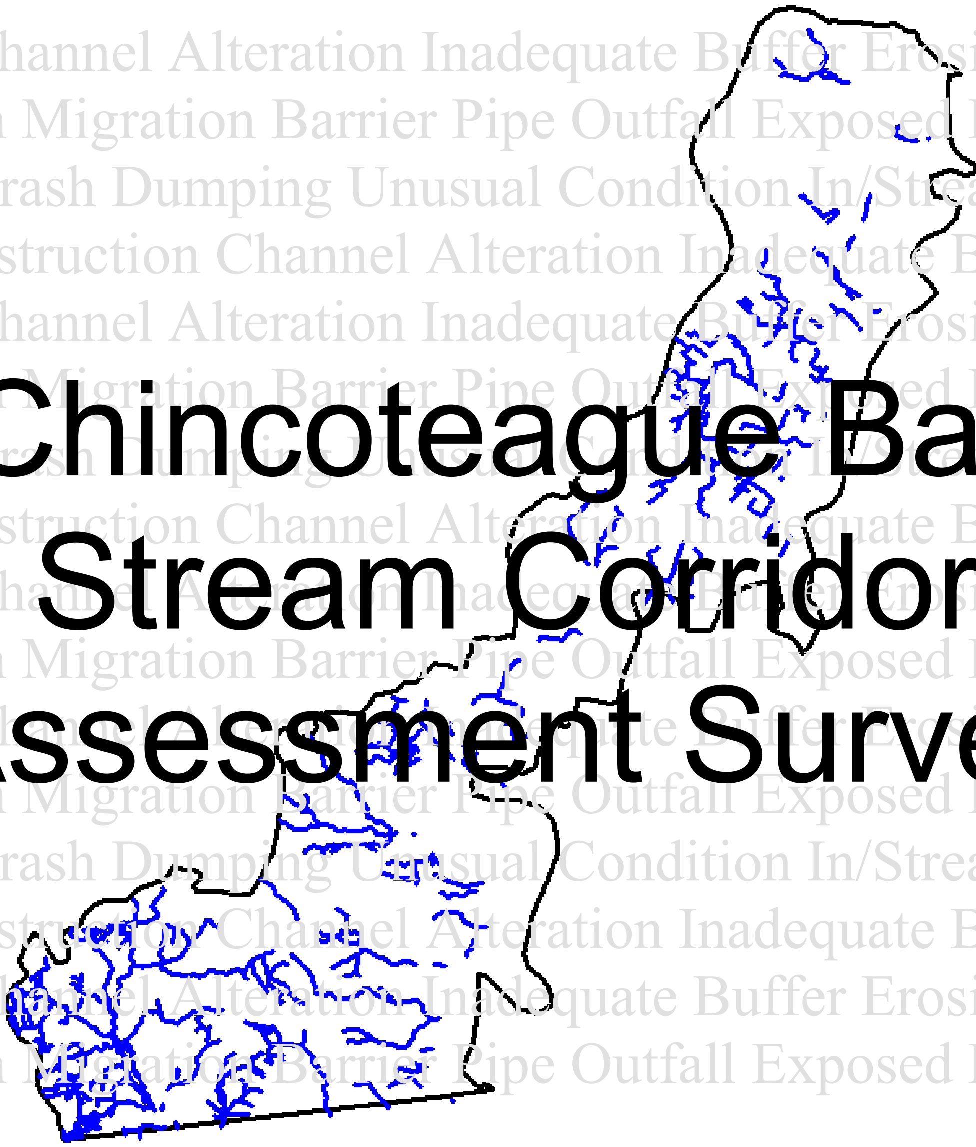

Chincoteague Bay Stream Corridor Assessment Survey

Maryland Department of Natural Resources
Watershed Services
May 2005

Robert L. Ehrlich, Jr.
Governor

Michael S. Steele
Lieutenant Governor

A Message To Maryland Citizens

The Maryland Department of Natural Resources (DNR) seeks to preserve, protect and enhance the living resources of the state. Working in partnership with the citizens of Maryland, this worthwhile goal will become a reality. This publication provides information that will increase your understanding of how DNR strives to reach that goal through its many diverse programs.

C. Ronald Franks
Secretary

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CHINCOTEAGUE BAY STREAM CORRIDOR ASSESSMENT

BY

Robin Pellicano & Ken Yetman
Watershed Services Unit
Maryland Department of Natural Resources

2004

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SUMMARY

In 1998, the Maryland Clean Water Action Plan identified the Chincoteague Bay watershed as one of the State's water bodies that did not meet water quality requirements. In response to this finding, the Maryland Department of Natural Resources (DNR) and Worcester County formed a partnership to develop a Watershed Restoration Action Strategy (WRAS) for the Chincoteague Bay watershed. The following Stream Corridor Assessment (SCA) survey is part of the WRAS development process.

The SCA survey provides descriptive and positional data for potential environmental problems along a watershed's non-tidal stream network. Developed by DNR's Watershed Services, the survey is a watershed management tool to identify environmental problems and help prioritize restoration opportunities on a watershed basis. As part of the survey, specially trained personnel walk a watershed's streams and record data and the location for several environmental problems that can be easily observed within the stream corridor. Each potential problem site is ranked on a scale of one to five for its severity, correctability, and access for restoration work.

SCA survey fieldwork for the Chincoteague Bay began in January 2004 and was completed by November 2004. To complete the survey, field crews walked approximately 79 miles of the 110 miles of streams (72%) assigned in the watershed. Survey teams did not have access to all the watershed's streams and did not survey tidal areas. There were also several areas that were not surveyed because the streams were not assigned. These areas were mostly ditched areas.

Over the streams assessed, survey teams identified 158 potential environmental problem sites. At the time of the survey, the most frequently observed potential problem sites were channel alterations, reported at 66 sites and inadequately forested stream buffers, reported at 63 sites. Other potential environmental problems recorded during the survey included: 11 erosion sites, 6 fish barriers, 6 trash dumping sites, 3 unusual conditions, 2 pipe outfalls, and 1 exposed pipe (Table 1). These sites all ranked from moderate to minor in severity. Opportunities exist to restore potential problem sites in all categories to increase fish and wildlife habitat, other natural resources, and resource services. Additionally, crews recorded descriptive habitat condition data at 49 representative sites.

The Stream Corridor Assessment Survey is a rapid overview of the entire stream network in order to determine the location of potential environmental problems and to collect some basic habitat information about its streams. The value of the present survey is its help in placing individual stream problems into their watershed context and its potential common use among resource managers and land-use planners to cooperatively and consistently prioritize future restoration work. Results of the present survey will be given to the Chincoteague Bay Watershed WRAS committee, which is developing a Watershed Restoration Action Strategy for the Chincoteague Bay. Information on the Chincoteague Watershed Action Strategy can be found on the Department of Natural Resources' website (www.dnr.maryland.gov/watersheds/wras).

ACKNOWLEDGEMENTS

Without the hard work and dedication of the Lower Eastern Shore Crew of the Maryland Conservation Corps, this survey would not have been possible. The crew chief during the survey was Angela Baldwin. The crewmembers were Anneke Nordmar, Lydia Lawson, Melissa Zechiel, Heidi Hanson, Claudia Padilla, Melissa Markee, and Dan Sullivan.

TABLE OF CONTENTS

INTRODUCTION

In 1998, Maryland's Clean Water Action Plan identified bodies of water that failed to meet water quality requirements or other natural resource goals. One of the areas identified in the report was the Chincoteague Bay watershed. The Maryland Department of Natural Resources formed a partnership with Worcester County to assess and improve environmental conditions in the Chincoteague Bay Watershed. The main goal of this partnership is to develop and implement a Watershed Restoration Action Strategy (WRAS) for the Chincoteague Bay.

Located in southern Worcester County, the watershed covers approximately 34,700 acres of land (54 square miles) in the Coastal Plain of Maryland's Eastern Shore (Figure 1). Figure 2 shows a digital orthophoto map of the watershed. Figure 3 shows the same watershed boundary superimposed on a 7.5 minute USGS topographic quadrangle maps. Figure 4 shows the areas of the watershed where the teams were not given permission to survey the streams

The first step in developing a Restoration Action Strategy for this watershed is to complete an overall assessment of the condition of the watershed and the streams it contains. This initial step was accomplished using three approaches. First, a watershed characterization was completed that compiles and analyzes existing water quality, land use, and living resource data about the watersheds (Shanks, 2005). Secondly, a synoptic water quality survey, as well as surveys of the fish and macroinvertebrate communities, was conducted at selected stations throughout the Chincoteague Bay watersheds to provide information on the present condition of aquatic resources (Primrose, 2005). Lastly, a Stream Corridor Assessment (SCA) survey was completed for the watersheds' non-tidal stream network to provide specific information on the present location of potential environmental problems and restoration opportunities. This report details the results of the Chincoteague Bay Stream Corridor Assessment Survey and highlights potential restoration opportunities within the watershed based on the survey.

