July 3, 1998

To: Dr. William Schuster, Forest Director
Black Rock Forest Consortium
129 Continental Road
Cornwall, NY 12518

From: Jack Caldwell
Newburgh Middle School
405 Union Avenue
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Final Report: Black Rock Forest Small Grant 1997-1998

A Black Rock Forest Small Grant was awarded to me to implement a project called "Students Becoming Scientists." Upon reviewing the project, now completed, I find that it had two main goals: (1) to use the Apple eMate 300 mobile field computer and eProbes in the forest with eighth grade students and (2) to create and implement a set of activities designed to allow these students to perform tasks similar to those of a scientist in the field. I worked with Robert Schiff, eighth grade science teacher, and four of his five classes. (I mention this information about Rob's classes as a point of clarification and curiosity. The class that did not go to the forest was Rob's earth science honors class. There is something about Regents level courses that seems to prohibit time away from the classroom for projects like this one. Are they too content driven, denying skills and process?) We made five trips to the forest. One class going in the fall and in the spring while the other three classes went in the spring only.

Our basic instructional design went like this:

1. two to three days of classroom preparation regarding the forest and the eMate with the eProbe.
2. a day trip to the forest was broken into three parts: a) arrival and set up of the eMates for a spreadsheet (data collection at various sites of pH, air temp. and water temp.), the eProbe (temperature readings and graph), a journal page, and a scavenger hunt page, b) a forest hike to the chlorinator to familiarize students with the forest (scavenger hunt) and to recognize the forest as a water shed.

3. data collection, during the hike, of the stream leaving the Upper Reservoir and, after lunch (which by the way is very important to eight graders), of the Upper Reservoir tributary.
4. one day in the classroom to report out the data, confirm any predictions, and discuss the experience in general.

In all honesty, I need to report to you that I feel the project was only moderately successful. The following are the elements of the project that were not satisfactorily completed:

- the project was to have students attempt to collect enough data, over time, that could be examined for patterns and trends, possibly leading to deeper investigations. We did not do this.
- if we were able to do an investigation (research), the project was to have students attempt to replicate the investigation, previous practices and findings of the first set of students. We did not do this either.
- the project was to explore the workings of the eMate and eProbe. We did this but in doing as much as we did, we realized that the eMate and eProbe have more to offer to the science education of our students. We only touched on a small part of the machine's potential for field work and classroom learning.

To answer why we failed with these parts of the project, you need to understand the difficulty of integrating a project like this one into a middle school schedule (similar to a secondary school schedule). To remove a class and a teacher from the school day has implications for a good part of the entire school. To properly prepare a class for a day in the forest requires time away from a tight and somewhat unforgiving science curriculum. This is a risk for both the students and their teacher. Rob and I had to scale down the more ambitious elements of the project in order to maintain an equitable balance between the school's concerns and the project's goals.

But nevertheless we had some worthwhile moments also.

- the eMate with the eProbe seem to possess a wonderful capacity to fascinate our students. They truly liked to use them. I am sure with more time we would have succeeded in completed all parts of the project.
- the forest itself fascinates the students, though my guess is that a good number

of them would rather spend time with the machine than with the forest.

- the design of the water study was proved satisfactory. Our students collected data well. They liked being around the water, stream and reservoir. Any attempt at adding to and/or improving the water study would come from a fuller implementation of the eMate and eProbe.
- on a personal note, this experience gives me new knowledge regarding the creating of future projects that better match middle school science and the finding of new ways within the structure of large middle school to bring students into Black Rock Forest.

I tend to speak highly of the eMate regardless of the fact that Apple is no longer producing them. Other people, I am sure, can point out its limitations and faults. But you must know that our students responded to them incredibly well. The machines fascinated them. The eMate allowed for learning to be done in a real context. We were using technology in the forest. And not only that, it connected to a computer back in the classroom. The follow-through and the follow-up work was real and exciting. Simply put, I am not sure how high up the educational and research ladder the eMate can climb, but for eighth graders it was a perfect fit.

Included in this final report are model lessons and their assessments that Rob and I used to implement the project in school. Black Rock Forest Consortium is welcome to them.

Model Lesson - Data Collection and Data Analysis leads to Research

Background Information - *The data used in this model lesson comes from a three year water monitoring project done by the same students from the Newburgh Magnet Middle School during the school years 1992-3, 1993-4, and 1994-5. The students monitored water from 54 different sites in Black Rock Forest during these years. When the pH of the sites was placed against the elevation of the sites, a clear trend was evident: higher elevated sites had lower pH readings while the lower sites had higher pH readings. It seemed that as water flowed through the forest, it was neutralized - became less acidic. The data collection and data analysis process revealed a phenomenon that required investigation - Why and How was this change in pH happening?*

Objectives

1. Students will enter data given to them using the eMate 300. (Newton Works spreadsheet)
2. Students will use the eMate to produce a chart (X - Y scatter graph) representing the data.
3. Students will examine the graph for patterns and trends.
4. Students will draw conclusions from the analysis.
5. Students will repeat this process using data from the next two years to evaluate conclusions drawn from the first analysis.

Materials

3 year water monitoring data, eMate 300 computer, PowerMac with printer.

Procedure

1. Practice and review using the eMate computer, especially the "make a chart" features. Student are to work in teams.
2. Distribute the first year water data - 54 sites with pH and elevation.
3. Enter data and make a chart. Upload data and print graph.
4. Analyze data and form conclusions.
5. Repeat using data from the next two years. Are the results the same? What research opportunities can be drawn from these conclusions? What more is there to do?

Evaluation

1. Rate students' skill using the eMate with entering data, making the chart, and uploading data.
2. Rate students' skill regarding drawing conclusions and presenting their findings.

