TABLE OF CONTENTS

APPENDICIES

TABLE OF FIGURES AND PHOTOGRAPHS

INTRODUCTION

In May of 2003, the Tenmile Lakes Basin Partnership (TLBP) passed a motion initiating the development of Tenmile Lakes Watershed Monitoring Program as a part of implementing the Watershed Council's Action Plan and recommended activities that were recommended within the draft Tenmile Lakes TMDL.

With this direction, funding was obtained from the Oregon Watershed Enhancement Board, and the Department of Environmental Quality. Planning and scheduling began for Project Partners who included the Elliott State Forest, Menasha, City of Lakeside, Coos County and many individual landowners.

With several of the project tasks being annual ones and/or could only be implemented during specific times of the year, Osprey Nesting surveys and Lake surveys, this series of projects was completed in two years.

This report is to fulfill the TLBP's final report requirements of this monitoring project, grant 204-282. Work within this contract completed an approved QAPP, over 600 volunteer hours, in addition to our individual monitoring components as well as development of the Watershed Council's web page. All of these monitoring activities were specifically designed to provide information on the apparent decline of water quality and native fish habitat within the basin.

PROJECT EVALUATION

Overall, the Tenmile Lakes' Watershed Monitoring Project successfully completed all of the stated ten objectives on private and public lands within the watershed. Future monitoring efforts will be based on the Tenmile Lakes Water Quality Monitoring QAPP developed through this contract.

ACKNOWLEDGEMENTS

The Tenmile Lakes Basin Partnership would like to thank the many contributors that assisted in designing and conducting the monitoring plan of this project, without whose cooperation, getting a better understanding of watershed conditions would not have been possible.

Funding

Oregon Watershed Enhancement Board
Oregon Department of Environmental Quality - 319 program
City of Lakeside
Tenmile Lakes Basin Partnership
Coos County Health Department
Coos Soil and Water Conservation District
Elliott State Forest
U.S. Forest Service

Technical Assistance

Pam Blake (ODEQ)
Mike Northrop (USFS)

Landowner

Joe Goularte Jim Larsen
Bob Hankins Muffett Clan
Gary Wallace Dennis Fritz
Jim Linwood Elliott State Forest
Curt Haman

MONITORING PROTOCOLS

Watershed Council staff with the assistance of the site Landowner(s) conducted our bi-annual surveys of the project components of this monitoring program. The "Monitoring Teams" evaluated project sites and associated areas twice a year, during high and low flows. These surveys involve visiting a photo point to record current status of the project with a camera. Effectiveness Monitoring follows the guidelines established in the approved Tenmile Lakes Watershed Quality Assurance Plan 2004.

MONITORING COMPONENTS

The Tenmile Lakes Watershed Monitoring Project has successfully achieved 90% of our initial monitoring goals in addition to several sediment accural rate studies listed as priorities in the Tenmile Watershed Quality Assurance Project Plan.

PROJECT TYPE	NO. OF SITES	FEQUENCY	COMPLETE
1. Tenmile Lakes Watershed Quality Assurance Project Plan	N/A	N/A	X
2. Stream Crossings	30	2x per year	X
3. Nutrient Management	2	2x per year	X
4. Instream structures (boulder/LWD)	4	2x per year	X
5.Road Decommissioning	2	2x per year	X
6. Road/drainage improvements	2	2x per year	X
7. Riparian Plantings	11 reaches 10 micro sites	2x per year	X
8. Stream Temperatures	21	June - Oct Monthly Audits	X
9. Algae Composition	6	June - Oct Monthly sampling	X
10. Upslope erosion	9	2x per year	X
11. Eagle/Osprey Nesting and use	27	Bi-annual June surveys	X
12. Purple Martin Nesting Boxes	47	1x per year	Partial
13. Western Pond Turtle	5	1x per year	Partial
14. Delta Building	4	1x per year	X
15. Baseline Tributary Water Quality Monitoring	9 sites	3x per year	X
16. Storm Chasing Program	3	Various	X

More specific observations are available in the attached monitoring data sheets. In addition, a GIS map has been created to show project locations relative to the Tenmile watershed.

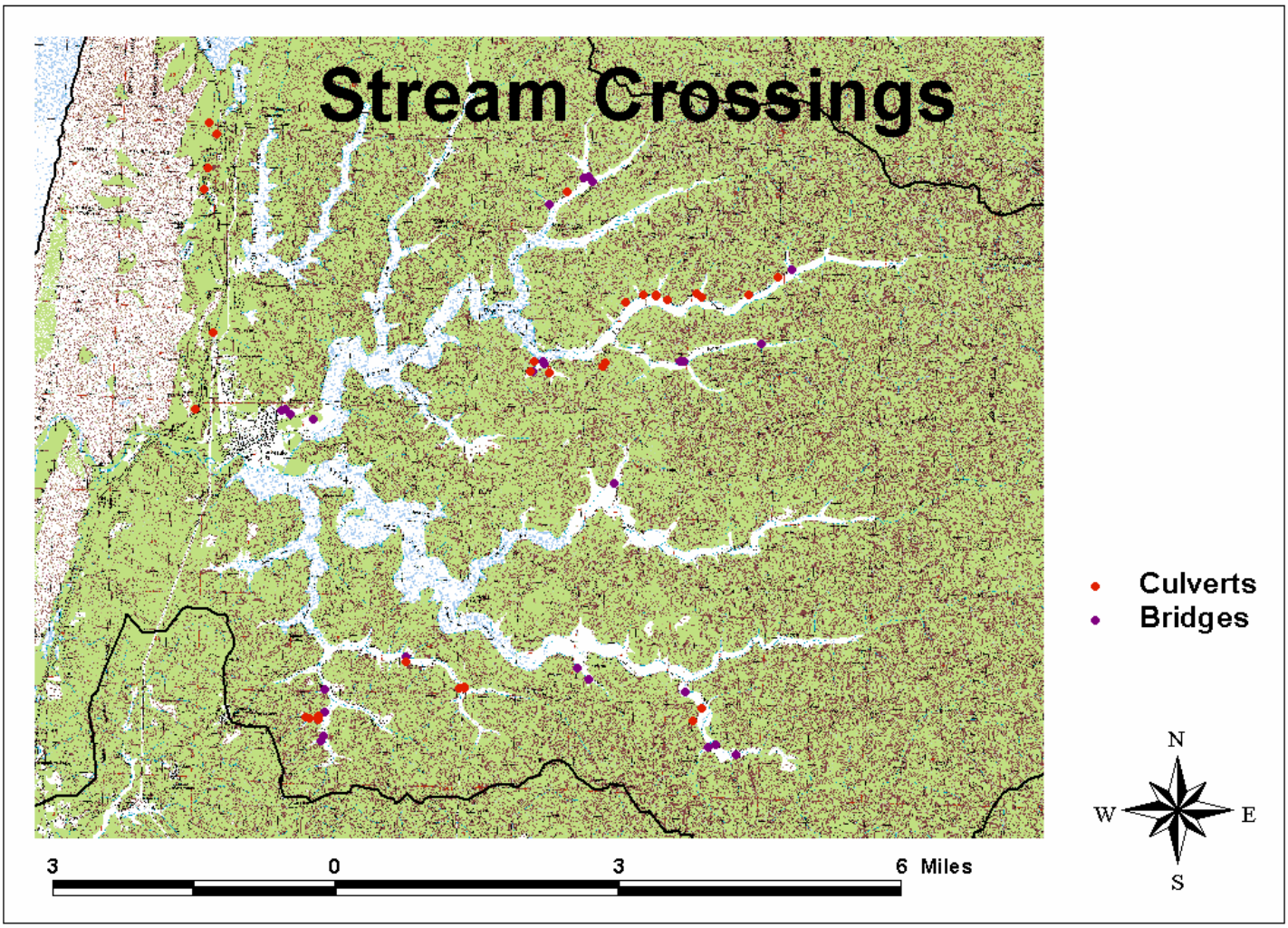
PROJECT TYPE RESULTS and DISCUSSION

Development of an approved QAPP to guide the Watershed Council's and Project Partners monitoring efforts was the first priority task undertaken by the Monitoring Coordinator supported by this funding. The Council's Monitoring Committee and ODEQ staff completed the draft document over the period of six months and the Tenmile Lakes Watershed Water Quality Project Plan was approved in March 2004. In addition, a cd with two annual monitoring presentations have been included with this report.