Survey teams walked approximately 79 miles of the 110 miles of streams in the Chincoteague stream network. The survey began January 2004 and was completed by November 2004. At each site during the survey, field crews collected descriptive data, recorded the location on field maps, and took a photograph to document each potential environmental problem observed. As an aid to prioritizing future restoration work, crews rated all problem sites on a scale of one to five in three categories: 1) how *severe* the problem is compared to others in its category; 2) how *correctable* the specific problem is using current restoration techniques; and 3) how *accessible* the site is for work crews and any machinery necessary to complete restoration work. In addition, field teams collect descriptive data for both in- and near-stream habitat conditions at representative sites spaced at approximately ½ to 1-mile intervals along the stream.

One of the main goals of the Chincoteague Bay SCA survey is to compile a list of observable environmental problems in these watersheds in order to most successfully target future restoration efforts. Once this list is compiled and distributed, county planners, resource managers, and others can initiate a dialog to cooperatively set the direction and goals for the watersheds' management and plan future restoration work at specific problem sites. All of the problems identified as part of the Chincoteague Bay Stream Corridor Assessment survey can be addressed through existing State or Local government programs.

To this end, the Maryland Department of Natural Resources is working with Worcester County to develop a Watershed Restoration Action Strategy (WRAS) of the Chincoteague Bay Watershed. As part of this process, data collected during the SCA survey will be used to help define present environmental conditions and possible restoration opportunities in the watershed. This information, combined with the watershed characterization, synoptic water quality surveys, recent biological surveys, and local knowledge of the watershed will be used to develop a Watershed Restoration Action Strategy for the Chincoteague Bay. The Watershed Restoration Action Strategy, in turn, will help guide future restoration efforts with the ultimate goals of restoring the area's natural resources and meeting State water quality standards.

Chincoteague Bay Watershed
Worcester County, Maryland

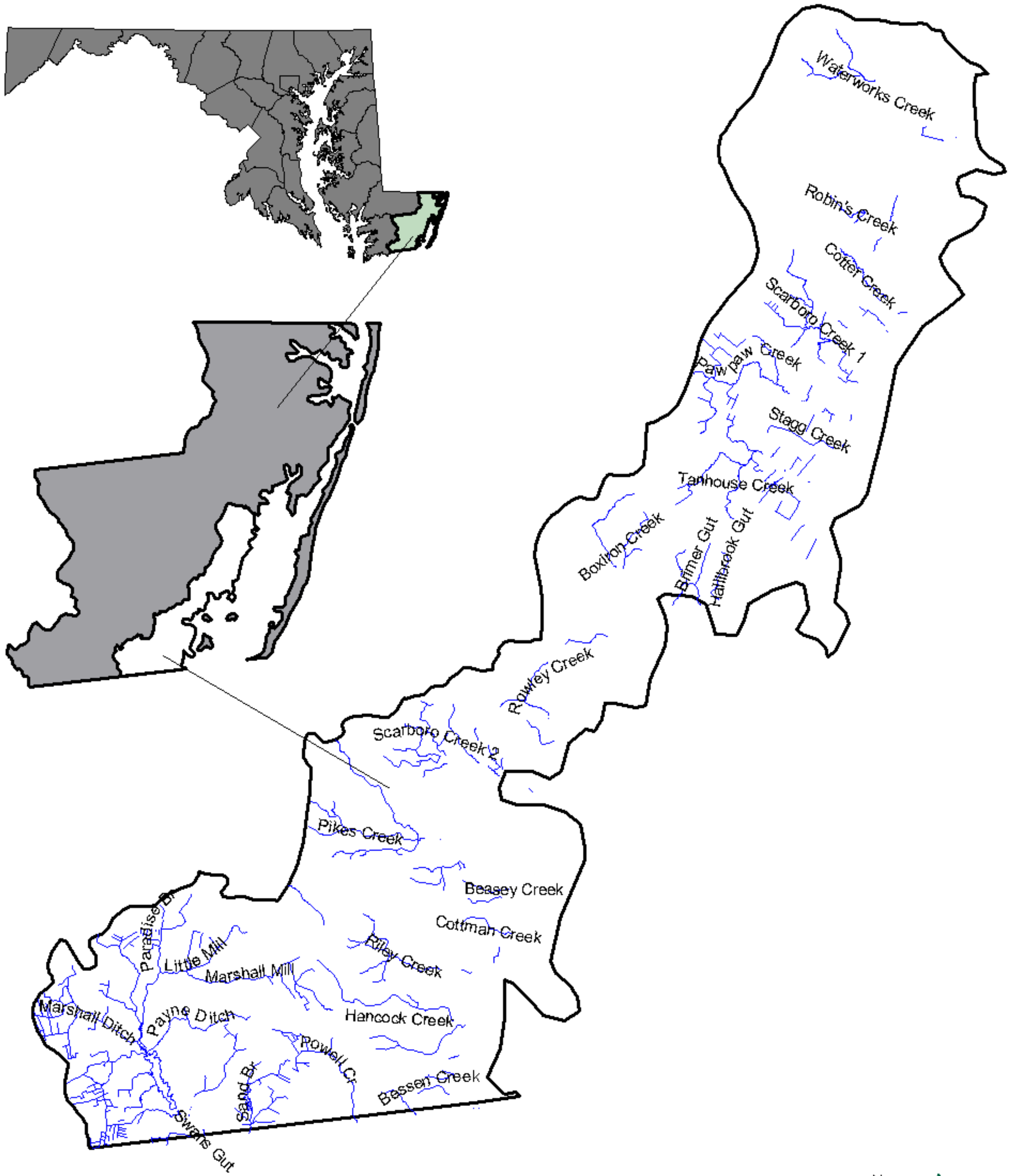

Figure 1: Map showing the location of the Chincoteague Bay Watershed in Worcester County ,Maryland