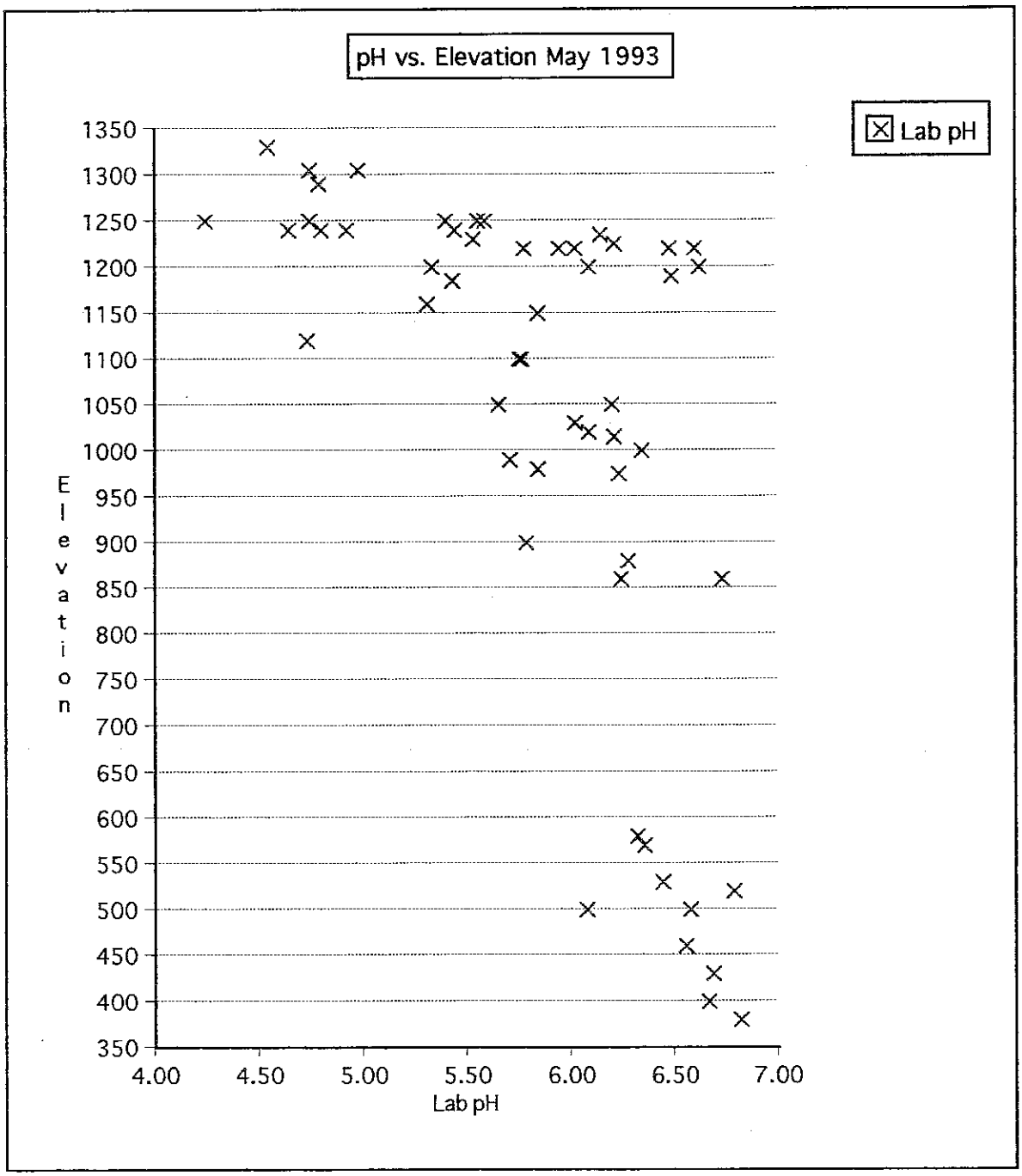
Note - Remember the students did not perform the field work. They did not collect the data used in this model. They will need to practice these skills. The key issue here is to get the students to see that data collection and data analysis will often generate a research investigation.

Site	Site Name	Drainage	Class	Group	Student Name
1	E. Branch Canterbury Brook at Hulse Road	Canterbury Brook	North	1(Canterbury Brook)	Wes Needham
2	Two Gates Spring	Canterbury Brook	North	1(Canterbury Brook)	Natisha McQueen
3	E Fork W Branch Canterbury Brook at Hall Road	Canterbury Brook	North	1(Canterbury Brook)	Joseph Reardon
4	W Fork W Branch Canterbury Brook at Sackett Trail	Canterbury Brook	North	1(Canterbury Brook)	Shawn McVoy
5	E Branch Canterbury Brook at Continental Road	Canterbury Brook	North	1(Canterbury Brook)	Lemar Hinson
6	Canterbury Brook at exit from Forest	Canterbury Brook	North	1(Canterbury Brook)	(John Brady)
7	S Tributary to Upper Reservoir below wetlands	Black Rock Brook	North	2(Upper Reservoir)	Michael Tuna
8	Swamp Trail Tributary to Upper Reservoir	Black Rock Brook	North	2(Upper Reservoir)	Sondra Barker
9	S Tributary to Upper Reservoir at jeep road	Black Rock Brook	North	2(Upper Reservoir)	Jermaine Monroe
10	Upper Reservoir	Black Rock Brook	North	2(Upper Reservoir)	Richard Haviland
11	Upper Reservoir outflow before Black Rock Brook	Black Rock Brook	North	2(Upper Reservoir)	Faithia Green
12	Black Rock Brook before Upper Reservoir outflow	Black Rock Brook	North	2(Upper Reservoir)	Anna Chaves
13	Black Rock Brook before Chlorinator	Black Rock Brook	North	3(Lower Black Rock)	Valerie Lamb
14	Deer Hill Tributary to Black Rock Brook	Black Rock Brook	North	3(Lower Black Rock)	Mindy Erden
15	Black Rock Mountain Tributary to Black Rock Brook	Black Rock Brook	North	3(Lower Black Rock)	Michael Harrison
16	Lower Reservoir	Black Rock Brook	North	3(Lower Black Rock)	Leanne Scalli
17	Black Rock Brook at Exit from Forest	Black Rock Brook	North	3(Lower Black Rock)	Yajaira Vasquez
18	Black Rock Brook at Forest Headquarters	Black Rock Brook	North	3(Lower Black Rock)	Mindy Erden
19	Upper Cascade Brook at Carpenter Road	Cascade Brook	Central	1(Glycerine Hollow)	James Bradbury
20	Lower Cascade Brook at Old West Point Road	Cascade Brook	Central	1(Glycerine Hollow)	Mike Doty
21	Cascade Brook at bottom of Glycerine Hollow	Cascade Brook	Central	1(Glycerine Hollow)	Kate DeLemos
22	Cascade Brook at top of Glycerine Hollow	Cascade Brook	Central	1(Glycerine Hollow)	Eynd Collazo
23	Rattlesnake Hill Tributary to Bog Meadow Pond	Bog Meadow	Central	1(Glycerine Hollow)	Laguardia Clegg
24	Birch Spring Tributary to Aleck Meadow Reservoir	Black Rock Brook	Central	2(Aleck Meadow)	Allie Shiels
25	Swamp Trail Tributary to Aleck Meadow Reservoir	Black Rock Brook	Central	2(Aleck Meadow)	Jen Skibitsky
26	Aleck Meadow Reservoir	Black Rock Brook	Central	2(Aleck Meadow)	Jaison Serrano
27	Upper Black Rock Brook	Black Rock Brook	Central	2(Aleck Meadow)	Jon Williams
28	Upper Ponds Tributary at Aleck Meadow Reservoir	Black Rock Brook	Central	2(Aleck Meadow)	Pedro Villarreal
29	Upper Ponds Tributary at White Oak Road	Black Rock Brook	Central	2(Aleck Meadow)	Jen Lofaro
30	Arthur's Pond below Chatfield House	Black Rock Brook	Central	3(Sphagnum/Arthurs)	Shannon Hawxhurst
31	Arthur's Pond at Spillway	Black Rock Brook	Central	3(Sphagnum/Arthurs)	Brandon Datoli
32	Arthur's Pond outflow	Black Rock Brook	Central	3(Sphagnum/Arthurs)	Carissa Whitney
33	Tamarack/Sphagnum outflow at White Oak Road	Black Rock Brook	Central	3(Sphagnum/Arthurs)	Peter Nugent
34	Tamarack/Sphagnum outflow below diversion	Black Rock Brook	Central	3(Sphagnum/Arthurs)	Marcella Jacobs
35	Sphagnum Pond outflow at pipe	Black Rock/Canterbury	Central	3(Sphagnum/Arthurs)	Angie Ortiz
36	Sphagnum Swamp outflow	Black Rock/Canterbury	Central	3(Sphagnum/Arthurs)	Marcus Brown
37	Tamarack Pond at the Pines	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Josh Arnold