Thirty stream crossing upgrades, culverts replaced with bridges, were monitored for effectiveness of improving fish passage and reduction of sediment inputs from these sites. The monitoring question for project type number 1 is; Are storm related turbidity responses reduced? The results of our monitoring of these sites revealed that after an initial flushing of "stored" sediment behind these crossings, storm related turbidity is dramatically reduced when improperly placed and sized culverts are replaced with bridges. In addition, stream channels were observed to function more like the "natural" stream conditions and Coho fry were commonly observed using bridges as sanctuary from bird predations.

Photo 1. Summer monitoring photo of Goose Creek Bridge site.

Figure 1. GIS layer of monitoring sites for stream crossings.



Two Nutrient Management projects, located in the Big and Noble Creek subbasins were monitored to determine if project type reduced nutrient loading into the Lakes from these sites. Monitoring of these sites which included Nitrogen and Phosphorus grab samples and use of a turbidity meter. Monitoring revealed that actions within the Nutrient Management projects, bioswales and gutters to feed buildings have little impact on nutrients entering adjacent tributaries and Lakes from these livestock operations.

Figure 2. GIS layer of Nutrient monitoring sites.

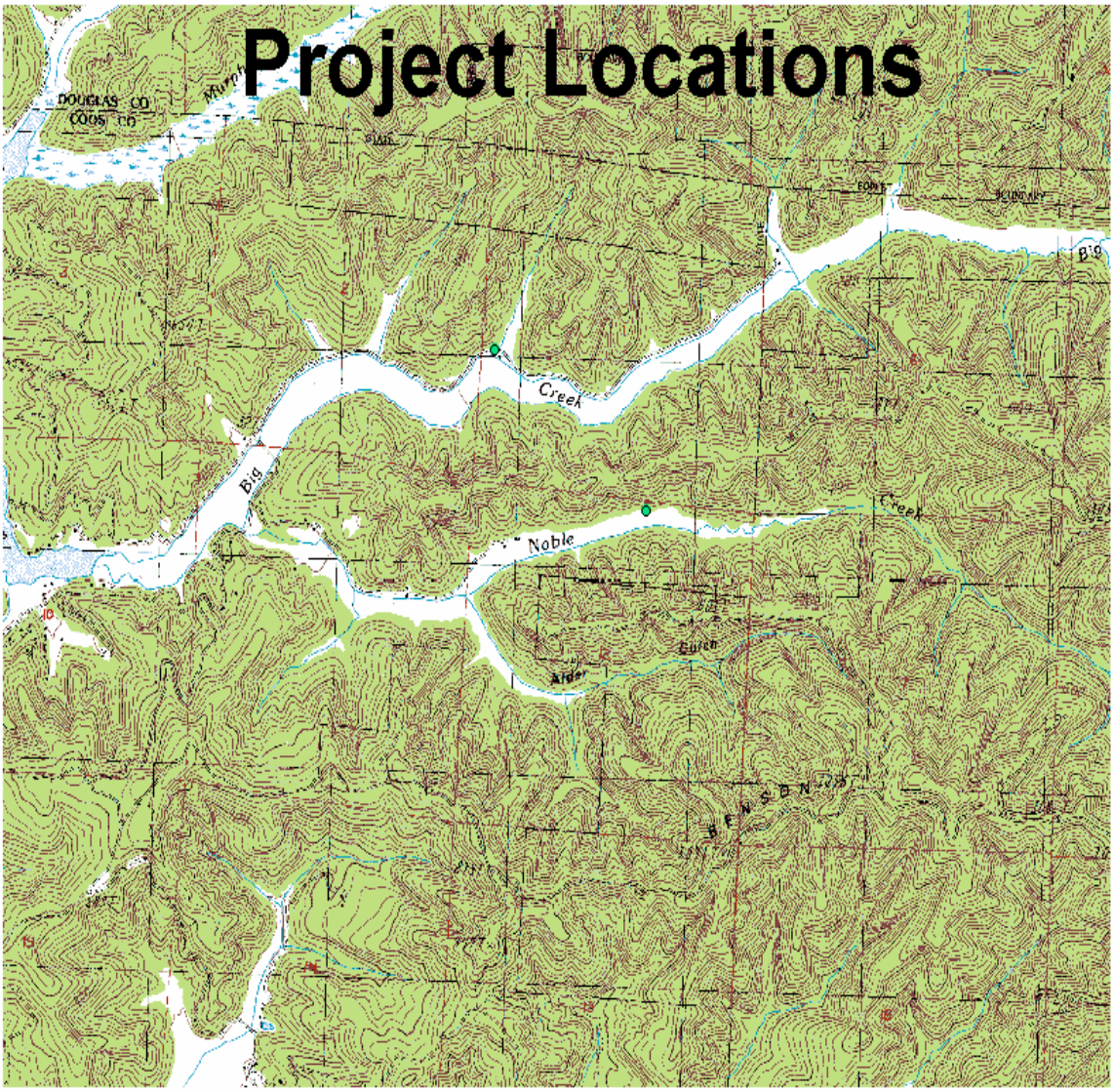


Photo 2. Big Creek Nutrient Management site.

Four Large Woody Debris projects located in the Big Creek and Robertson Creek were monitored over the period of this monitoring project. Monitoring during low and high flow events was implemented to determine effectiveness of structures improving stream habitat conditions. Monitoring revealed mixed results from this project type. For the Sunlake Tributaries of Big Creek, both LWD sites revealed that they added very little to channel complexity. With the amount of upslope erosion and soil movement through this system, both structures were completely buried by sediment during the first high flow event. Visual observations through winter reveal that the structures were unburied and buried under sediment through out the winter but did not create the rearing pools as designed and planned. The thirteen Red Cedar logs placed in Robertson Creek did not achieve any better results than those on Sunlake. None of these structures were cabled in and all moved significantly from one high water year to the next so did not improve stream habitat conditions on Robertson Creek. Visual observations of the Robertson LWD structures will be increased due to close proximity of structures to the Upper Robertson Bridge and Fence.

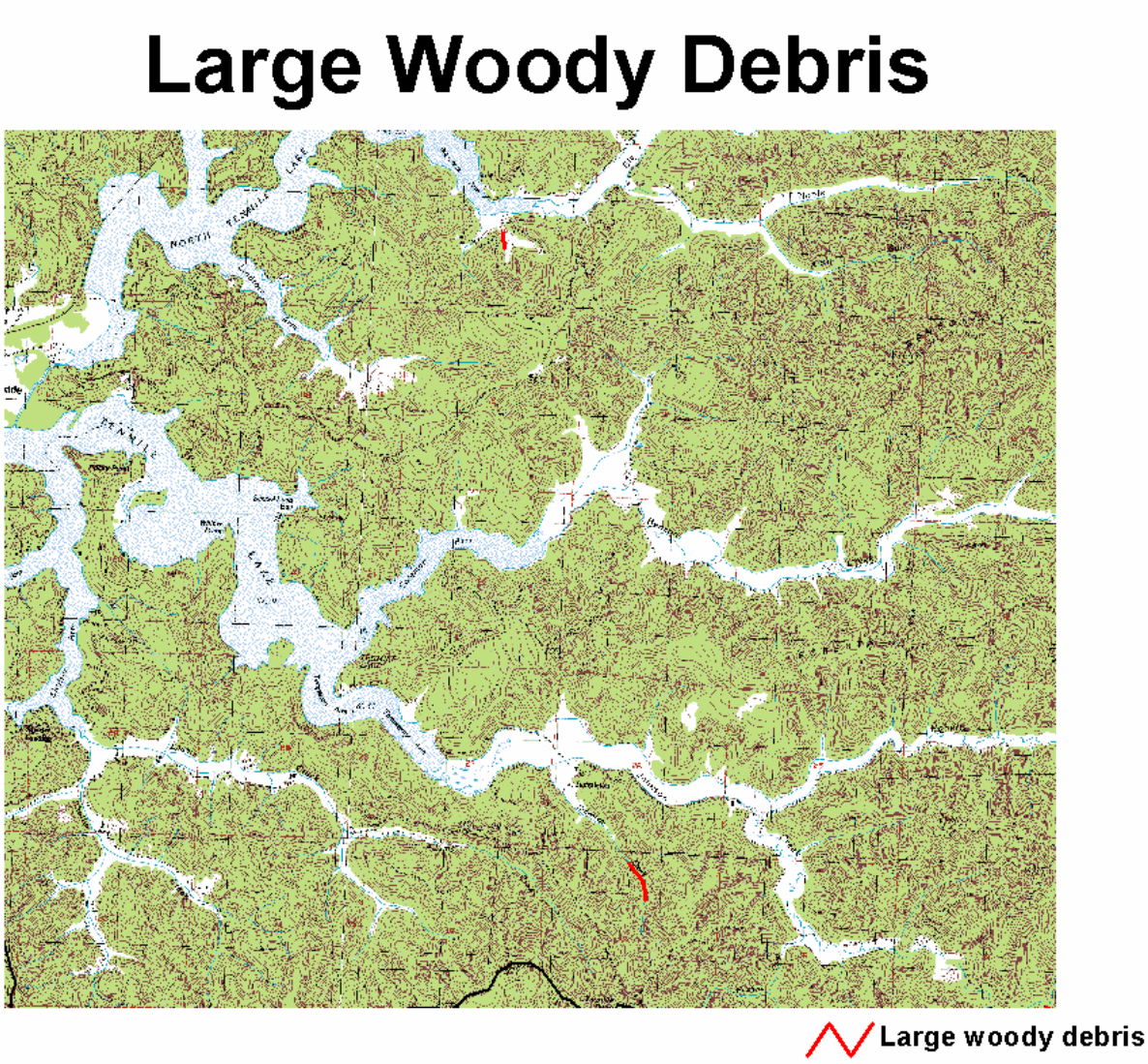


Figure 3. GIS layer of LWD monitoring locations.