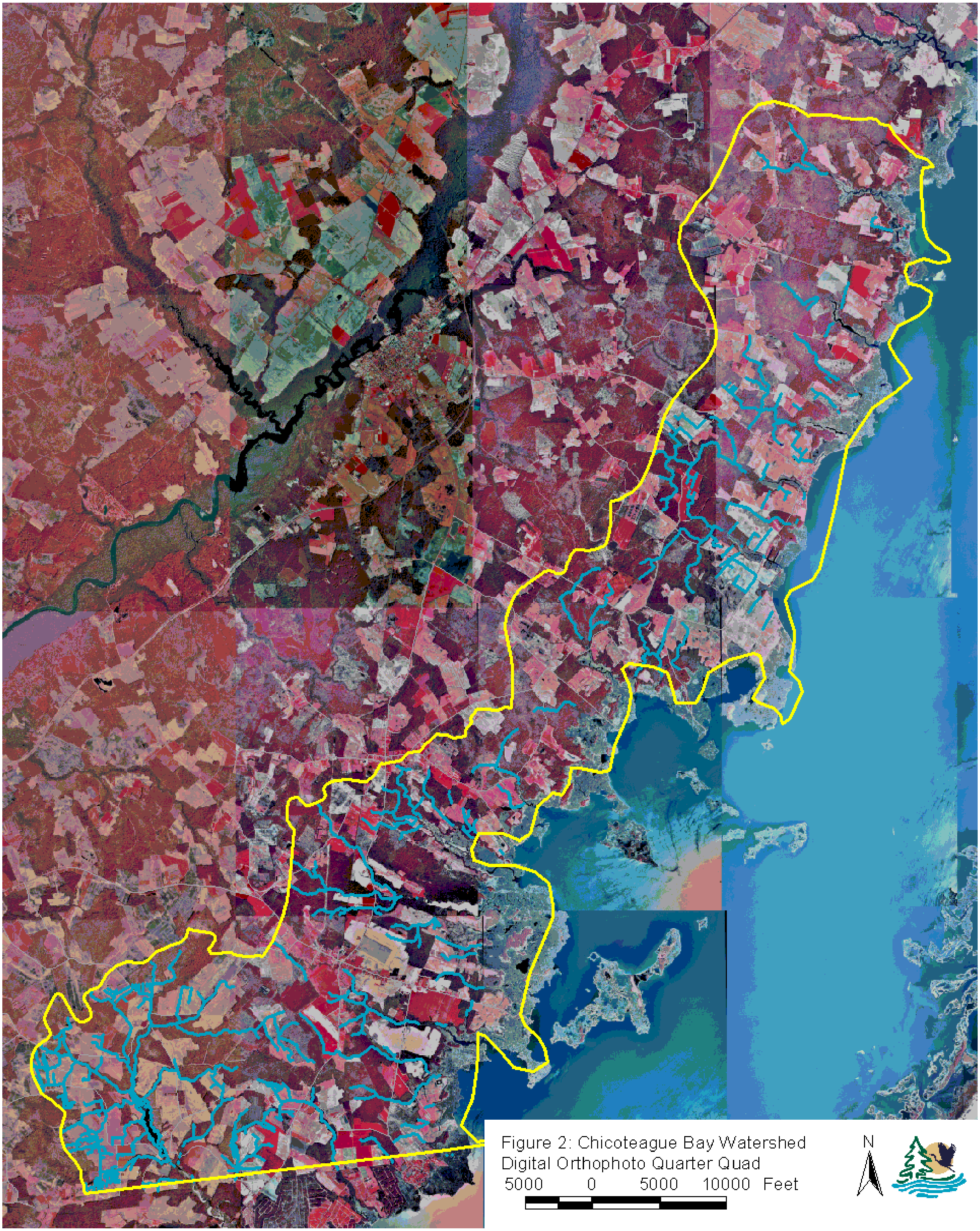

Figure 2: Chicoteague Bay Watershed
Digital Orthophoto Quarter Quad

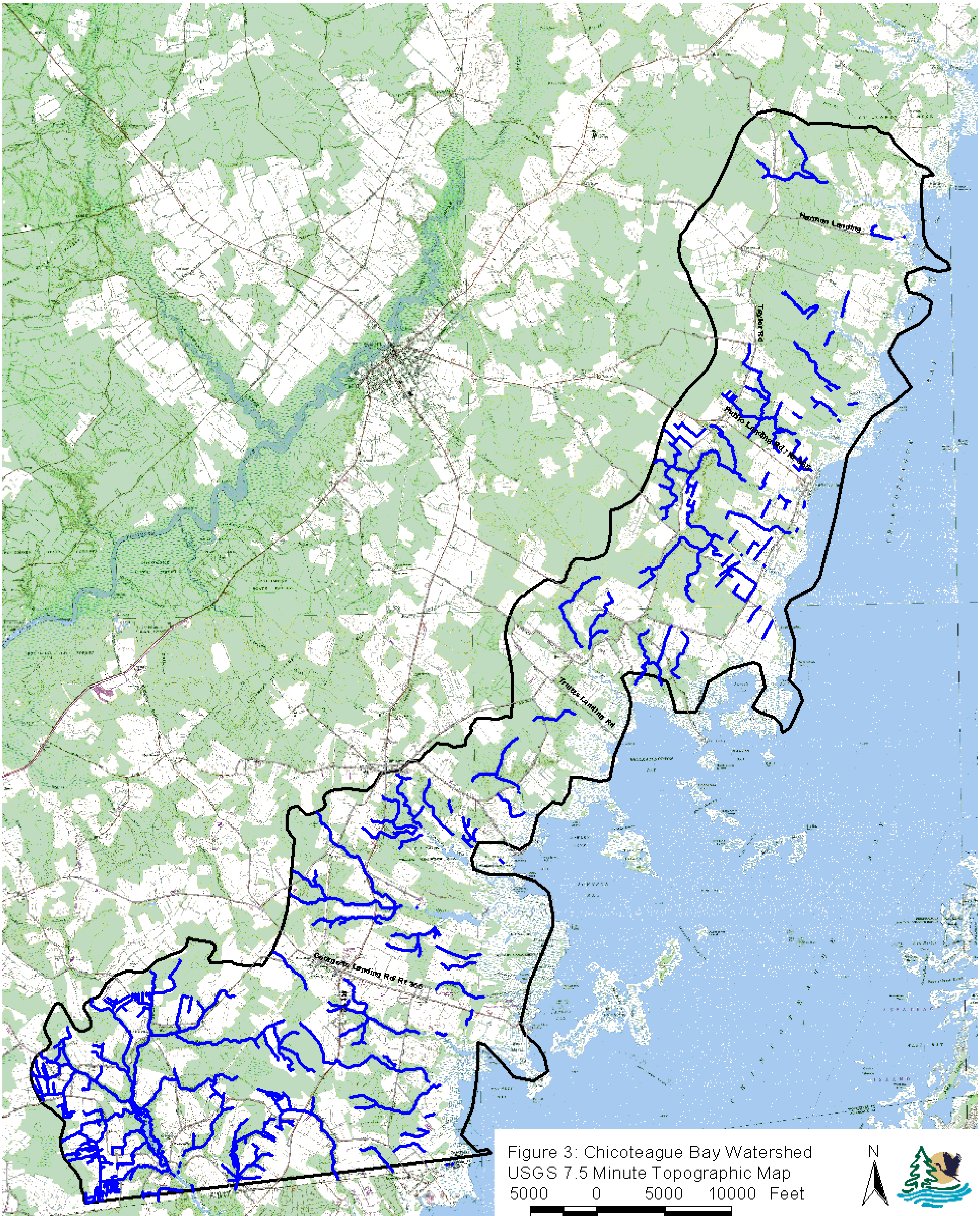

Figure 3: Chicoteague Bay Watershed
USGS 7.5 Minute Topographic Map

No Entry Areas

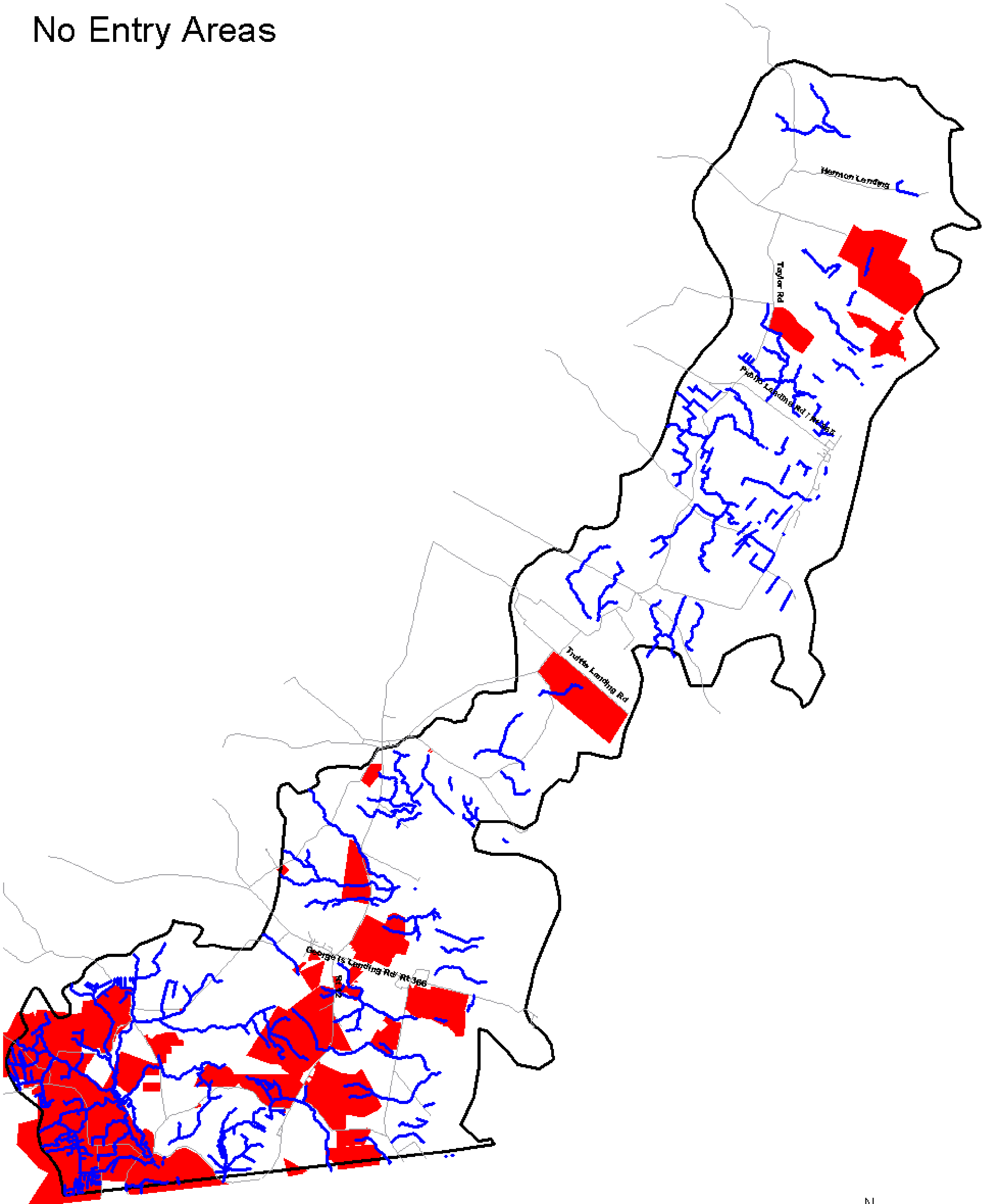

Figure 4: Map showing the location of the No Entry Areas in Chincoteague Bay Watershed in Worcester County ,Maryland

METHODS

Goals of the SCA Survey

To help identify some of the common problems that affect streams in a rapid and cost effective manner, the Watershed Services Unit of the Maryland Department of Natural Resources developed the Stream Corridor Assessment (SCA) survey. The four main objectives of the survey are to provide:

1. A list of observable environmental problems present within a stream system and along its riparian corridor.

2. Sufficient data on each problem in order to make a preliminary determination of both the severity and correctability of each problem.

3. Sufficient data to prioritize restoration efforts.

4. A quick assessment of both in- and near-stream habitat conditions to make comparisons among the conditions of different stream segments.

The SCA survey provides a rapid method of examining and cataloguing the observable environmental problems within an entire drainage network to better target future monitoring, management and/or conservation efforts. This survey is not a detailed scientific survey, nor will it replace chemical and biological surveys in determining overall stream conditions and health. One advantage of the SCA survey over chemical and biological surveys is that the SCA survey can be done on a watershed basis both quickly and at relatively low cost.