38	East Tributary to Tamarack Pond	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Annie Williams
39	Tamarack Pond at Lunch Rock	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Karina Quinonez
40	Sphagnum Pond inflow from Tamarack Pond	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Steven Smith
41	Sphagnum Pond	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Michael Laurino
42	Sphagnum Pond outflow below dam	Black Rock/Canterbury	South	1(Tamarack/Sphagnum)	Diana Andrews
43	Arthur's Spring	Black Rock Brook	South	2(Jim's Pond)	James Wilson
44	Jim's Pond outflow	Jim's Pond	South	2(Jim's Pond)	Patty Deyo
45	Jim's Pond at Causeway	Jim's Pond	South	2(Jim's Pond)	Alicia Keyser
46	Jim's Pond W end	Jim's Pond	South	2(Jim's Pond)	Yashsmika Stevenso
47	Wilkin's Pond inflow at Jim's Pond Road	Wilkin's Pond	South	2(Jim's Pond)	Travis Hays
48	Cat Hollow inflow	Cat Hollow	South	2(Jim's Pond)	J. Robles/E. Bowen
49	N end Sutherland Pond	Mineral Spring	South	3(Sutherland Pond)	Nathan Brown
50	W end Sutherland Pond	Mineral Spring	South	3(Sutherland Pond)	David Burgoa
51	Sutherland Pond wetlands, North	Mineral Spring	South	3(Sutherland Pond)	Chris Potter
52	Sutherland Pond wetlands, South	Mineral Spring	South	3(Sutherland Pond)	Nicholas Politi
53	Mineral Spring Brook at Sutherland Pond Road	Mineral Spring	South	3(Sutherland Pond)	Melissa Smith
54	O'Dell's Spring	Mineral Spring	South	3(Sutherland Pond)	April Stecher

Black Rock Forest Water Monitoring Project
May 1993

Site Number	Field pH	Elevation	Lab pH	Elevation
1	6.00	1226	6.21	1226
2	5.50	1200	5.33	1200
3	6.00	1100	5.77	1100
4	6.25	1100	5.76	1100
5	6.50	860	6.25	860
6	6.50	500	6.58	500
7	6.50	1050	6.20	1050
8	6.00	990	5.71	990
9	6.50	980	5.85	980
10	7.50	975	6.23	975
11	8.00	580	6.32	580
12	8.00	570	6.36	570
13	6.00	530	6.44	530
14	7.00	520	6.79	520
15	6.00	500	6.08	500
16	7.00	460	6.55	460
17	7.00	400	6.67	400
18	7.00	380	6.82	380
19	5.50	1120	4.73	1120
20	6.00	860	6.73	860
21	6.00	880	6.28	880
22	5.50	900	5.79	900
23	5.50	1184	5.43	1184
24	6.00	1050	5.65	1050
25	6.00	1030	6.02	1030
26	6.00	1016	6.21	1016
27	6.00	1000	6.34	1000
28	6.00	1020	6.09	1020
29	6.00	1200	6.09	1200
30	6.00	1220	6.02	1220
31	6.50	1220	5.94	1220
32	6.50	1200	6.62	1200
33	6.50	1190	6.49	1190
34	6.50	1220	6.60	1220
35	6.50	1220	6.48	1220
36	6.00	1220	5.78	1220
37	5.00	1305	4.98	1305
38	5.00	1330	4.54	1330
39	5.00	1305	4.75	1305
40	5.00	1290	4.79	1290
41	5.50	1240	4.92	1240
42	6.00	1236	6.14	1236
43	5.50	1250	5.59	1250
44	6.00	1230	5.53	1230
45	5.00	1240	4.92	1240
46	5.00	1240	4.80	1240
47	5.50	1160	5.31	1160
48	6.00	1150	5.85	1150
49	5.50	1250	5.56	1250
50	5.50	1250	5.40	1250
51	5.00	1250	4.74	1250
52		1250	4.25	1250
53	5.00	1240	4.65	1240
54	5.50	1240	5.45	1240