Photo 3. Robertson LWD monitoring site.

This project supported effectiveness monitoring of two completed Road Decommissioning projects, the ESF 5100 road and 2100 road. The question that our monitoring sought to answer was did our activities reduce turbidity from these sites. With no Premonitoring of these sites it is very difficult to quantify results but our visual observations of these sites reveal that this type of project implemented correctly results in reduced sediment inputs from these Legacy roads. Its important to note that applying erosion control grass seed will most likely have to be reapplied due to shading from overhanging sources.

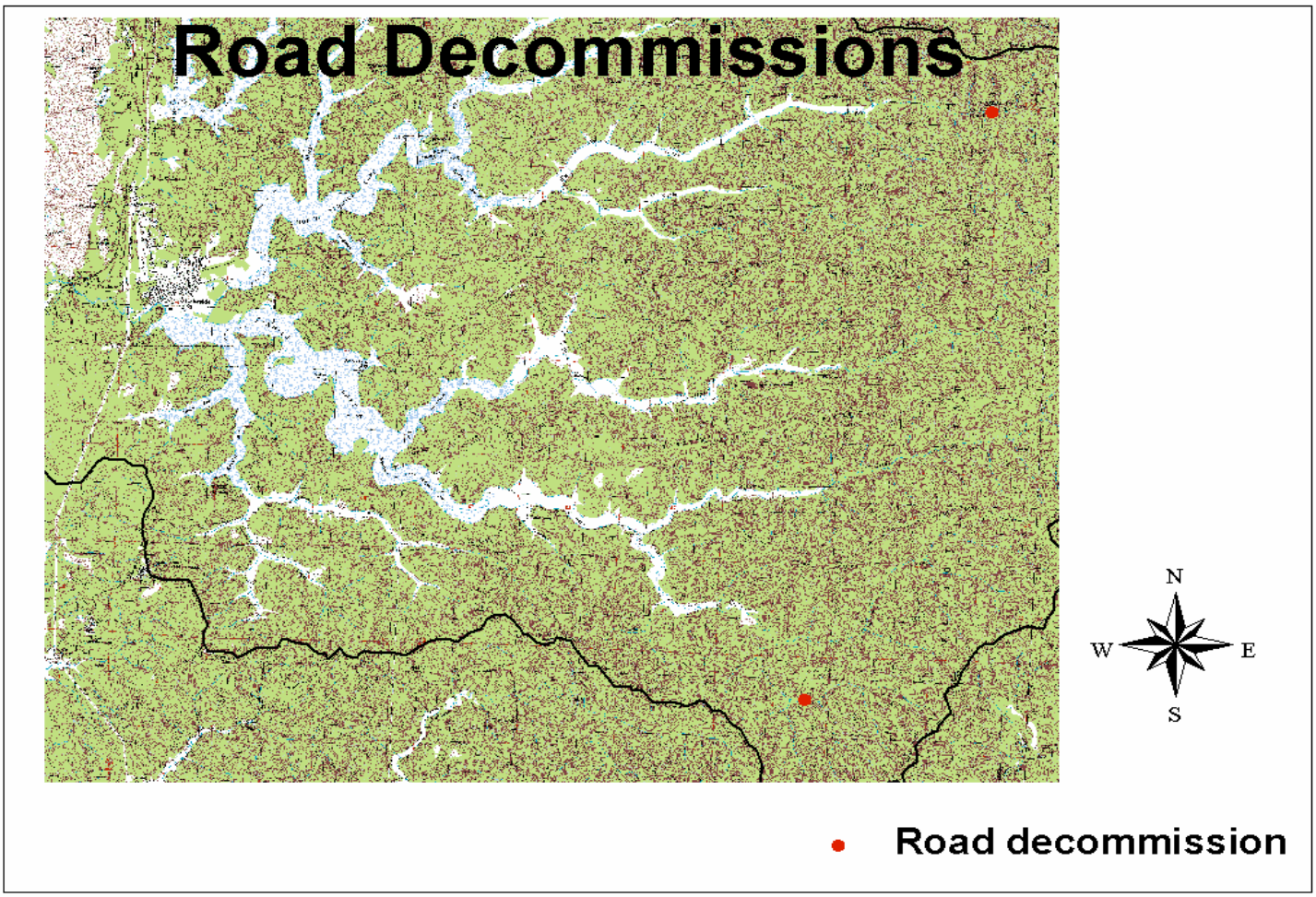


Figure 4. GIS layer of Road decommission monitoring sites.

Photo 4. 2100rd monitoring site.

Riparian planting along eleven stream reaches was monitored for effectiveness of improving shade conditions and decreasing stream temperatures. Our results are inconclusive at this time on how our riparian plantings are impacting shade conditions on these tributary reaches. Even at those “microsites” that were planted with 7-14 foot tall transplants our monitoring was unable to determine impacts on shade. Monitoring results did reveal several interesting facts. First, transplants supplemented with BH hormone have equal survival rates as nursery stock. Growth of transplants is slower in first year after planting than nursery stock. Second, Sitka Spruce seedlings, either nursery or transplants, have the highest rate of survival for conifer plantings. Third, once free to grow, at least six feet for all species, within these agricultural reaches these riparian plants grow at incredible rates. Sitka spruce planted on Big Creek four years ago grew on average 12-14 feet in height.