Maryland's SCA survey is both a refinement and systematization of an old approach – the stream walk survey. Many of the common environmental problems affecting streams can be straightforward to identify by an individual walking along a stream. These include: excessive stream bank erosion, blockages to fish migration, stream segments without trees along their banks, or a sewage pipeline exposed by stream bank erosion leaking sewage into the stream. With a limited amount of training, most people can correctly identify these common environmental problems.

Over the years, many groups standardized a stream walk survey approach for their particular purpose or interest. Many earlier approaches, such as EPA's, "Streamwalk Manual" (EPA, 1992), Maryland Save our Stream's "Conducting a Stream Survey," (SOS, 1970) and Maryland Public Interest Research Foundation "Streamwalk Manual" (Hosmer, 1988), focused on utilizing citizen volunteers with little or no training. While these surveys can be a good guide for citizens interested in seeing their community's streams, the data collected during these surveys can vary significantly based on the background of the surveyor. In the *Maryland Save our Stream* "Stream Survey," for example, training for citizen groups includes giving guidance on how to organize a survey and a slide show explaining how to complete the field work. After approximately one hour of training, citizen volunteers are sent out in groups to walk designated stream segments. During the survey, volunteers usually walk their assigned stream segment in under a few hours and return their data sheets to the survey organizers for analysis. While these surveys can help make communities more aware of the problems present in their local stream, citizen groups normally do not have the expertise or resources to properly analyze or fully interpret the collected information. In addition, the data collected from these surveys often only indicates that a potential environmental problem exists at a specific location, but it does not provide sufficient information to judge the severity of the problem.

Other visual stream surveys, such as the Natural Resources Conservation Service's "Stream Visual Assessment Protocols" (NRCS, 1998), are designed for use by trained professionals analyzing a very specific stream reach type, such as a stream passing through an individual farmer's property. While this survey can provide useful information on a specific stream segment, it is usually not carried out on a watershed basis.

The Maryland SCA survey bridges the gap between these two approaches. The survey is designed to be completed by a small group of well-trained individuals who walk the entire stream network in a watershed. While those working on the survey are usually not professional natural resource managers, they do receive several days of training in both stream ecology and SCA survey methods.

Field Training and Procedure

While almost any group of dedicated volunteers can be trained to do a SCA survey, the Maryland Conservation Corps (MCC) has proven to be an ideal group to do this work in Maryland. The Maryland Conservation Corps is part of the AmeriCorps Program, initiated to promote greater involvement of young volunteers in their communities and the environment. The MCC program is managed by DNR's Forest and Park Service. Volunteers with the MCC are 17-25 years old and can have educational backgrounds ranging from high school to graduate degrees. With the proper training and supervision, MCC volunteers are able to significantly contribute to the State's efforts to inventory and evaluate water quality and habitat problems from a watershed perspective. For more information on the Maryland Conservation Corps call their main office in Annapolis at (410) 260-8166 or visit their web site at: www.dnr.maryland.gov/mcc.

Prior to the start of Chincoteague SCA Survey, the members of the MCC's Lower Eastern Shore Crew received training in assessing both environmental problem sites and habitat conditions in and along Maryland streams. For problem sites, crewmembers learned how to identify common problems observable within the stream corridor, record problem locations on survey maps, and accurately complete data sheets for each specific problem type. For habitat conditions, the crew learned and practiced assessing stream health based on established criteria indicating both favorable conditions for macroinvertebrates and fish and healthy riparian habitat. These reference sites for habitat condition are located at approximately 1/2- to 1-mile intervals along the stream. In addition, the field crew reviewed a standard procedure for assigning site numbers based on the 3-digit map number, 1-digit team number, and 2-digit problem number for each problem and reference site during the survey. Lastly, in order to have a visual record of existing conditions at the time of the SCA survey, the MCC's Lower Eastern Shore Crew received guidelines for taking photographs at all problem and reference sites.

Several weeks prior to the beginning of the survey, property owners along the stream reach received letters informing them of what the survey is and when it was to be completed.

This letter also provided a phone number to call if individuals wanted more information and a postcard stating if the crews would have permission to access the streams on their property. In addition, survey crews were not to cross fence lines or enter any areas that are marked "No Trespassing" unless they had specific permission from the property owner.

The MCC crew conducted field surveys of the Chincoteague Bay Watershed from January 2004 to November 2004. The survey teams walked most of the Bay's drainage network, collecting information on potential environmental problems. Those commonly identified during the SCA Survey include: inadequate stream buffers, excessive bank erosion, channelized stream sections, fish migration blockages, in or near stream construction, trash dumping sites, unusual conditions, and pipe outfalls. In addition, the survey recorded information on the general condition of in-stream and riparian habitats and the location of potential wetland creation sites.

More detailed information on the procedures used in the Maryland SCA survey can be found in, "Stream Corridor Assessment Survey – Survey Protocols" (Yetman, 2001). A copy of the survey protocols can found on DNR's web site at http://www.dnr.maryland.gov/streams/pubs/other.html. Hard copies of the protocols also can be obtained by contacting the Watershed Services Unit of the Maryland Department of Natural Resources, Annapolis, MD.

Overall Ranking System

The SCA survey field crews evaluate and score all problems on a scale of 1 to 5 in three separate areas: problem severity, correctability, and accessibility. A major part of the crew's training on survey methods is devoted to properly rating the different problems identified during the survey. This ranking system developed from an earlier survey that found 453 potential environmental problems along 96 miles of stream of the Swan Creek Watershed in Harford County. The most frequently reported problem during the survey was stream bank erosion, reported at 179 different locations (Yetman et. al., 1996). Follow-up surveys found that while stream bank erosion was a common problem throughout the watershed, the severity of the erosion problem varied substantially among the sites and that the erosion problems at many sites were minor in severity. Based on this experience and its goal of helping to prioritize restoration work, the SCA survey rates the severity, correctibility, and access of each problem site.

While the ratings are subjective, they have proven to be very valuable in providing a starting point for more detailed follow-up evaluations. Once the SCA survey is completed, the collected data can be used by different resource professionals to help target future restoration efforts. A regional forester, for example, can use data collected on inadequate stream buffers to help plan future riparian buffer plantings, while the local fishery biologist can use the data on fish blockages to help target future fish passage projects. The inclusion of a rating system in the survey gives resource professional an idea of which sites the field crew believed were the most severe, easiest to correct and easiest to access. This information combined with photographs of the site can help resource managers focus their own follow up evaluations and fieldwork at the most important sites.

A general description of the rating system is given below. More specific information on the criteria used to rate each problem category is provided in the *SCA – Survey Protocol*s (Yetman, 2000). It is important to note that the rating system is designed to contrast problems within a specific problem category and is not intended to be applied across categories. When assigning a severity rating to a site with an inadequate stream buffer for example, the rating is only intended to compare the site to other in the State with inadequate stream buffers. A trash dumping site with a very severe rating may not necessarily be a more significant environmental problem than a stream bank erosion site that received a moderate severity rating.

The **severity** rating indicates how bad a specific problem is relative to others in the same problem category. It is often the most useful rating because it answers questions such as: where are the worst stream bank erosion sites in the watershed, or where is the largest section of stream with an inadequate buffer? The scoring is based on the overall impression of the survey team of the severity of the problem at the time of the survey, based on the established criteria for each problem category (Yetman, 2000).

* A <u>very severe rating</u> of 1 is used to identify problems that have a direct and wide reaching impact on the stream's aquatic resources. Within a specific problem category, a very severe rating indicates that the problem is among the worst that the field teams have seen or would expect to see. Examples include a discharge from a pipe that was discoloring the water over a long stream reach (greater than 1000 feet) or a long section of stream (greater than 1000 feet) with high raw vertical banks that are unstable and eroding at a rapid rate.

* A <u>moderate severity rating</u> of 3 is identifies problems that have some adverse environmental impacts but the severity and/or length of affected stream is fairly limited. While a moderate severity rating would indicate that field crews did believe it was a significant problem, it also indicates that they have seen or would expect to see worse problems in the specific problem category. Examples include: a small fish blockage that is passable by strong swimming fish like trout, but a barrier to resident species such as sculpins or a site where several hundred feet of stream has an inadequate forest buffer.

* A <u>minor severity rating</u> of 5 identifies problems that do not have a significant impact on stream and aquatic resources. A minor rating indicates that a problem is present, but compared to other problems in the same category it is considered minor. One example of a site with a minor rating is an outfall pipe from a storm water management structure that is not discharging during dry weather and does not have an erosion problem at the outfall or immediately downstream. Another example is a section of stream with stable banks that has a partial forest buffer less than 50 feet wide along both banks.

The **correctability** rating provides a relative measure on how easily the field teams believe the problem can be corrected. The correctability rating can be helpful in determining which problems can be easily dealt with when developing a restoration plan for a drainage basin. One restoration strategy, for example, would initially target the severest problems that are the easiest to fix. The correctability rating also can be useful in identifying simple projects that can be done by volunteers, as opposed to projects that require more significant planning and engineering efforts to complete.

* A <u>minor correctability rating</u> of 1 indicates problems that can be corrected quickly and easily using hand labor, with a minimal amount of planning. These types of projects would usually not need any Federal, State or local government permits. It is a job that

small group of volunteers (10 people or less) could fix in a day or two without using heavy equipment. Examples include removing debris from a blocked culvert pipe, removing less than two pickup truck loads of trash from an easily accessible area or planting trees along a short stretch of stream.