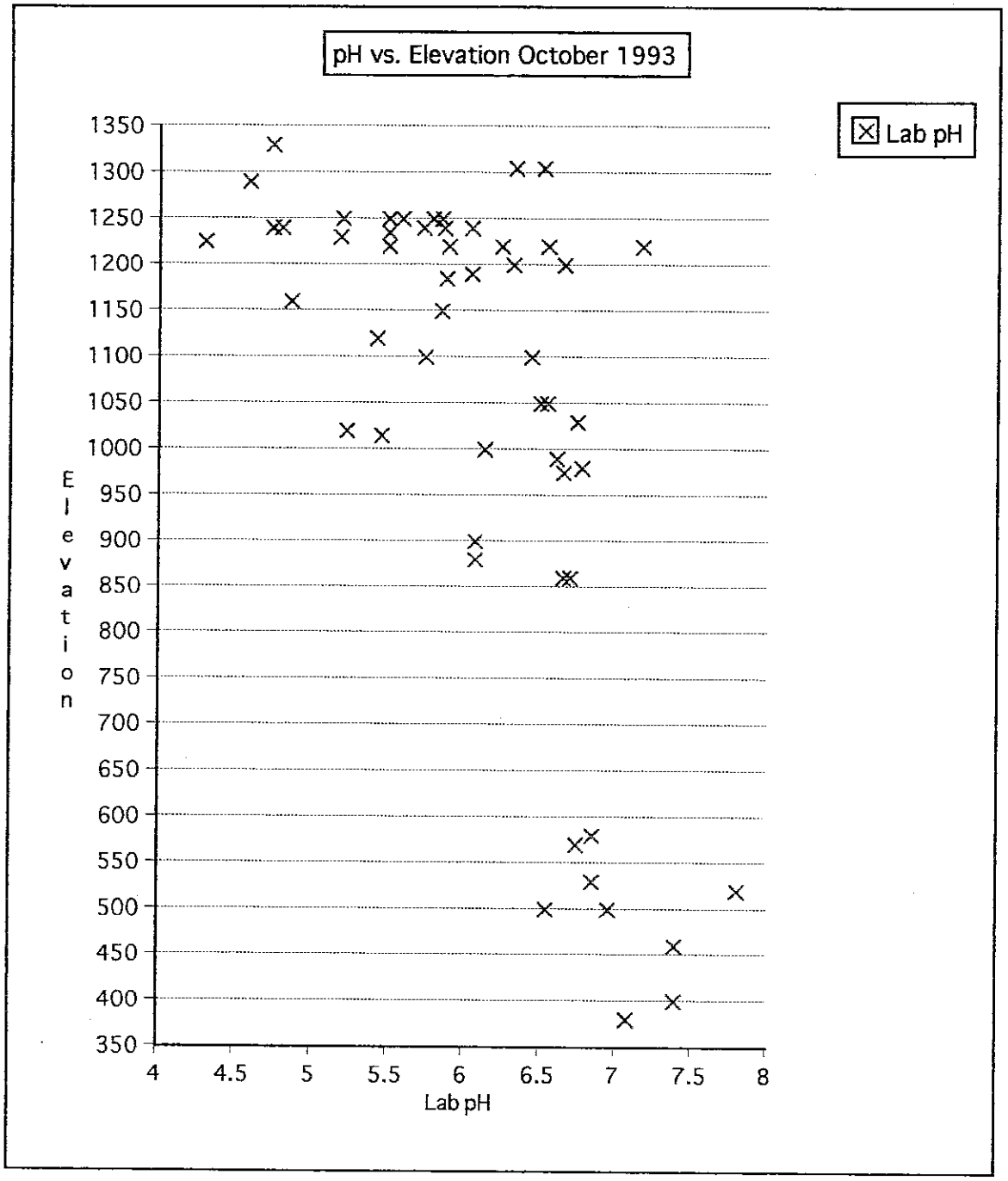

pH vs. Elevation May 1993
Lab pH
Elevation
1350
1300
1250
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
4.00
4.50
5.00
5.50
6.00
6.50
7.00
Lab pH

Site Number	Site Name	Drainage
1	E. Branch Canterbury Brook at Hulse Road	Canterbury Brook
2	Two Gates Spring	Canterbury Brook
3	E Fork W Branch Canterbury Brook at Hall Road	Canterbury Brook
4	W Fork W Branch Canterbury Brook at Sackett Trail	Canterbury Brook
5	E Branch Canterbury Brook at Continental Road	Canterbury Brook
6	Canterbury Brook at exit from Forest	Canterbury Brook
7	S Tributary to Upper Reservoir below wetlands	Black Rock Brook
8	Swamp Trail Tributary to Upper Reservoir	Black Rock Brook
9	S Tributary to Upper Reservoir at jeep road	Black Rock Brook
10	Upper Reservoir	Black Rock Brook
11	Upper Reservoir outflow before Black Rock Brook	Black Rock Brook
12	Black Rock Brook before Upper Reservoir outflow	Black Rock Brook
13	Black Rock Brook before Chlorinator	Black Rock Brook
14	Deer Hill Tributary to Black Rock Brook	Black Rock Brook
15	Black Rock Mountain Tributary to Black Rock Brook	Black Rock Brook
16	Lower Reservoir	Black Rock Brook
17	Black Rock Brook at Exit from Forest	Black Rock Brook
18	Black Rock Brook at Forest Headquarters	Black Rock Brook
19	Upper Cascade Brook at Carpenter Road	Cascade Brook
20	Lower Cascade Brook at Old West Point Road	Cascade Brook
21	Cascade Brook at bottom of Glycerine Hollow	Cascade Brook
22	Cascade Brook at top of Glycerine Hollow	Cascade Brook
23	Rattlesnake Hill Tributary to Bog Meadow Pond	Bog Meadow
24	Birch Spring Tributary to Aleck Meadow Reservoir	Black Rock Brook
25	Swamp Trail Tributary to Aleck Meadow Reservoir	Black Rock Brook
26	Aleck Meadow Reservoir	Black Rock Brook
27	Upper Black Rock Brook	Black Rock Brook
28	Upper Ponds Tributary at Aleck Meadow Reservoir	Black Rock Brook
29	Upper Ponds Tributary at White Oak Road	Black Rock Brook
30	Arthur's Pond below Chatfield House	Black Rock Brook
31	Arthur's Pond at Spillway	Black Rock Brook
32	Arthur's Pond outflow	Black Rock Brook
33	Tamarack/Sphagnum outflow at White Oak Road	Black Rock Brook
34	Tamarack/Sphagnum outflow below diversion	Black Rock Brook
35	Sphagnum Pond outflow at pipe	Black Rock/Canterbury
36	Sphagnum Swamp outflow	Black Rock/Canterbury
37	Tamarack Pond at the Pines	Black Rock/Canterbury
38	East Tributary to Tamarack Pond	Black Rock/Canterbury
39	Tamarack Pond at Lunch Rock	Black Rock/Canterbury
40	Sphagnum Pond inflow from Tamarack Pond	Black Rock/Canterbury
41	Sphagnum Pond	Black Rock/Canterbury
42	Sphagnum Pond outflow below dam	Black Rock/Canterbury
43	Arthur's Spring	Black Rock Brook
44	Jim's Pond outflow	Jim's Pond
45	Jim's Pond at Causeway	Jim's Pond