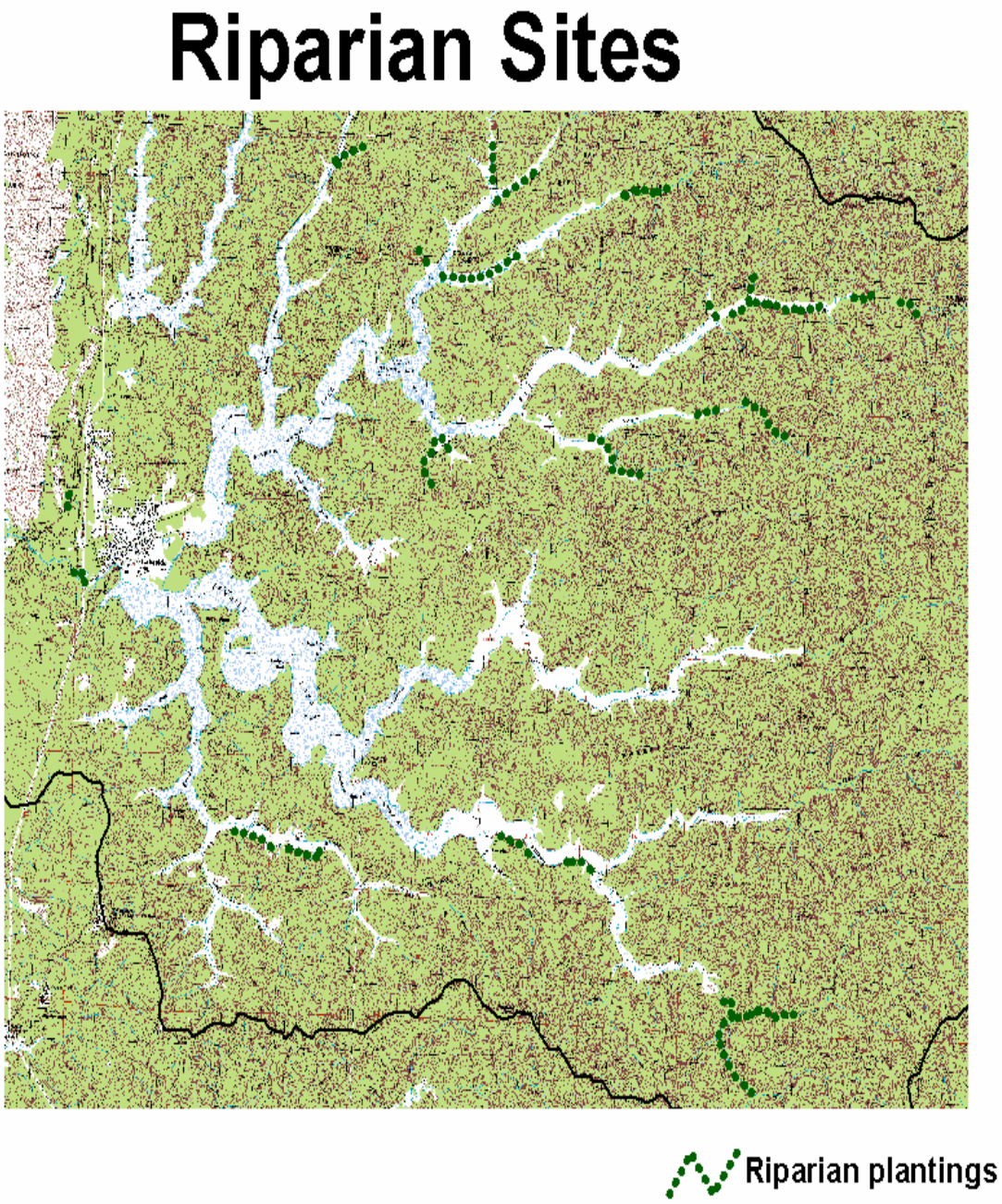


Figure 5. GIS layer of riparian monitoring sites.

Photo 5. Big Creek riparian monitoring site.

Twenty-seven stream sites were monitored for temperature uses VEMCOs placed at land-use changes within each subbasin. For example, on Roberts Creek, a VEMCO was placed and audited at the ESF boundary and at the end of the agricultural reach. The monitoring question developed for this project type asked what stream reaches have temperatures that can be cooled by riparian treatments. The result of our monitoring was unable to address this question as well as the visual observations made during sites visits. What our monitoring was able to answer was how associated land-uses impacting stream temperatures. Forested reaches have lower stream temperatures than agricultural reaches.

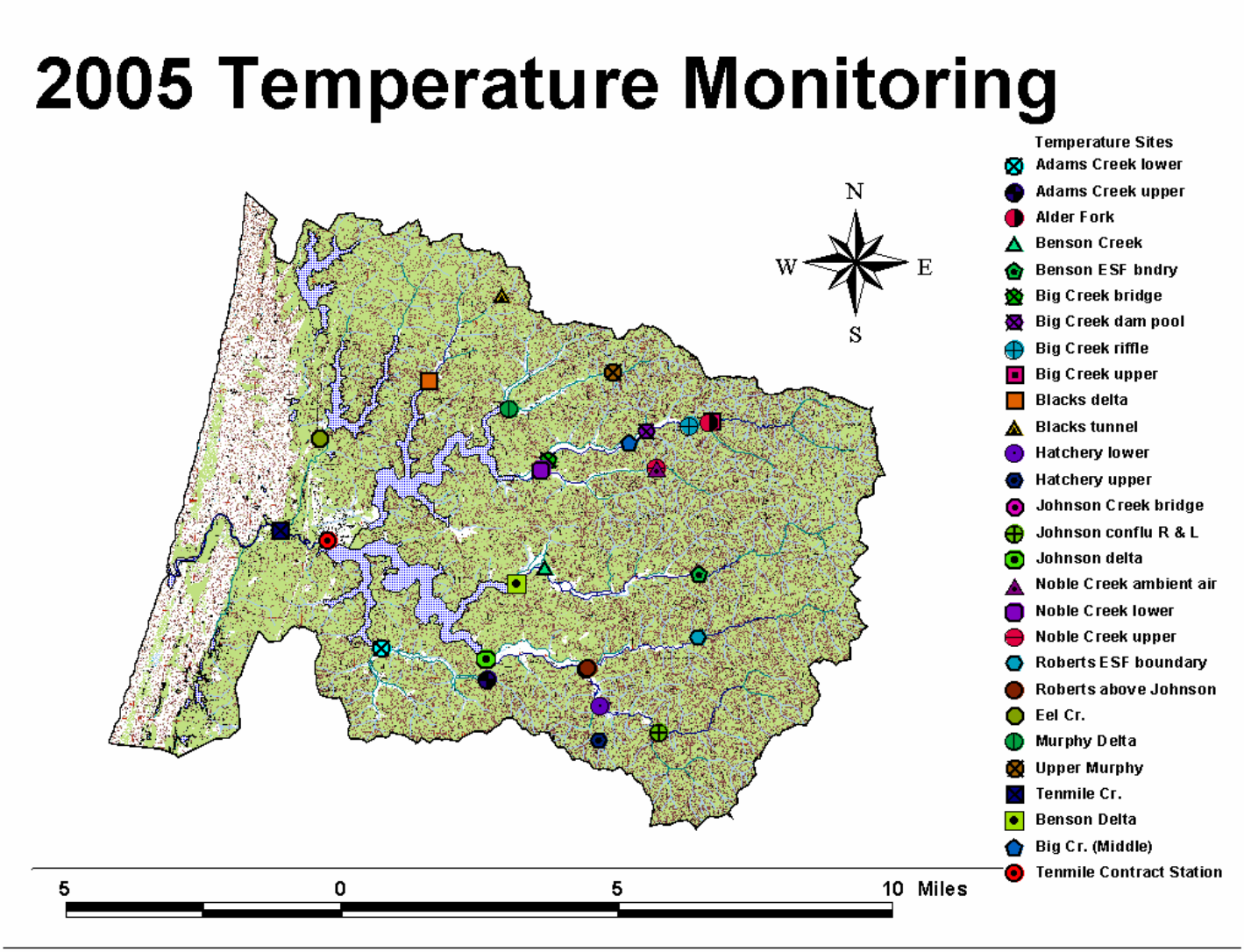


Figure 6. GIS layer of Stream temperature monitoring sites.

Summary Data

Site Name	Lat	Long	Start Date	Stop date	Seasonal Maximum Date	Value
Alder Fork	43.61139	124.0392	05/27/05	10/26/05	07/18/05	64.4
Blacks Delta	43.62129	124.1393	05/26/05	11/01/05	07/18/05	61.6
Upper Benson Cr.	43.57235	124.0405	06/02/05	11/06/05	07/18/05	71.7
Big Cr. Middle	43.60801	124.0643	05/27/05	10/26/05	07/29/05	71.2
Big Cr. Riffle	43.61172	124.0406	05/27/05	10/26/05	07/18/05	70.0
Eel Cr.	43.60621	124.1771	05/24/05	10/23/05	07/18/05	76.2
Big Cr. Bridge	43.59871	124.0961	05/24/05	10/26/05	07/18/05	70.3
Noble Ambient Air	43.599466	124.0574	05/27/05	10/27/05	07/17/05	87.7
Upper Blacks Cr.	43.6	124	05/24/05	10/23/05	08/18/05	62.7
Kellog Bridge	43.54903	124.1533	05/25/05	10/25/05	07/18/05	68.9
Benson Delta	43.54436	124.0777	05/26/05	11/01/05	07/18/05	68.6
Lower Roberts Cr.	43.54436	124.0777	05/25/05	10/31/05	07/18/05	72.6
Johnson Cr. Bridge	43.54597	124.0794	05/25/05	10/25/05	08/21/05	71.5
Johnson Ambient Air	43.53397	124.0973	05/25/05	10/25/05	07/17/05	89.4
Benson Bridge	43.61814	124.0967	05/24/05	10/26/05	08/18/05	67.2
Roberts ESF Boundary	43.55567	124.039	07/29/05	11/06/05	07/29/05	63.0
Upper Hatchery Cr.	43.53041	124.0769	05/25/05	10/25/05	09/30/05	56.2
Johnson Confluence	43.53031	124.0527	05/25/05	10/25/05	07/18/05	60.0
Upper Noble Cr.	43.59947	124.0574	05/27/05	10/27/05	07/14/05	64.1
Big Cr. Dam Pool	43.60851	124.0614	05/27/05	10/26/05	07/29/05	70.9
Upper Big Cr.	43.6119	124.0377	05/27/05	10/26/05	07/05/05	64.9
Lower Hatchery	43.53503	124.0742	05/25/05	10/25/05	07/15/05	56.8
Upper Murphy	43.62336	124.0782	06/03/05	11/05/05	08/13/05	64.9
Lower Murphy	43.61999	124.0905	06/02/05	11/06/05	06/20/05	60.3

Figure 7. Summary Table of stream temperature data.