* A moderate correctability rating of 3 indicates sites that may require a small piece of equipment, such as a backhoe, and some planning to correct the problem. This would not be the type of project that volunteers would usually do alone, although volunteers could assist in some aspects of the project, such as final landscaping. This type of project would usually require a week or more to complete. The project may require some local, State or Federal government notification or permits. However, environmental disturbance would be small and approval should be easy to obtain.

* A very difficult correctability rating of 5 indicates problems that would require a large expensive effort to correct. These projects would usually require heavy equipment, significant amount of funding ($100,000 or more), and construction could take a month or more. The amount of disturbance would be large and the project would need to obtain a variety of Federal, State and/or local permits. Examples include a potential restoration area where the stream has deeply incised several feet over a long distance (i.e., several thousand feet) or a fish blockage at a large dam.

The **accessibility** rating provides a relative measure of how difficult it is to reach a specific problem site. The rating is made at the site by the field survey team, using a survey map and field observations. While factors such as land ownership and surrounding land use can enter into the field judgments of accessibility, the rating assumes that access to the site could be obtained if requested from the property owner.

* A very easy accessibility rating of 1 indicates sites that are readily accessible both by car and on foot. Examples include a problem in an open area inside a public park where there is sufficient room to park safely near the site.

* A moderate accessibility rating of 3 indicates sites that are easily accessible by foot but not easily accessible by a vehicle. Examples would include a stream section that can be reached by crossing a large field or a site that is accessible only by 4-wheel drive vehicles.

* A very difficult accessibility rating of 5 is assigned to sites that are difficult to reach both on foot and by a vehicle. To reach the site it would be necessary to hike at least a mile, and if equipment were needed to do the restoration work, an access road would need to be built through rough terrain. Examples include a site where there are no roads or trails nearby.

Data Analysis and Presentation

Following the completion of the survey, crews entered and information from the field data sheets into a Microsoft Access database and verified the accuracy of the data. Field crews labeled and organized the **690** photographs taken during the survey by site number and placed them in binders in both print and digital form. Members of the Department of Natural

Resources' Watershed Services Unit incorporated the map location, recorded data, and digitized photographs into the ArcGIS computer software. The GIS project is an electronic geodatabase that integrates all the collected problem locations and descriptive data by site number, links photographs to each potential problem site, and produces the maps presented in this report. This data can then be used alongside of other digital geographic datasets available for features within the watersheds. A final copy of the ArcView files was given to the Worcester County Planning Department for their use in developing a Watershed Action Strategy for the Chincoteague Bay Watersheds.

RESULTS

The Stream Corridor Assessment Survey identified 158potential environmental problems within the stream corridor (Table 1). At of the time of the survey, the most frequently observed potential problem sites were channel alterations, reported at 66 sites and inadequately forested stream buffers, reported at 63 sites. Other potential environmental problems recorded during the survey included: 11 erosion sites, 6 fish barriers, 6 trash dumping sites, 3 unusual conditions, 2 pipe outfalls, and 1 exposed pipe (Table 1).

Table 1 presents a summary of survey results and Table 2 is a summary by stream reach. Appendices A and B list the data collected during the survey. Appendix A provides a listing of information by site number and location, referenced by both tributary name and the X,Y coordinates using Maryland State Plane 83 meters. Information in this format is useful to determine what problems are present along a specific stream reach. In Appendix B, the data is presented by problem type and lists the collected descriptive data. Presenting the data by problem type allows the reader to see which problems are rated as most severe or easiest to correct within each category. Result categories are discussed further in order of those with the greatest number of sites to those with the least.

Table 1. Summary of results from the Chincoteague Bay SCA Survey.

Potential Problems Identified	**Number**	**Estimated Length**	**Very Severe**	**Severe**	**Moderate**	**Low Severity**	**Minor**
Channel Alteration	66	140,950 feet (26.7miles)	3	3	17	24	19
Inadequate Buffer	63	117,605 feet (22.27miles)	3	5	13	19	23
Erosion	11	8,420 feet (1.59miles)	0	0	2	6	3
Fish Barrier	6		0	0	2	1	3
Trash Dumping	6		0	0	1	3	2
Unusual Condition	3		0	0	0	1	2
Pipe Outfall	2		0	0	1	1	0
Exposed Pipe	1	5 feet (0.001miles)	0	0	0	0	1
Total	**158**						
Comments	21						
Representative Sites	49						

Table 2. Summary of results by major stream reach.

Stream Segment	Channel Alteration	Erosion	Exposed Pipes	Fish Barriers	Inadequate Buffers	Pipe Outfalls	Trash Dumping	Unusual Conditions	Representative Sites	Comments	Total
Beasey Creek	1				1					1	3
Bessen Creek	2				2				1		5
Big Mill					1						1
Boxiron Creek	2	2		2	2				2		10
Brimer Gut	1				1				3		5
Cotter Creek										2	2
Cottman Creek					1				1		2
Hallbrooks Gut	1				1						2
Hancock Creek	1				2				3		6
Little Mill Creek	3	1	1		3		3		2		13
Little Mill Run									1		1
Marshall Mill Run									1		1
Paradise Branch	3				3						6
Paw Paw Creek	4	1			5			1	6	3	20
Payne Ditch	1								2	1	4
Pikes Creek	4	1			2	1		2	3	5	18
Powell Creek	1								3		4
Public Landing	1				1						2
Riley Creek	2				4	1			3		10
Rowley Creek	2	1		1	1				2	1	8
Sand Branch	2			1	3		1		3	1	11
Scarboro Creek	7	1			6				2	2	18
Scarboro Creek 2	8			1	5				5	3	22
Stagg Creek	5				5		2		1		13
Tanhouse Creek	9	2			9				3	2	25
Unnamed trib 2	1				1						2
Unnamed trib 3	1				1						2
Waterworks Creek	4	2			3				2		11

Channel Alterations

Channel alterations are sections where the stream's banks or channel are significantly altered from their naturally-occurring structure or condition. These channelized streams are straightened, deepened, and/or the banks hardened using rock, gabion baskets or concrete over a significant length of stream (usually 100 feet or more). Most frequently, channels are altered to decrease the likelihood of flooding by increasing the stream velocity through an area, making stream channelization more common near development or roadways. On Maryland's Eastern Shore, earth channels also are created for drainage purposes.

For the purposes of this survey, there are three types of channel alternations *not* recorded. The first are tributaries where the entire stream branch is piped underground and storm drains replace the stream channel. While these stream sections are significantly altered, it is not possible to know precisely where this was done by walking the stream corridor. Secondly, crews do not specifically record road crossings unless a significant portion of the stream above or below the road is channelized. Lastly, the survey does not report places where a small section of only one side of the stream bank is stabilized to reduce erosion.

Results of this survey show recognizably altered stream channels at 66 sites. The severity and location of channel alteration sites is shown in Figure 5b. The total length of stream affected by channelization is estimated to be 140,950 feet (26.7 miles), or 24 percent of streams.

Severity rankings for the sites range from minor to very severe with most of the sites ranked moderate to minor in severity (Figure 5a). The severity of channel alterations is based on both the channel type and the length of the site. Earth channels are regularly rated as moderate but due the extreme length of some of the channels, those over 5,000 feet that did not have an adequate forest buffer were given a very severe rating. Three sites within this watershed are ranked as very severe due to a length of over 5,000 feet.

Restoring channel alteration sites can increase fish and wildlife habitat and may allow for more time for nutrient uptake in the waterway. In its simplest form, restoration for earth channels would include allowing vegetation and/or tree roots to stabilize the sediment along the channel, causing sinuosity to re-form naturally. This sinuosity may reform within the bed of the channelization or along its banks, depending on the site and the depth of the channel alteration.

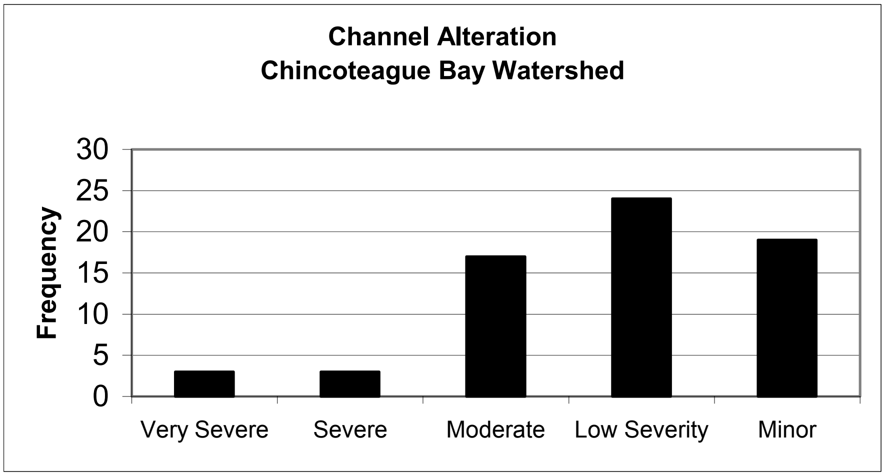

Figure 5a. Histograph showing the frequency of severity ratings given to channel alteration sites during the Chincoteague Bay SCA survey.