46	Jim's Pond W end	Jim's Pond
47	Wilkin's Pond inflow at Jim's Pond Road	Wilkin's Pond
48	Cat Hollow inflow	Cat Hollow
49	N end Sutherland Pond	Mineral Spring
50	W end Sutherland Pond	Mineral Spring
51	Sutherland Pond wetlands, North	Mineral Spring
52	Sutherland Pond wetlands, South	Mineral Spring
53	Mineral Spring Brook at Sutherland Pond Road	Mineral Spring
54	O'Dell's Spring	Mineral Spring
55	Mineral Spring Falls	Mineral Spring
56	Bog Meadow outflow	Bog Meadow
57	Cascade Brook at Route 9W	Cascade Brook
58	White Oak wetlands	?
59	Upper Deer Hill drainage	Black Rock Brook
60	Lower Canterbury Brook	Canterbury Brook
61	Canterbury Brook at Academy Avenue	Canterbury Brook
62	Hudson River at Cornwall Landing	Hudson River
63	CBR Ranch drainage	Canterbury Brook
64	BRF Precipitation	n/a
65	BRF Precipitation	n/a
66	BRF Precipitation	n/a

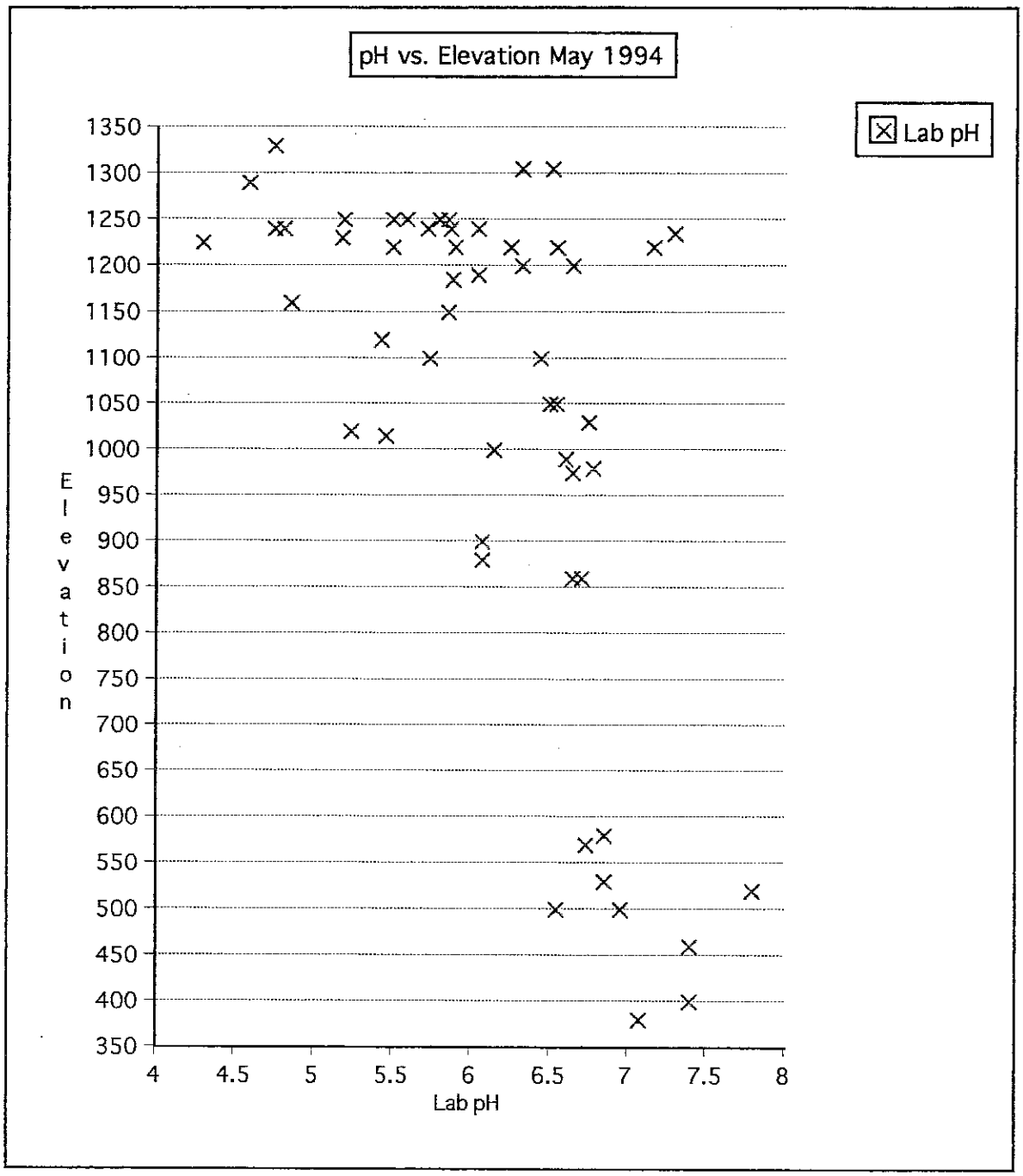
Elevation	Student Name	Field pH	Lab pH
1226	Wes Needham	6	4.3
1200	Natisha McQueen	5.5	6.65
1100	Joseph Reardon	6	5.74
1100	Shawn McVoy	6	6.44
860	Lemar Hinson	6	6.7
500	(John Brady)	6.5	6.54
1050	Michael Tuna	6	6.5
990	Sondra Barker	6	6.6
980	Jermaine Monroe	6.5	6.78
975	Richard Haviland	6.5	6.65
580	Faithia Green	6.5	6.85
570	Anna Chaves	6.5	6.74
530	Valerie Lamb	6	6.85
520	Mindy Erden	7.5	7.8
500	Michael Harrison	6.5	6.95
460	Leanne Scalli	7	7.4
400	Yajaira Vasquez	7	7.4
380	Mindy Erden	7	7.08
1120	James Bradbury	5.5	5.42
860	Mike Doty	6	6.65
880	Kate DeLemos	6	6.08
900	Eynd Collazo	6	6.08
1184	Laguardia Clegg	5.5	5.88
1050	Allie Shiels	6	6.55
1030	Jen Skibitsky	6	6.75
1016	Jaison Serrano	6	5.46
1000	Jon Williams	6.5	6.14
1020	Pedro Villarreal	6	5.23
1200	Jen Lofaro	6.25	6.65
1220	Shannon Hawxhurst	6	5.5
1220	Brandon Datoli	6	6.25
1200	Carissa Whitney	6.5	6.32
1190	Peter Nugent	6	6.05
1220	Marcella Jacobs	5.75	6.55
1220	Angie Ortiz	6.25	7.16
1220	Marcus Brown	5.5	5.9
1305	Josh Arnold	6	6.52
1330	Annie Williams	4.5	4.75
1305	Karina Quinonez	6	6.33
1290	Steven Smith	5	4.59
1240	Michael Laurino	5.5	4.81
1236	Diana Andrews	5.5	5.5
1250	James Wilson	5.75	5.19
1230	Patty Deyo	5.25	5.18
1240	Alicia Keyser	5.25	5.87