Algae composition monitoring was conducted during the months of June through October at four standard lake sites, 2 in North Tenmile and 2 in South Lake. This baseline monitoring was conducted to determine what algae species are present in the Lakes and what Lake conditions results in blooms. This monitoring was successful identified 16 different species within the Lakes. Of which two, Microcystis aeroginosa and Anabaena flos-aquae can when conditions in the Lakes are right produce harmful toxic blooms. Monitoring reveals that harmful blooms can occur in both Lakes when Lake temperatures remain stable at 68-70 degrees during August through September.

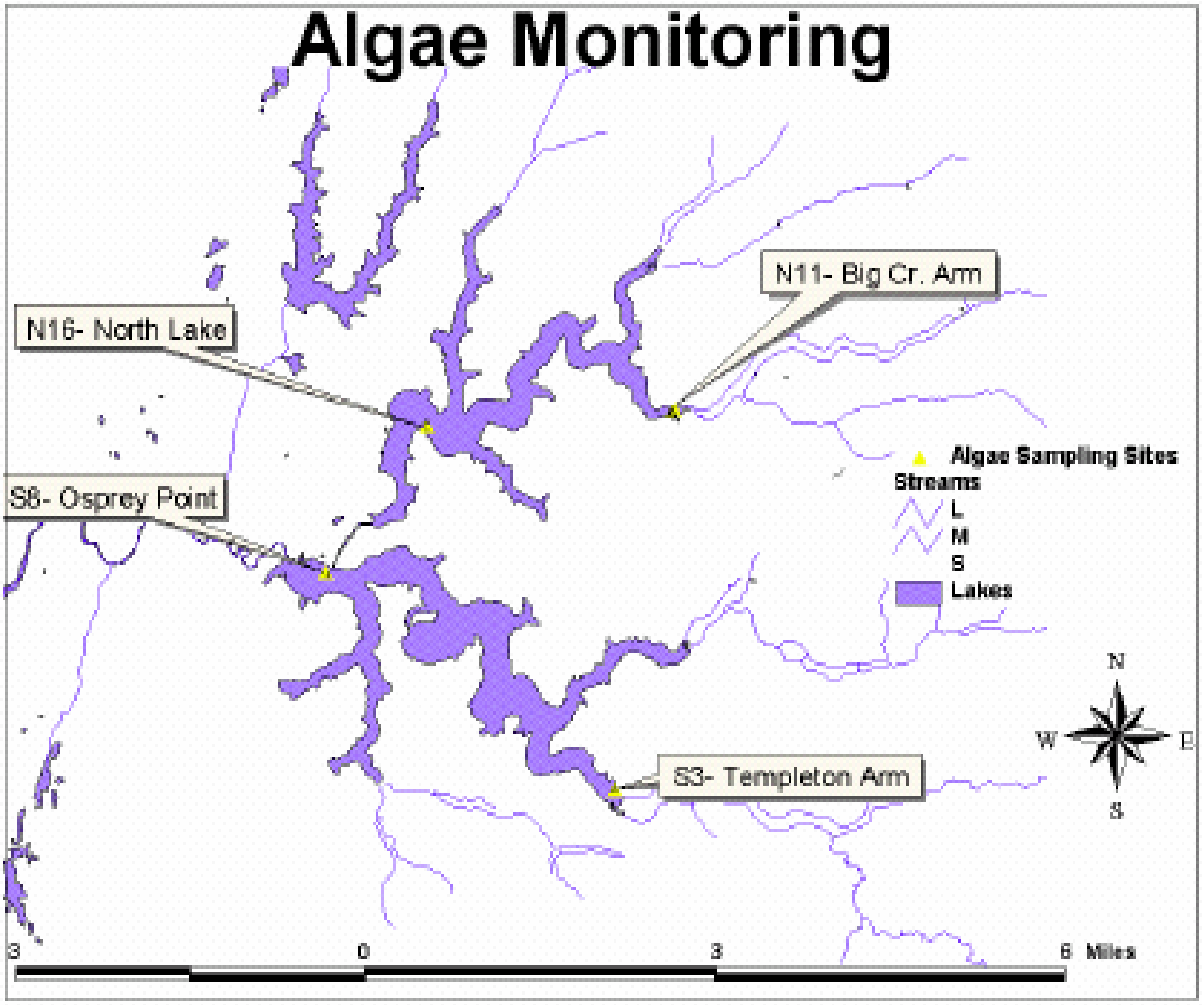


Figure 8. Map of Lake standard sampling sites.

Photo 6. Algal bloom on Templeton arm.

Seven Upslope Erosion Control sites where erosion mix grass seed was applied to disturbed sites were monitored for effectiveness of reducing storm related turbidity responses. Results reveal that where erosion mix has been adequately applied, it is successful in reducing chronic sediment inputs from these small upland sources. Again, it is impossible to quantify results due the lack of Premonitoring at sites. Seeding exposed soils is very effective along roadsides, landings, and impacted riparian areas around Lakeshore. Sites must be exposed to direct sunlight to ensure adequate growth of erosion mix. As shown with Road decommissioning, applying grass seed to heavily shaded areas is not effective.

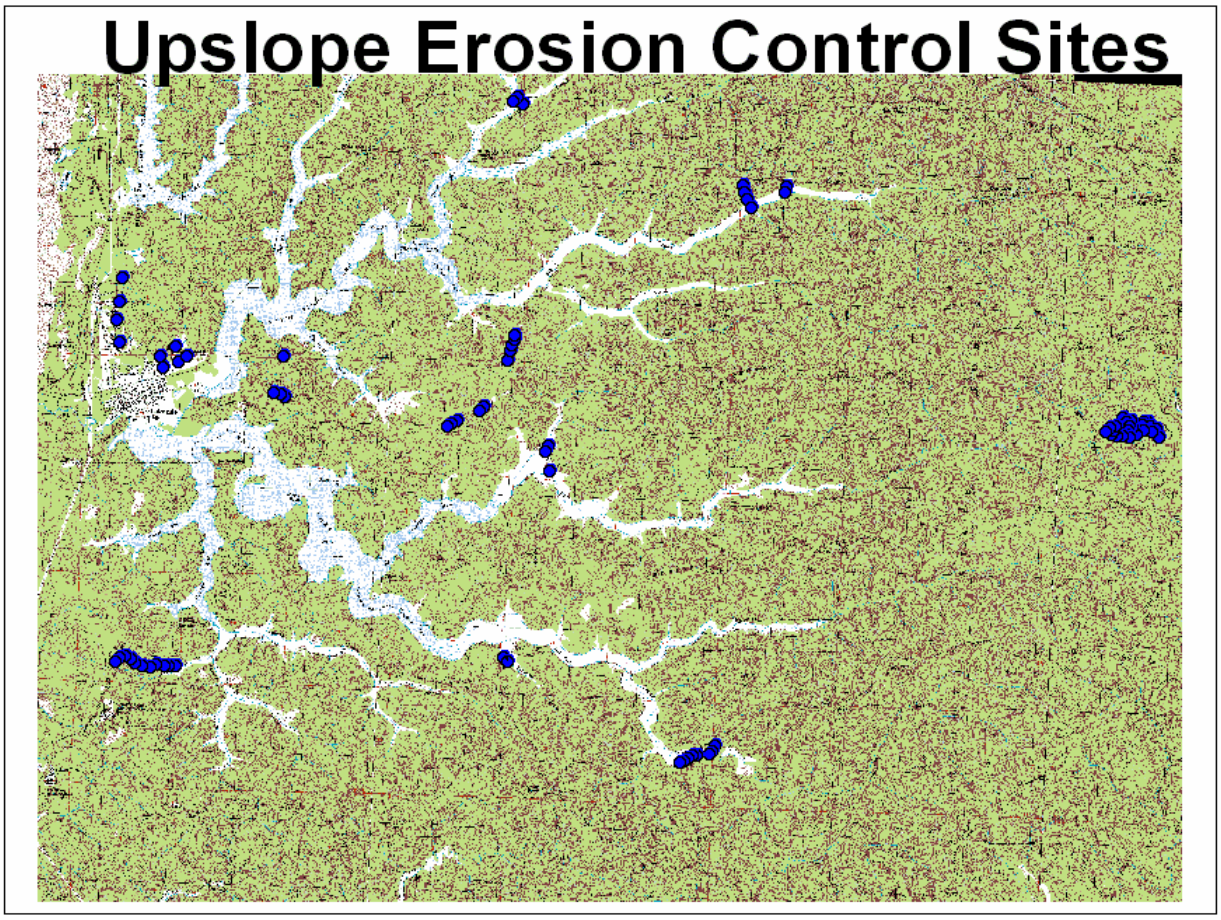


Figure 9. GIS layer of Upslope Erosion monitoring sites.