Channel Alterations

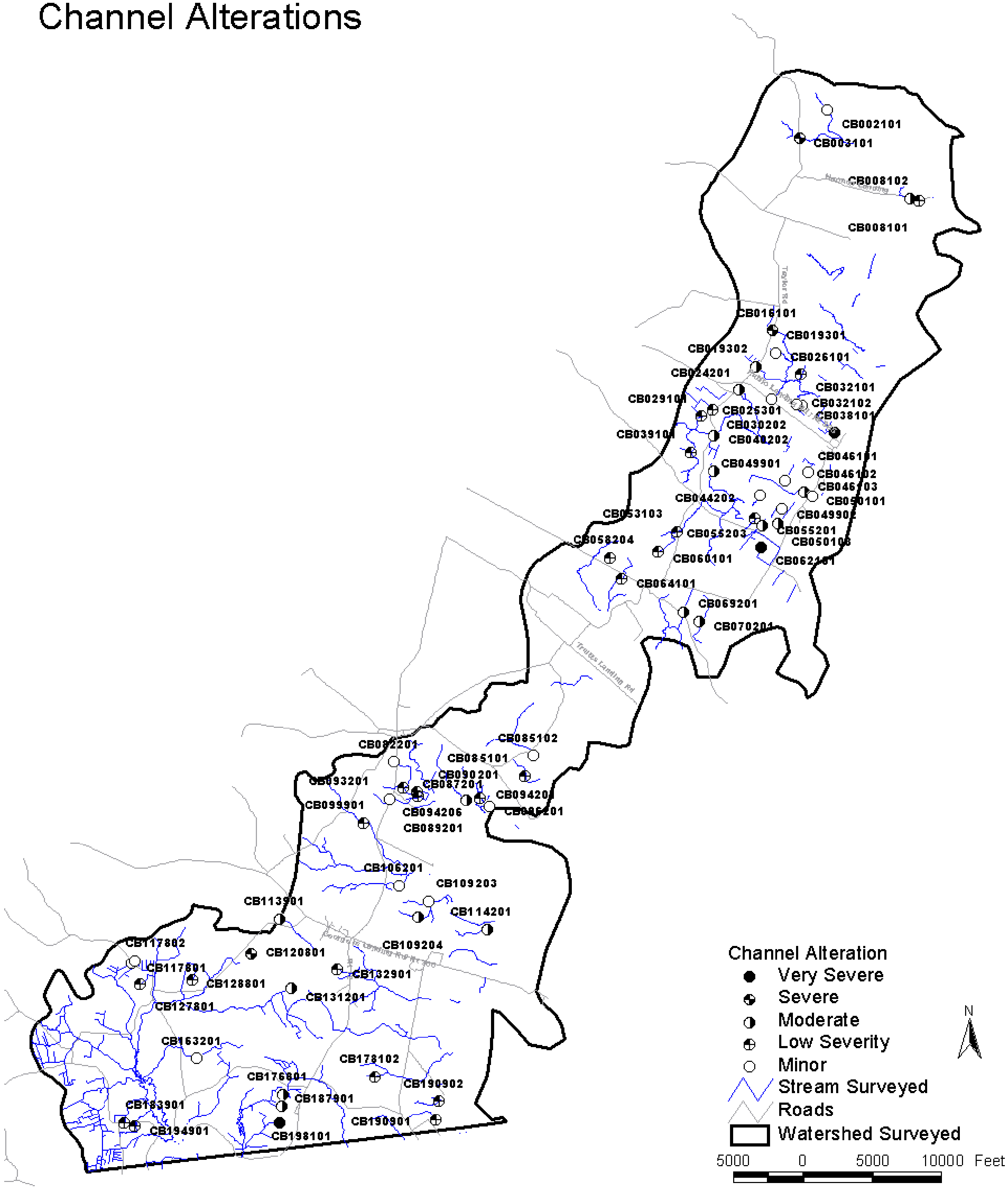

Figure 5b: Map showing the locations of the Channel Alterations in the Chincoteague Bay Watershed

Inadequate Buffers

Forests are the historically-occurring ecosystem around Maryland streams and are very important for maintaining stream health in Maryland. Forested buffer areas along streams play a crucial role in increasing water quality, stabilizing stream banks, trapping sediment, mitigating floods, and providing the required habitat for all types of stream life, including fish. Tree roots capture and remove pollutants and excess nutrients from shallow flowing water, and their structure helps prevent erosion and slow down water flow, reducing sediment load and the risk of flooding. Shading from the tree canopy provides the cooler water temperatures necessary for most stream life, especially cold-water species like trout. In smaller streams such as those surveyed, terrestrial plant material falling into the stream is the primary source of plant food for stream life. Tree leaves provide seasonal, instant food for stream life, while fallen tree branches and trunks provide a more consistent, slow-release food source throughout the year. Tree roots and snags also provide necessary fish habitat. Maintaining healthy streams and forest buffers are important to reducing the nutrient and sediment loadings to the Chesapeake Bay.

While there is no single minimum standard for how wide a stream buffer should be in Maryland, for the purposes of this study a forest buffer is considered inadequate if it is less than 50 feet wide, measured from the edge of the stream. The severity of inadequate forest buffers is based on both the length and width of the site. Those sites over 1,000 feet long with no forest on either side of the stream rank as the most severe. For streams on the Eastern Shore there is also the consideration of whether or not the channel is a drainage ditch. Drainage ditched with little to no water in the entire ditch is considered less severe than a ditch with water. A fourth ranking, wetland potential, rates if there is a potential of creating a wetland. The rating is based on bank height and slope of the areas.

Survey crews identified 63 inadequate buffer sites with a total length of 117,605 feet (22.3 miles), or approximately 28 percent of the 79 miles streams surveyed. The severity and location of inadequate buffer sites is shown in Figure 6b. Eight of these sites are ranked as very severe or severe, while the other fifty-five sites are moderate, of low severity, or minor (Figure 6a). Land use along the stream at inadequate buffer sites, were reported as mostly cropland.

Any inadequate buffer site would benefit from the restoration of trees and shrubs along both stream banks. For sites on agricultural land, farmers also may qualify for federal and state government financial incentives for allowing 50-foot forest buffers to grow on their farmland. Those sites that may have particular natural resource value are headwater streams, streams running directly into either bay, or those that form gaps in existing forested buffer areas.

In addition, many of inadequate buffer sites also have channel alterations. Establishing a forested buffer in any of these areas also may passively restore the stream channel function over time by stabilizing its sediment, decreasing its temperature, and possibly increasing fish and wildlife habitat and allowing time for nutrient uptake. In areas where establishing a 50-foot buffer is not possible at this time, allowing shrubs and small trees to grow in and along smaller channels and/or only clearing one side of the channel for scheduled maintenance on larger channels may yield more of the benefits of forest buffers than a stream buffer that is completely cleared of perennial woody vegetation.

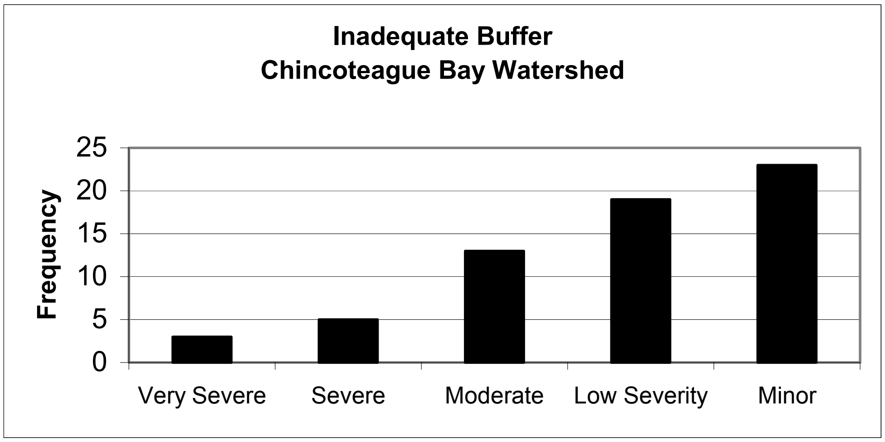

Figure 6a. Histograph showing the frequency of severity ratings given to inadequate buffer sites during the Chincoteague Bay SCA survey.