1240	Yashsmika Stevenson	5.75	4.75
1160	Travis Hays	5.75	4.86
1150	J. Robles/E. Bowen	5.5	5.85
1250	Nathan Brown	5.5	5.79
1250	David Burgoa	5	5.5
1250	Chris Potter	4.5	5.59
1250	Nicholas Politi	4.5	5.85
1240	Melissa Smith	5.5	6.05
1240	April Stecher	5.5	5.72
430	n/a		
795	n/a		
610	n/a	7	
1080	n/a		
520	n/a	7.5	7.25
400	n/a		
250	n/a	6.5	6.9
0	n/a	7.5	7.45
350	n/a	7	7.13
	n/a	4.5	4.8
	n/a		
	n/a		


pH vs. Elevation October 1993
Lab pH
Elevation
1350
1300
1250
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
4
4.5
5
5.5
6
6.5
7
7.5
8
Lab pH

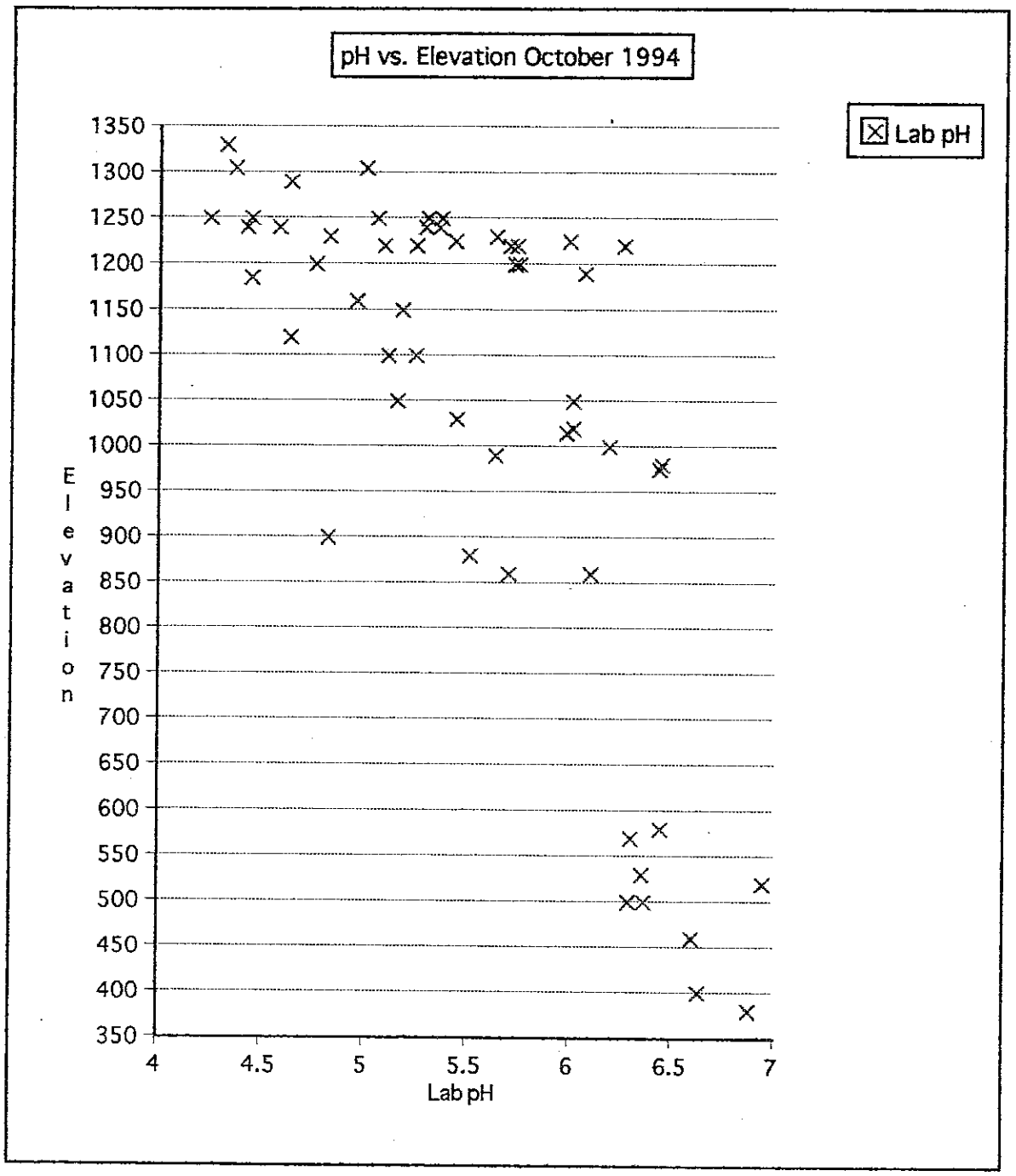
Black Rock Forest Water Monitoring Project
May 1994

Site Number	Field pH	Elevation	Lab pH	Elevation
1	6	1226	4.3	1226
2	5.5	1200	6.65	1200
3	6	1100	5.74	1100
4	6	1100	6.44	1100
5	6	860	6.7	860
6		500	6.54	500
7	6	1050	6.5	1050
8	6	990	6.6	990
9	6.5	980	6.78	980
10	6.5	975	6.65	975
11	6.5	580	6.85	580
12	6.5	570	6.74	570
13	6	530	6.85	530
14	7.5	520	7.8	520
15	6.5	500	6.95	500
16	7	460	7.4	460
17	7	400	7.4	400
18	7	380	7.08	380
19	5.5	1120	5.42	1120
20	6	860	6.65	860
21	6	880	6.08	880
22	6	900	6.08	900
23	5.5	1184	5.88	1184
24	6	1050	6.55	1050
25	6	1030	6.75	1030
26	6	1016	5.46	1016
27	6.5	1000	6.14	1000
28	6	1020	5.23	1020
29	6.25	1200	6.65	1200
30	6	1220	5.5	1220
31	6	1220	6.25	1220
32	6.5	1200	6.32	1200
33	6	1190	6.05	1190
34	5.75	1220	6.55	1220
35	6.25	1220	7.16	1220
36		1220	5.9	1220
37		1305	6.52	1305
38		1330	4.75	1330
39		1305	6.33	1305
40		1290	4.59	1290
41		1240	4.81	1240
42		1236	7.3	1236
43	5.75	1250	5.19	1250
44	5.25	1230	5.18	1230
45	5.25	1240	5.87	1240
46	5.75	1240	4.75	1240
47	5.75	1160	4.86	1160
48	5.5	1150	5.85	1150
49	5.5	1250	5.79	1250
50	5	1250	5.5	1250
51	4.5	1250	5.59	1250
52	4.5	1250	5.85	1250
53	5.5	1240	6.05	1240
54	5.5	1240	5.72	1240


pH vs. Elevation May 1994
Lab pH
Elevation
1350
1300
1250
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
4
4.5
5
5.5
6
6.5
7
7.5
8
Lab pH