Photo 7. Upslope erosion control monitoring site

This monitoring project supported one complete inventory of the Osprey nesting conditions around the shorelines of Eel Lake, and both North and South Tenmile Lakes in June of 2004. This trend information was utilized to determine the number and location of Osprey and Eagle nests within the Watershed. Monitoring reveals that although nesting locations can and due change from year to year the number of pairs raising broods along the shorelines remain stable. Due to either naturally fallen nest trees and/or Lakeshore development three nesting sites were destroyed. The Eagle population is also stable at three nesting pairs. Note, GIS layers for this project do not include locations of Eagle nests.

Photo 8. Volunteers surveying Osprey nests on North Lake.

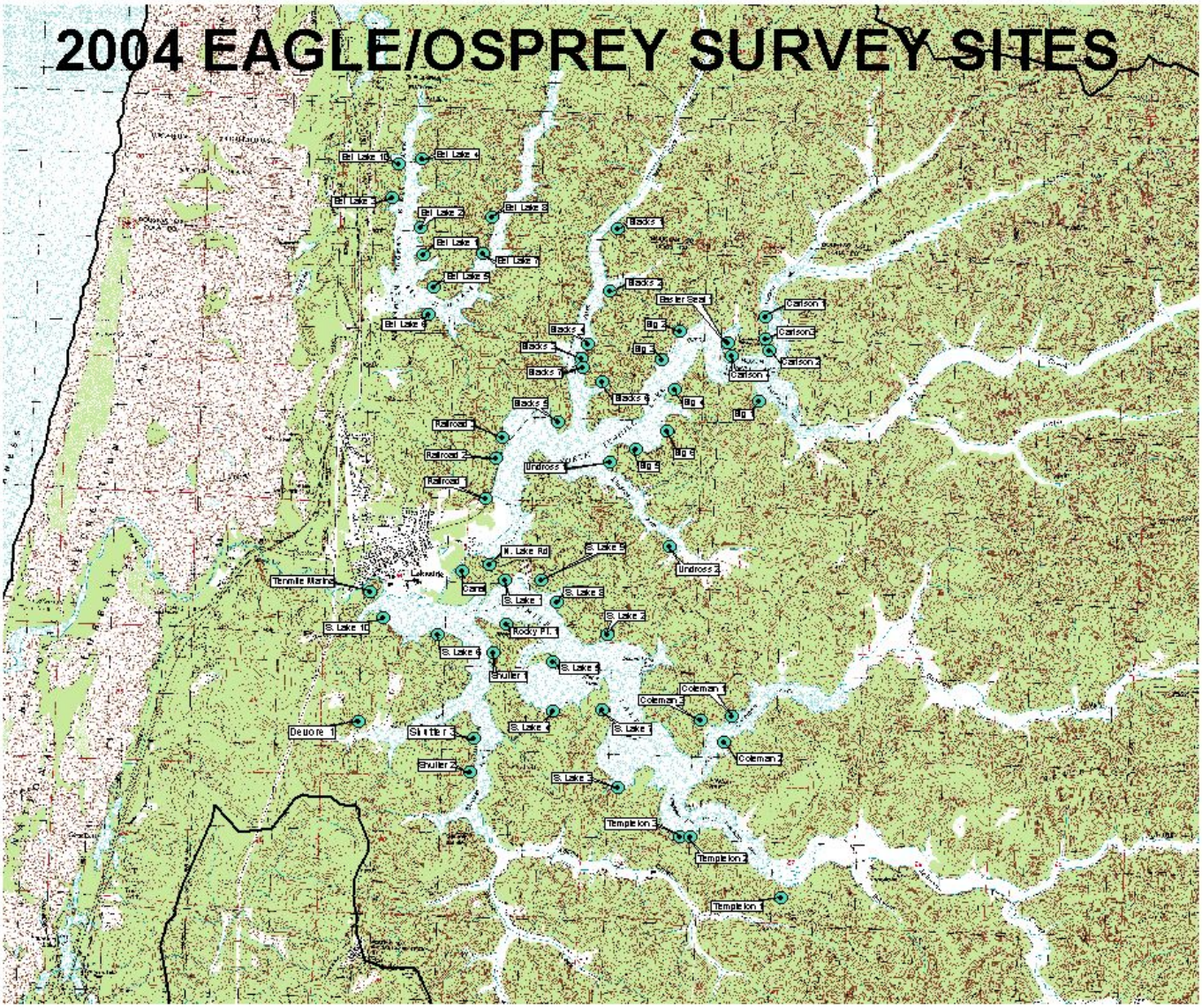


Figure 10. GIS layer of Osprey Nesting sites.

Purple Martin nest boxes were monitored during the period of June 2005 to determine if nesting colony is utilizing boxes and whether colony is expanding. Monitoring results reveal that Purple Martin colony is expanding. If fact, an additional 20 nesting platforms were placed across South Lake from main nesting site at the County Park Boat Ramp. Specific results reveal that of the 47 nesting boxes placed, 39 of them were utilized by Purple Martins. The remaining 9 were used by Swallows and House Sparrows and these were the lowest placed on the pilings. The new nesting platforms were placed to late in nesting season to determine use although several male Purple Martins were observed displaying on these new platforms.

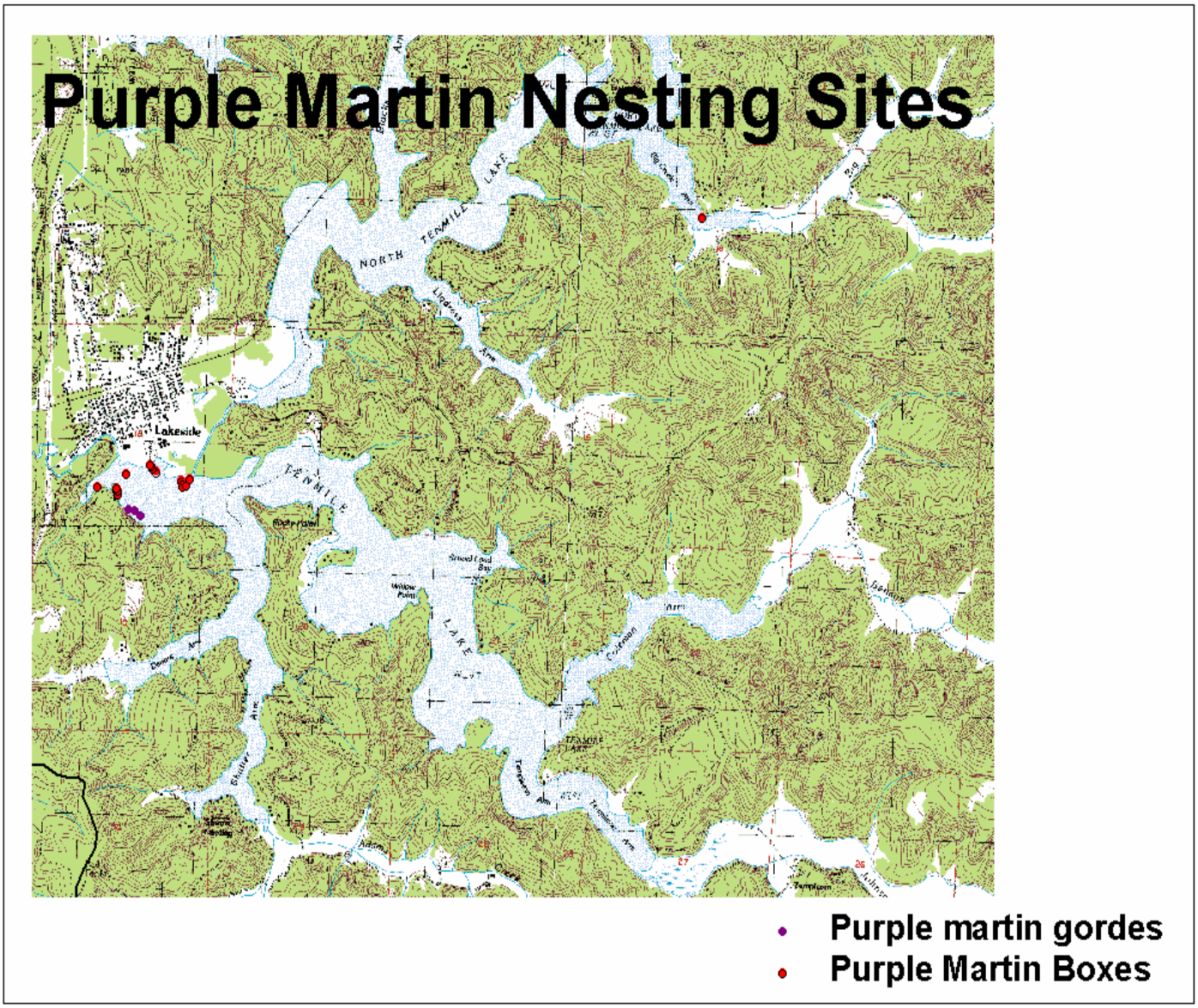


Figure 11. GIS layer of Purple Martin Nest Boxes.