Inadequate Buffers

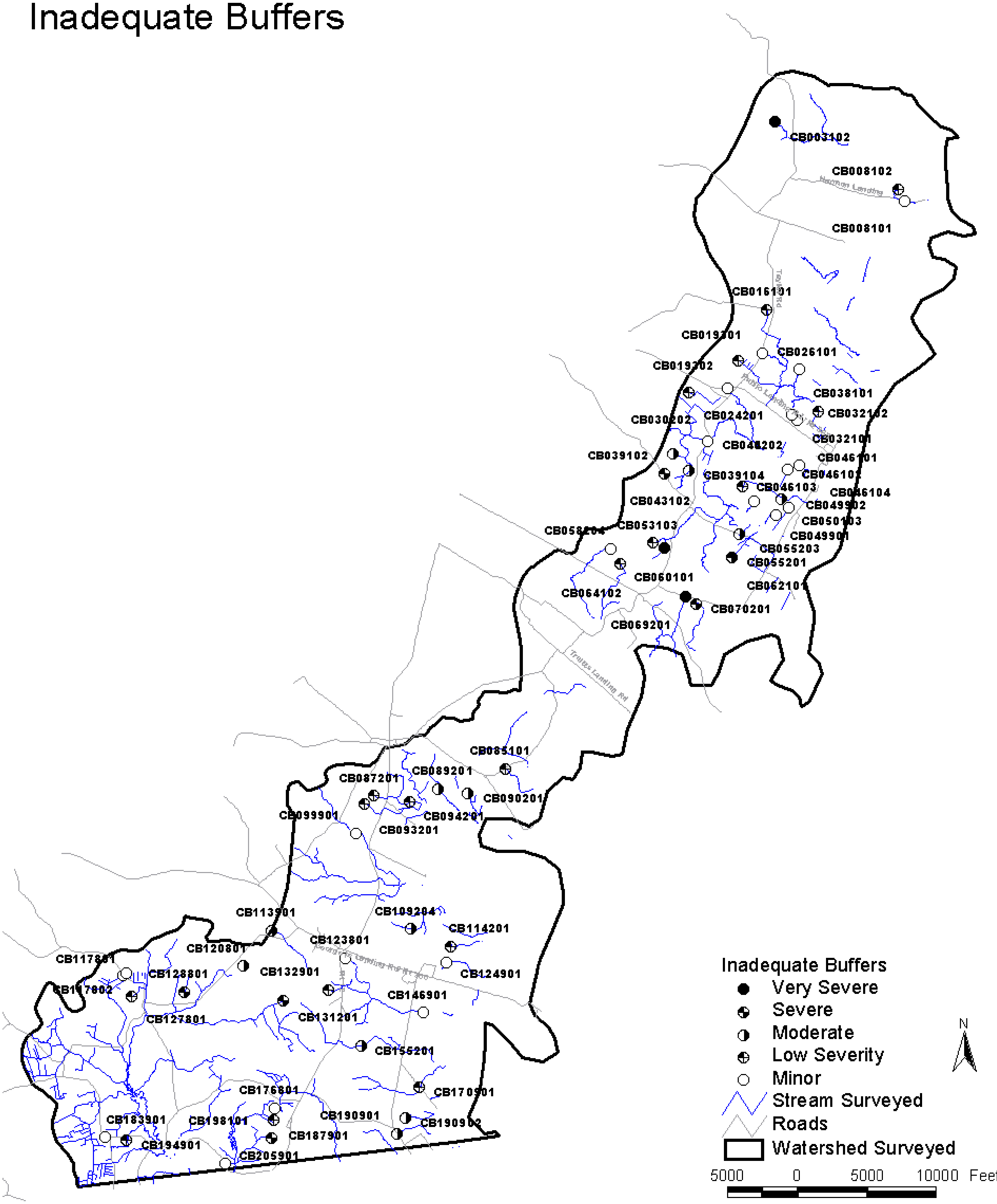

Figure 6b: Map showing the locations of the Inadequate Buffers in the Chincoteague Bay Watershed

Erosion Sites

Erosion is a natural process necessary to maintain good aquatic habitat. Too much erosion, however, can have the opposite effect on the stream by destabilizing stream banks, destroying in-stream habitat, and causing significant sediment pollution problems downstream. Erosion problems occur when either a stream's hydrology and/or sediment supply are significantly altered. This often occurs below a specific alteration, such as a pipe outfall or road crossing, or when land use in a watershed changes. For example, as a watershed becomes more urbanized, forest and agricultural fields are developed into residential housing complexes and commercial properties. As a result, the amount of impervious surface, or land area where rainwater cannot seep into the groundwater directly, increases in a drainage basin. This causes the amount of runoff entering a stream to increase. Over time, a stream channel will adjust to the greater rain-induced flows by eroding the streambed and banks to raise water-carrying capacity. This channel readjustment can extend over decades, during which time excessive amounts of sediment from unstable eroding stream banks can have very detrimental impacts on a stream's aquatic resources.

In this survey, unstable eroding streams are defined as areas where the stream banks are almost vertical, and the vegetative roots along the stream are unable to hold the soil onto the banks. While survey teams are asked to visually assess whether the stream was down-cutting, widening, or headcutting at a specific site, the only way to evaluate the full significance of the erosion processes at a specific site is to do more detailed monitoring over time.

The SCA survey found 11 eroding stream banks over the length of 8,420 feet (1.6 miles) of stream, or about 2 percent of streams surveyed. The severity and location of erosion sites is shown in Figure 7b. Two sites are ranked as moderate, six as of low severity, and three as minor (Figure 7a). Nearly all erosion sites are three feet in height or less, only one site has a height greater that 3 feet (Appendix B).

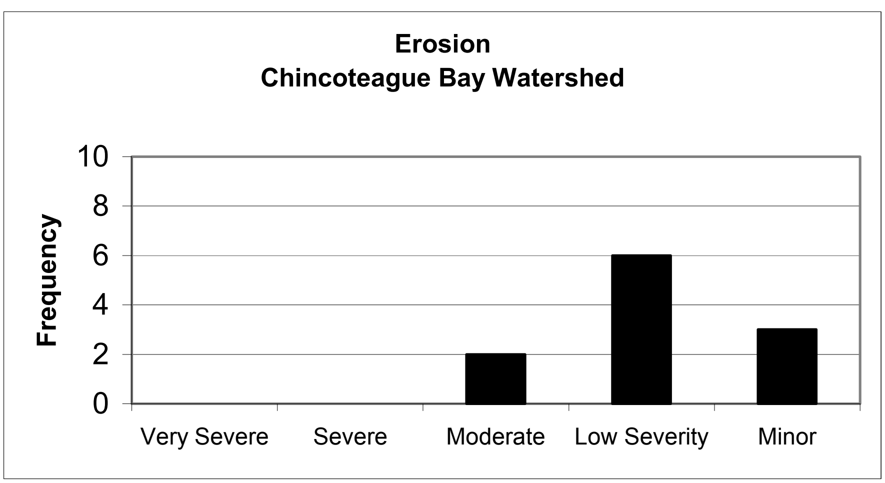

Figure 7a. Histograph showing the frequency of severity ratings given to erosion sites during the Chincoteague Bay SCA survey.

Erosion

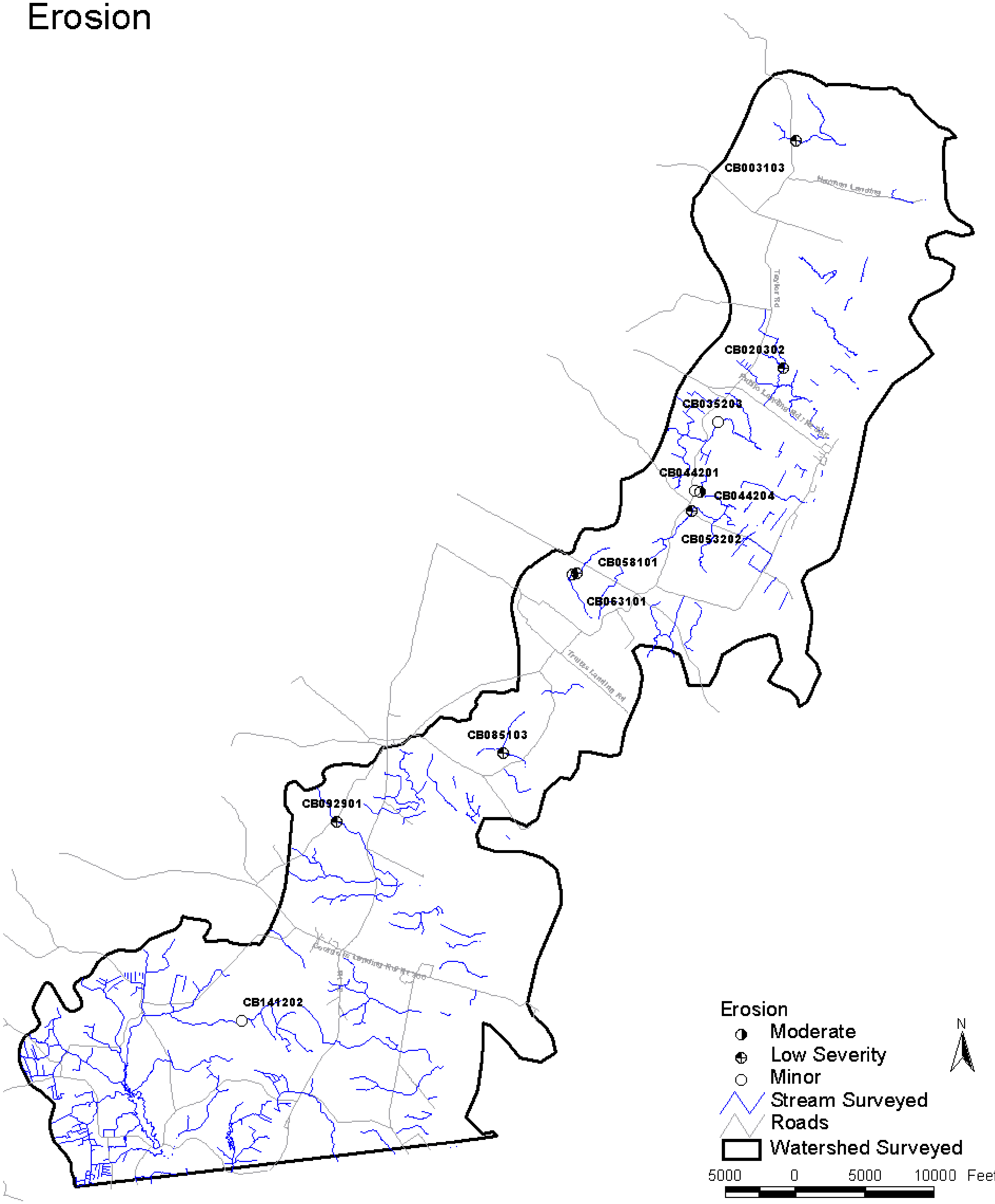

Figure 7b: Map showing the locations of the Erosion Sites in the Chincoteague Bay Watershed