Black Rock Forest Water Monitoring Project
October 1994

Site Number	Field pH	Elevation	Lab pH	Elevation
1	6	1226	5.99	1226
2	5.4	1200	4.76	1200
3	5.7	1100	5.11	1100
4	6	1100	5.25	1100
5	5.75	860	6.1	860
6	7.5	500	6.37	500
7	5.5	1050	6.01	1050
8	6	990	5.63	990
9	6.5	980	6.45	980
10	6.75	975	6.43	975
11	6.5	580	6.44	580
12	6.5	570	6.3	570
13	6.75	530	6.36	530
14	7.25	520	6.95	520
15	6.25	500	6.29	500
16	7	460	6.6	460
17	7	400	6.63	400
18	6.9	380	6.88	380
19	5	1120	4.63	1120
20	5	860	5.7	860
21	5.5	880	5.51	880
22	5	900	4.82	900
23	5	1184	4.45	1184
24	5.75	1050	5.16	1050
25	6	1030	5.44	1030
26	6.25	1016	5.98	1016
27	6.75	1000	6.19	1000
28	6	1020	6.01	1020
29	6	1200	5.72	1200
30	6	1220	5.73	1220
31	6	1220	5.7	1220
32	6.5	1200	5.75	1200
33	6.5	1190	6.07	1190
34	6.5	1220	6.26	1220
35	5.5	1220	5.24	1220
36	5.5	1220	5.09	1220
37	5.25	1305	5	1305
38	4.5	1330	4.32	1330
39	5.5	1305	4.37	1305
40	5.5	1290	4.63	1290
41	5.25	1240	4.58	1240
42	6	1230	4.82	1230
43	5.5	1250	5.3	1250
44	6	1230	5.63	1230
45	6	1240	5.29	1240
46	6	1240	5.36	1240
47	5.5	1160	4.96	1160
48	6	1150	5.18	1150
49	5.1	1250	5.06	1250
50	6	1250	5.37	1250
51	5	1250	4.45	1250
52	4.3	1250	4.24	1250
53	5.5	1240	4.42	1240
54	5.5	1225	5.43	1225


pH vs. Elevation October 1994
Lab pH
Elevation
1350
1300
1250
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
4
4.5
5
5.5
6
6.5
7
Lab pH

Preparation for Trip #1 - Making the Profile of the Research Site

The goal of this pre-field work activity is to practice the skills needed to make a profile of the research site.

Objectives

1. Students will work in teams of 3 to 4 students a team.
2. Students will prepare the materials and supply kits for the project.
3. Students will practice using the tools needed to complete the profile.
4. Students will practice using the eMate 300 to record the data from the practice activities.

Materials

Prepare a measurement and supplies kit - a thermometer, a compass, pencils, paper, ruler, measuring tape, measuring string, magnifying lense, water collecting bottle/jar, sheets of plastic, plastic baggies, color pencils.

Additional Materials

pH testing kit, identification books for animal, tree, and water life, camcorder, camera, eMate 300.

Procedures

•Use the Middle School Outdoor Classroom (wooded area with pond behind the school) for practice.

•Develop skills needed to be complete the project. These include:
measuring temperature and distance, making a rough map of the site, using a field guidebook to identify plant and animal life, recording data on the eMate, uploading information to PowerMac, reading a compass, using the pH test kit, working in a cooperative group, using the camera and camcorder.

Evaluation

Use the checklist, Are you ready for forest field work?

Preparation for Trips #2 to #5
the Black Rock Forest Site & Field Work Activities

The goal of this prepartory lesson is to review and rehearse skills needed by the students to return to the Black Rock Forest research site.

Background Information

By the time trips #2 through #5 come due, we will be in the late winter and spring. It will be necessary to renew the students skills and interest in the project. They will need to move the project forward by practicing the new skills of data analysis, drawing conclusions, and making presentations using data from a Water Monitoring Project done by middle school students at Black Rock Forest from 1993 to 1994.

Objectives

1. Students will assess their knowledge of the eMate 300, recall their research sites, and rehearse the skills needed to continue with the project.
2. Students will practice the skills of data entry (spreadsheet and make a chart), data analysis, and drawing conclusions using data from a Black Rock Forest Water Monitoring Project.
3. Students will produce correct representations of the data using the computers.
4. Students in teams will present their conclusions based on the Water Monitoring Project to the class.

Procedures

Provide plenty of opportunities for the students to refresh all their Black Rock Forest skills. Make it known that they are now to move the project to the next level by analyzing data, drawing conclusions from the data, and presenting this information to the class. All this practice will lead toward replicating their classmates work.

Evaluation

Use the scoring guide, Rating the Representations of Data, and the rubric, Making a Presentation.

Trip #1 - the Black Rock Forest Site & Field Work Activities

The goal of Trip #1 is to complete a profile of the research area.

Background Information

The main research area is a small forest stream that flows into a reservoir. Six smaller sites, one site for each student team, will be cut from this general area. Each site will be identified (flagged) inside this main area. A research site will run 20 feet along the stream and extend twenty feet from each side of the stream, making the total area of team research site 800 square feet (20' x 40'). The first site will begin at the mouth of the stream where the stream empties into the reservoir. Each successive site follows the stream back toward its source.

Objectives

1. Students work in teams of 3 to 4 students a team.
2. Students implement plans for field work. Plans include using the field computer, a camera, and a camcorder.
3. Students display appropriate behaviors to complete the profile.

Profile Activities

1. Implement your plan to record visual information about your assigned site using a camera and a camcorder (video camera). These images should help you remember your site, inform others about your site, and contribute to a full understanding of your site.