Monitoring of Western Pond Turtle populations surviving in the Tenmile Watershed did not provide adequate information to answer our question of population trends. Only two turtles, both wandering young males were captured during the period of this project. Only one previously marked Turtle (Double Dot) was observed this spring. To collect enough data to make this a viable monitoring project, much more time and resources need to be invested. This is the one project activity that was not a success.

Photo 9. The elusive Western Pond Turtle. Carlson Arm.

Through the process of developing the QAPP and what should be the monitoring priorities for the watershed it became very evident that tracking sediment accumulation into the Lakes from all sources was a priority for the Monitoring Committee. The Delta Building Study involves surveying four tributary mouths when the Lakes are at their lowest elevations. Transects were established and data collected included length and width at each point. The final product is a 3-dimentional map of each delta survey to provide information on sediment inputs. Every succeeding year, a survey team will survey at same Lake height and re-survey deltas.

Photo 10. Johnson Creek Delta monitoring.

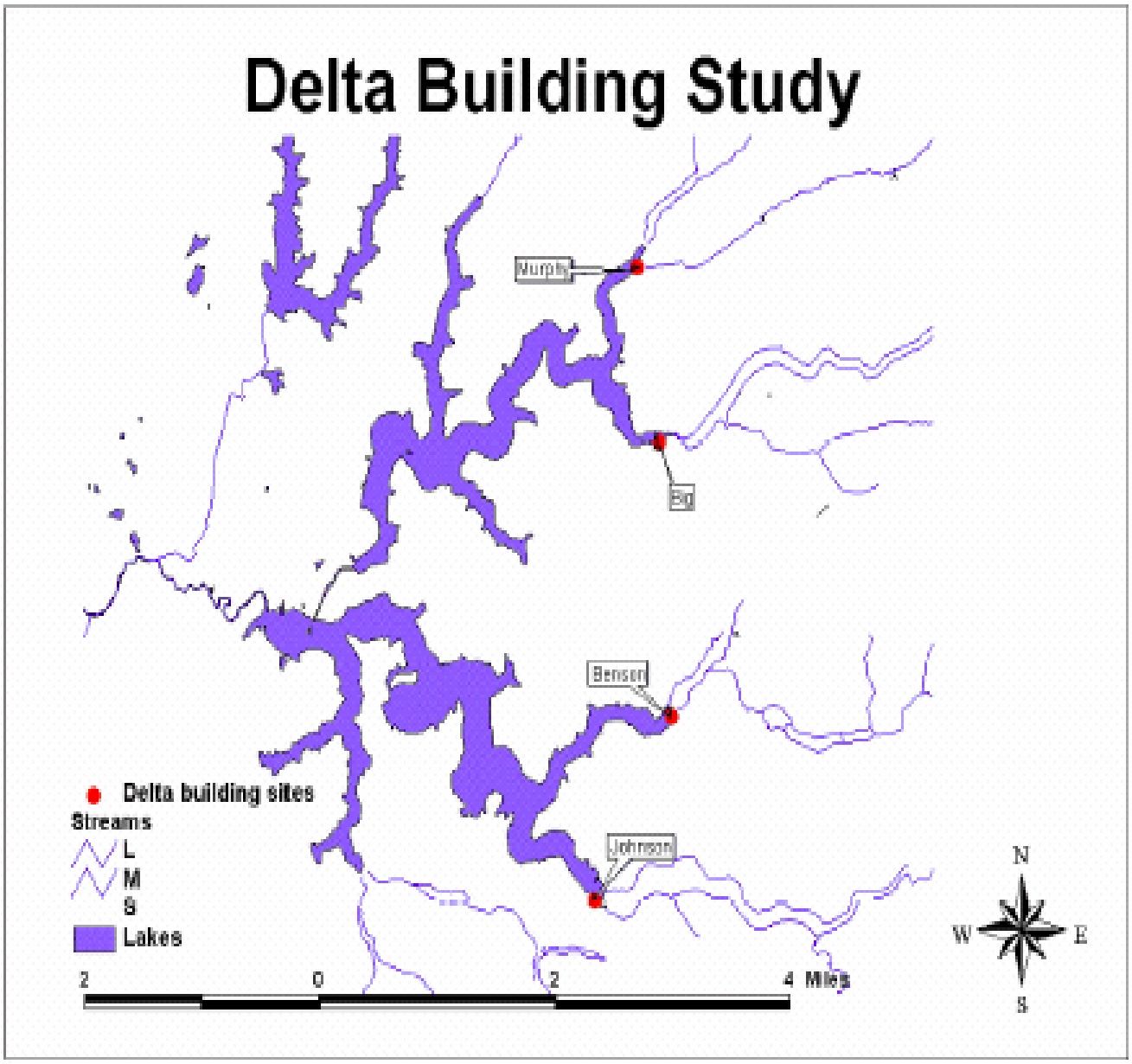


Figure 12. GIS layer of Delta monitoring sites.

Baseline water quality monitoring of five sites on two tributaries was also listed as a monitoring priority for the Tenmile Watershed. The objective is to monitor water quality in stream reaches with different land use areas. Monthly samples are collected during the period of June through October. Data collection includes information on stream temperatures, dissolved oxygen, pH, specific conductivity, and turbidity.

