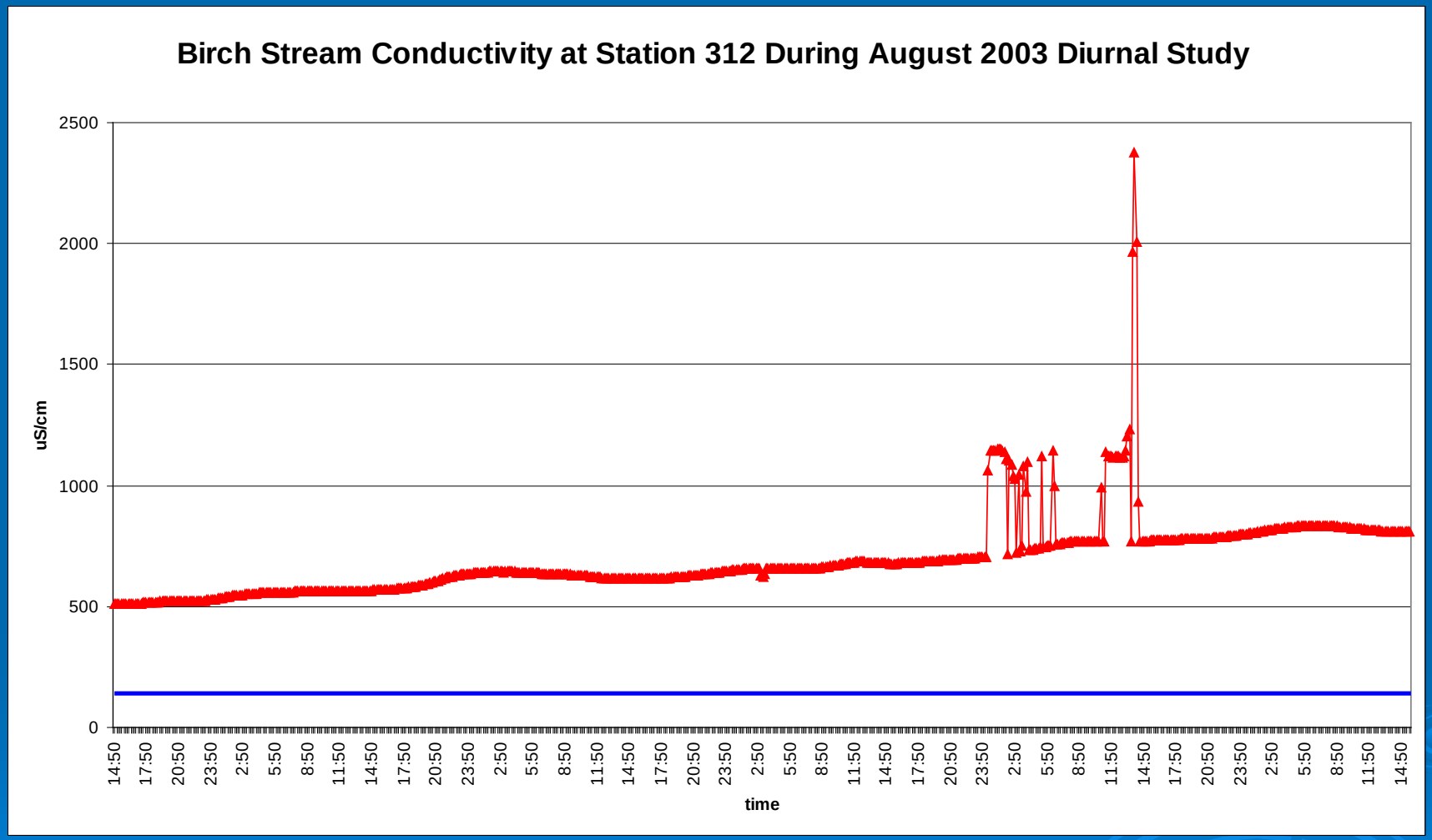

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Factors Affecting Dissolved Oxygen

- BOD and COD exerted by propylene glycol, DRO, GRO and other organic compounds entering Birch Stream
- Temperature elevation from first flush runoff and lack of stream cover
- Excess nutrients and resultant algal growth

- Potential sources for BOD and COD are runoff from paved surfaces, lawn fertilizers, pet wastes, wildlife wastes, and other organic waste.

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Pollutants with Potential Toxic Effects to Macroinvertebrates

- Diesel Range Organics (DRO)
- Gasoline Range Organics (GRO)
- Poly-Cyclic Hydrocarbons (PAH), the toxic effect is highly variable with concentration, pH, water temperature, salinity, tss and other water quality factors playing a complex role.
- These originate from runoff in parking areas, roads, driveways, and runways. PAH's are a component of asphalt and a byproduct of combustion of fossil fuel.

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