2. Implement your plan to record measurements about your assigned site using measuring tapes, thermometer, compass, pH test kit. Identify trees and other plant life, animal and water life as best you can. Keep files on your eMate computer. Your profile should include aspects of the biology, geology, chemistry of the site. Make drawings of your site using the computer. Accurately place all significant physical features on your drawing. Organize your data into a table using the computer. Keep a written record of all your observations using the computer.

Evaluation

Use the checklist, How does the field work data look?

Trips #2 and #3 - the Black Rock Forest Site & Field Work Activities

The goal of trips #2 and #3 is to collect and record all data from each team's original research site.

Background Information

For trips #2 and #3 students will return their original research sites. They will review the site profile and retake measurements to update the profile. The data collection phase of the project now begins. This will lead to analysis, conclusions, and presentations.

Objectives

1. Students will take measurements of their research site according to plan.
2. Students will make observations of their research site according to plan.
3. Students will record all data and observations using a field computer.

Procedures

Implement the plans each student team has prepared for Trips #2 And #3. These include a review and update of the site and a full data collection attempt.

Evaluation

Use the checklist, How does the field work data look?

Trips #4 and #5 - the Black Rock Forest Site & Field Work Activities

The goal of trips #4 and #5 is for each team to replicate the collection process at another research site.

Background Information

Before these trips, each team would have made a presentation to the class reporting their observations and conclusions from its first data collection attempt. They will receive the profile information of another site in order to perform a second data collection attempt at this new research site.

Objectives

1. Students will locate the new research site using another team's profile information.
2. Students will review and update the profile information of the new site.
3. Students will perform data collection procedures as usual.

Procedures

Implement the plans each student team has prepared for Trips #4 And #5. These include a review and update of the new research site profile and a full data collection attempt there.

Evaluation

Use the checklist, How does the field work data look?

Post Black Rock Forest Field Work
Analyzing Data, Drawing Conclusions, and Making Presentations

The goal of this set of activities is bring the project to its ultimate conclusion.

Background Information

All field work is now completed. Students, in teams, have made presentations of their own work done on trips#2 and #3 at the original research sites. They have just finished trips #4 and #5 at new sites, sites that another team had worked on previously. The teams are to analyze the data from the second site, draw conclusions from it, and present the findings to their classmates. This time the twist will be to see how well this second effort matches the first effort. After this is done, a final persistent thought must be address by each student to bring the project to a close - Did our work in Black Rock Forest result in any unanswered questions? Did any of our data cause us to wonder why or to ask questions? Is there more to do?

Objectives

1. Students analyze and draw conclusions data from the second sites.
2. Students present this second set of findings in light of the first set.
3. Students individually determine in a final report if the data collected calls for additional study.

Procedures

Allow students to fully analyze the data from the second site. This analysis must be done in light of the first effort at the site. This should lead to conclusions of how well the first and second attempts match or do not match. Findings are to be presented to classmates. Help students through discussion to move to another level of concern regarding new research initiatives as a result of our project. Each student must produce a written final report dealing with these considerations.

Evaluation

•Use the scoring guide, Rating the Representations of Data, and the rubric, Making a Presentation.

•Rate the final report of each student.

Assessment - Students Becoming Scientists Project

Part 1 - Pre-field Work Activities

Use a checklist to evaluate the level of preparedness of each student team.

Part 2 - Field Work - Recording Observations and Data on the eMate 300

Use a checklist to evaluate the thoroughness and organization of the recorded observations and data collection using the eMate 300.

Part 3 - Representing the Data Using the eMate 300

Using a rubric, evaluate the printed charts, tables, and graphs for clarity, accuracy, and thoroughness.

Part 4 - Making a Presentation

Using a rubric, evaluate each student team's presentation of data analysis and conclusion.

Part 5 - Individual Final Report

In a more traditional manner, rate a Final Report written by each student independentt of the team.

Newburgh Middle School and Black Rock Forest Project

Checklist - Are you ready for the Forest field work?

Names_____Date_____

_____

_____

Using the eMate 300 - Can you...?

- ☐ Save documents (naming documents)
- ☐ Record Observations in word processing
- ☐ Record Observations in drawing
- ☐ Record Data in spreadsheet

☐ **Supplies and Materials - Do you have...?**

- ☐ paper and pencils
- ☐ thermometer
- ☐ compass
- ☐ measuring string
- ☐ masking tape
- ☐ field guidebooks (plants and animals)

Measuring Skills - Have you practiced...?

- ☐ pacing
- ☐ reading the compass
- ☐ using the measuring string
- ☐ reading the thermometer
- ☐ doing a pH test

Planning for the Camera and Camcorder - Have you...?

- ☐ prepared a script for the camcorder
- ☐ planned to select four object/places to photograph

Newburgh Middle School and Black Rock Forest Project

Checklist - How does the field work data look?

Names_____Date_____

_____

_____

Using the eMate 300 - Did you...?

- ☐ Save all documents (name each document)
- ☐ Record Observations and Data in word processing
- ☐ Record Observations and Data in drawing
- ☐ Record Observations and Data in spreadsheet

Measuring Skills - Is the data...?

- ☐ accurately measured and recorded
- ☐ well-organized, easy to find, read, and understand

Using the Camera and Camcorder - Did you...?

- ☐ fully and accurately video-record your site
- ☐ photograph four significant objects/places which define your site

Team Work - Did each team member...?

- ☐ make positive contributions.
- ☐ do his/her job well.
- ☐ help to complete the field work.

Comments - Make any comments that will help improve the project the next time we do field work. _____

_____

_____

_____

_____

Newburgh Middle School and Black Rock Forest Project

Post Field Work

Rating the Representations of Data

Names_____Date_____

_____

_____

Be sure you and your team members know how to connect the eMate 300 to the PowerMac. Documents you create on the eMate 300 must be uploaded to the PowerMac for storing, editing, and printing.

Your field work data must be put into charts, drawings, tables, and/or graphs in order to be presented to the class. These are representations of your field work data. You are to use the eMate and the PowerMac to do this. When you are done, print out your work and turn the work in for evaluation. Your work will be evaluated in the following areas:

- Clarity and Appearance - The representations are neat and well-organized. All parts are correctly labled and identified.
- Accuracy - The data displayed in the representations are accurately taken from the field work data. They are correctly shown in the representations.
- Thoroughness - All data is displayed in some type of representation. All data from the field work is accounted for.

Scoring -

- 4 points = highest quality, needs no improvements
- 3 points = acceptable quality, needs improvements in one area
- 2 points = questionable quality, needs improvement in all areas
- 1 points = unacceptable work, needs to be redone
- 0 points = assignment incomplete or not done

Score and Comments