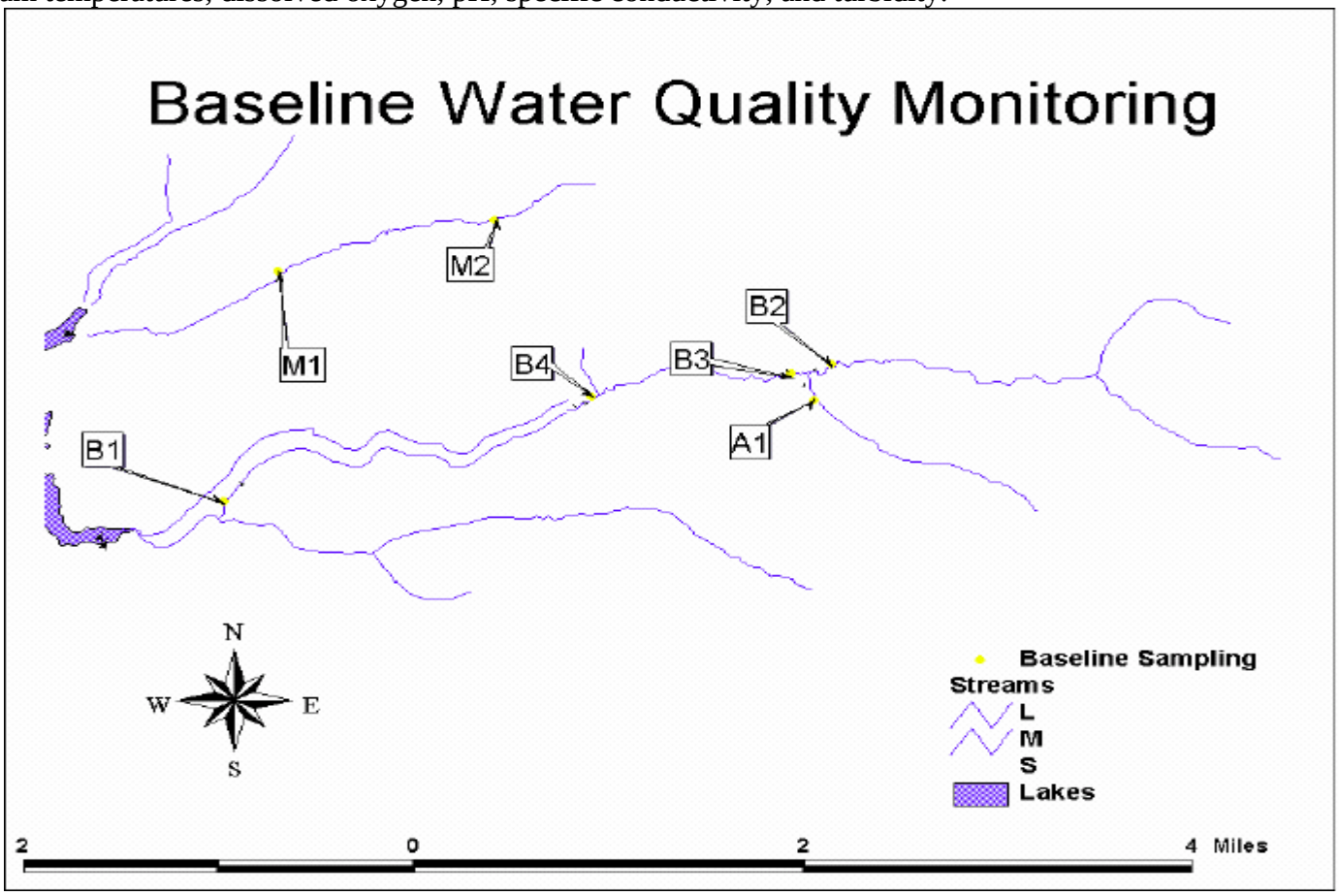


Figure 13. GIS layer of Baseline water quality monitoring sites.

The Storm Chasing Program was also listed as a monitoring priority within the QAPP. In 2005 three auto-samplers in three different tributaries to track sediment and nutrient loading in the Lakes. The goal was to sample during a 2-

25 year storm event. First rain event occurred during Thanksgiving and unfortunately was missed. Auto samplers were turned and the December 28 storm was sampled. The next day following our protocols, nutrient samples were collected from the four standard lake monitoring sites. With this information, we were able to determine when we see the highest amount of TSS and which tributary is contributing the highest nutrient loading.

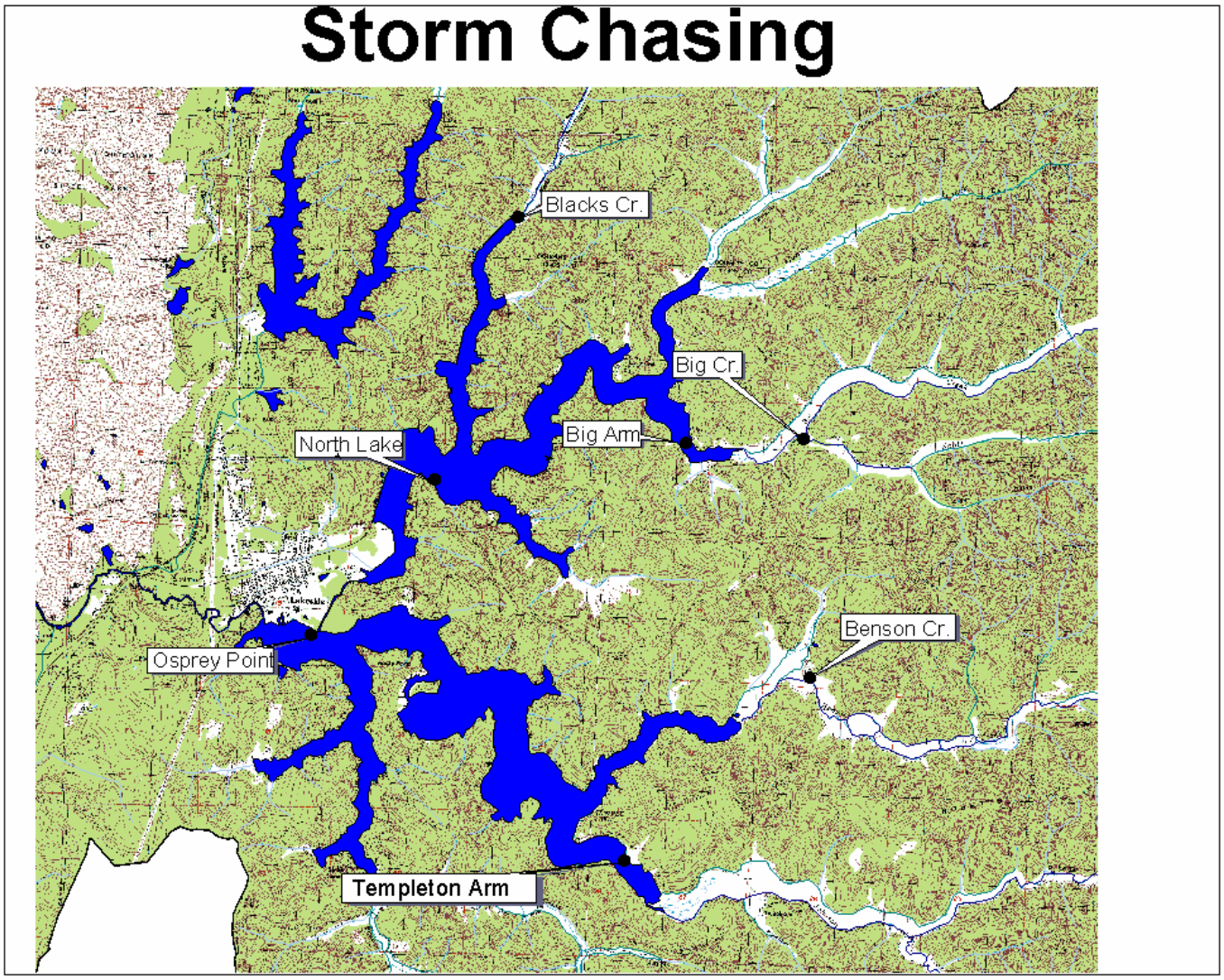


Figure 14. GIS layer of VEMCO placement sites.

Photo 11. Blacks Creek VEMCO monitoring station.

PROJECT PARTNER CONTRIBUTIONS

PROJECT PARTNER	CONTRIBUTION	CONTRIBUTION TYPE
Oregon Watershed Enhancement Board	Funding Technical Assistance	Funding In-kind
Oregon Department of Environmental Quality	Funding Technical Assistance	319 Funding In-kind
City of Lakeside	Office Space Utilities Insurance	Funding Funding Funding
Tenmile Lakes Basin Partnership Monitoring Committee	Funding Technical Assistance	Funding In-kind
Oregon Department of Fish & Wildlife	Technical Assistance	In-kind
Oregon Department of Forestry Elliott Forest	Technical Assistance	In-kind
Coos Soil and Water Conservation District	Technical Assistance	In-Kind
U.S Forest Service	Technical Assistance	In-kind
Tenmile Lakefront Owners Association	Volunteer Labor and equipment	In-kind
Various Project site Landowners	Volunteer monitoring	In-kind

PROJECT BUDGET DETAIL

ITEM	UNIT	UNIT COST	DONATED SERVICES	OTHER FUNDS	OWEB FUNDS	TOTAL COSTS
PERSONNEL						
Monitoring Coordinator	24 months	3,300/m		18,850.00	43,436.25	62,286.25
Monitoring Committee (ODF, ODFW, USFS, ODEQ, TLBP, CSWD)	24 months	$25/hr	5,350.00			5,350.00
Project Site Landowners	40 hours	$10/hr	400.00			400.00
OVERHEAD COSTS						
OFFICE SPACE/UTILITES	24 months	$250/month	6,000.00			6,000.00
TRAVEL						
Monitoring mileage				263.92	237.96	501.88
Volunteer mileage		.25/m	275.25			275.25
Training/lodging				122.31	355.00	715.27
CONTRACTED SERVICES						
Algae/Nutrient analysis				13,494.41	1,485.82	14,980.23
SUPPLIES/EQUIPMENT						
Report Supplies				4,440.29		4,440.29
Monitoring equipment			247.00	3,846.94	5,001.69	9,095.63
PRODUCTION COSTS						
COPYING SERVICES			275.00			275.00
FINAL REPORT PRODUCTION				4,786.25	165.08	4,951.33
SUBTOTALS:			**12,547.25**	**45,804.12**	**50,681.80**	**109,0331.17**
ADMINISTRATION						
CITY OF LAKESIDE					5,681.00	5,681.00
TOTALS:			**12,547.25**	**45,804.12**	**56,362.80**	**114,714.17**