Fish Migration Barriers

Fish migration barriers include anything in the stream that significantly interferes with the free, upstream movement of fish. Unimpeded fish passage is especially important for anadromous fish that live most of their lives in tidal waters but must migrate into non-tidal rivers and streams to spawn. Unobstructed upstream movement is also important for resident fish species, many of which also travel both up and down stream during different parts of their life cycle. In addition, without free fish passage, certain sections in a stream network become isolated from others. This becomes detrimental to species survival when a disturbance occurs in an isolated stretch of stream. A sediment discharge from a construction project, for example, or a sewage line break discharging into a small tributary can eliminate some or all of the fish species in an isolated stream stretch. With a fish blockage present, there is no avenue for fish to repopulate the inaccessible section. As a result, the disturbance will reduce diversity of the fish community in the area, and the remaining biological community may deviate from its natural balance and composition.

Fish blockages can be caused by man-made structures such as dams or road culverts and by natural features such as waterfalls or beaver dams. A structure becomes a blockage for fish if the stream water over or under it is too high, shallow, or fast. First, a vertical water drop such as a dam can be too high for fish to migrate over the obstacle. A vertical drop of 6 inches may cause a fish passage problem for some resident fish species, while anadromous fish can usually move through water drops of up to one foot, providing there is sufficient water flow and depth. Second, water too shallow for fish passage can occur in channelized stream sections or at road crossings, where the entire stream volume is spread over a large, flat area. Finally, a structure may be a fish blockage if the water is moving too fast through it for fish to swim through. This can occur at road crossings where the culvert pipe is placed at a steep angle, and the water moving through the pipe has a velocity higher than a fish's swimming ability.

In restoration work, priority is given to removing fish barriers that will yield access to the greatest quality and quantity of upstream habitat per dollar spent. The mainstem is ideally kept as barrier-free as possible, allowing anadromous fish to migrate to spawn and a source of fish species for tributaries in the event of a disturbance. Restoration planning includes targeting barriers for removal that isolate entire tributaries, those that isolate significant portions of the upper tributary, and those that isolate quality fish habitat. The best restoration sites also are far from other existing fish barriers.

The Chincoteague Bay SCA survey found 6 fish migration barriers. The locations of fish blockages are shown in Figure 8b. Fish barriers in these watersheds are due instream ponds (3) and debris dams (3). Two sites CB081101 and CB195901 received moderate ratings. They were instream ponds.

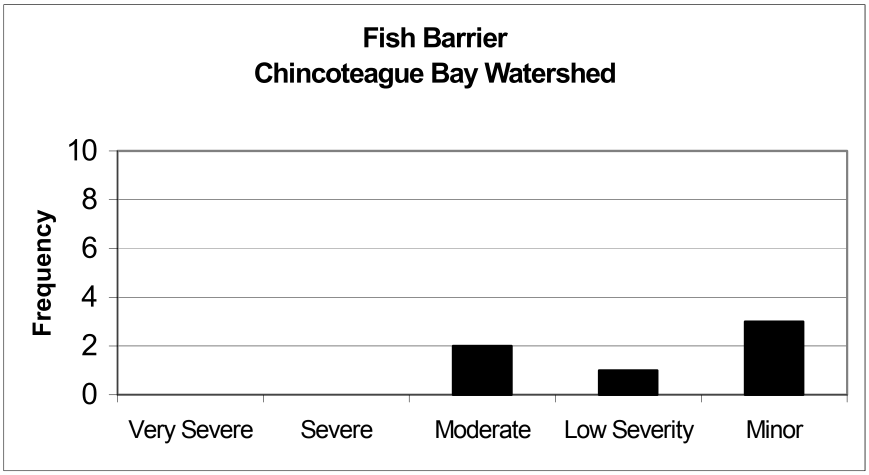

Figure 8a. Histograph showing the frequency of severity ratings given to fish barrier sites during the Chincoteague Bay SCA survey.

Fish Barriers

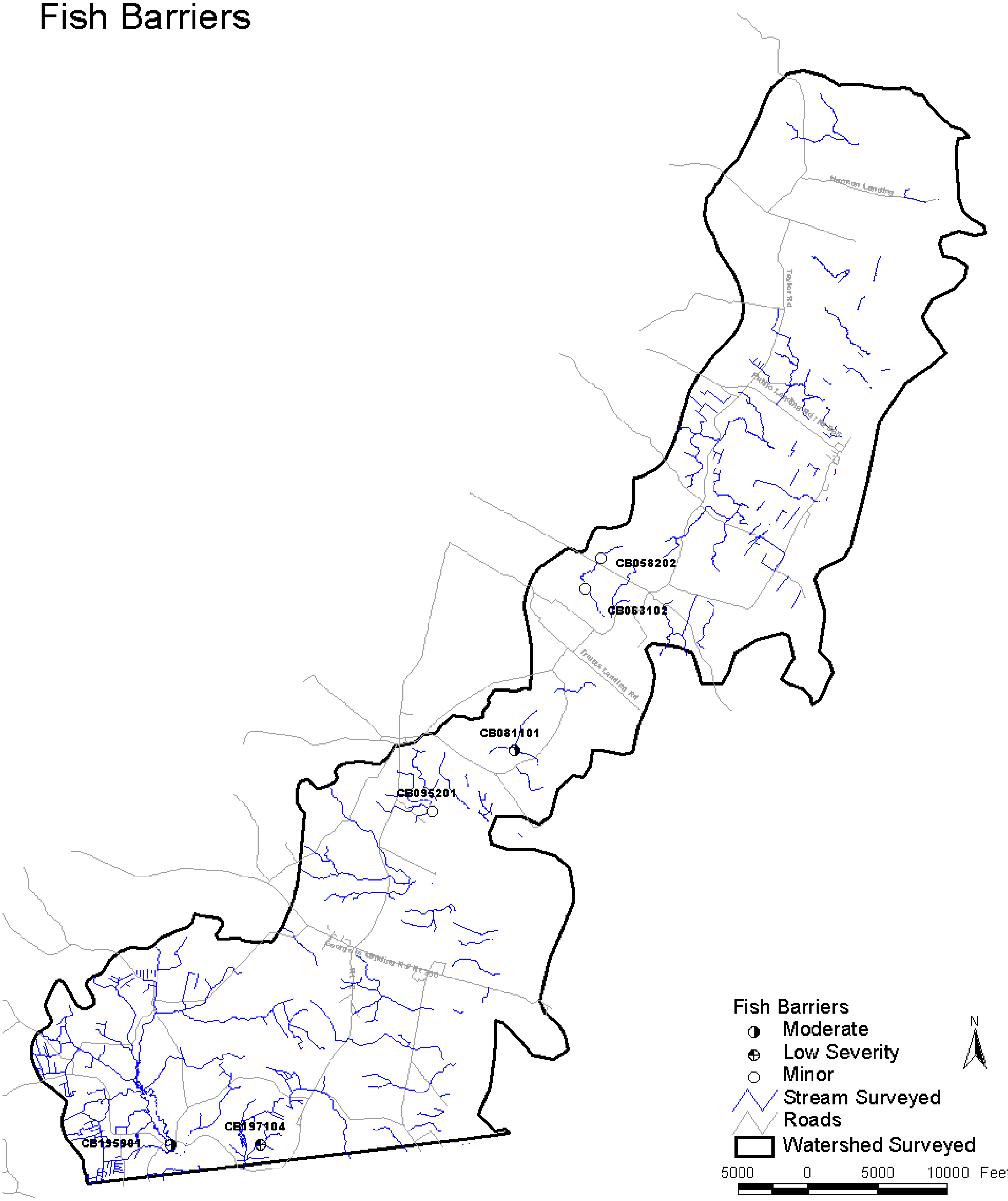

Figure 8b: Map showing the locations of the Fish Barriers in the Chincoteague Bay Watershed

Trash Dumping

Trash dumping sites are places where large amounts of trash are inside the stream corridor, either as a site of deliberate dumping or as a place where trash tends to accumulate (often a result of storm drainage). Site severity rankings are based on size, contents of trash, and potential impact on the stream.

Survey crews found six trash dumping sites (Figure 9b). The sites contained residential waste (4), tires (1), and metal roofing, siding (1). The one moderate site consisted of residential waste over a larger area within the stream corridor.

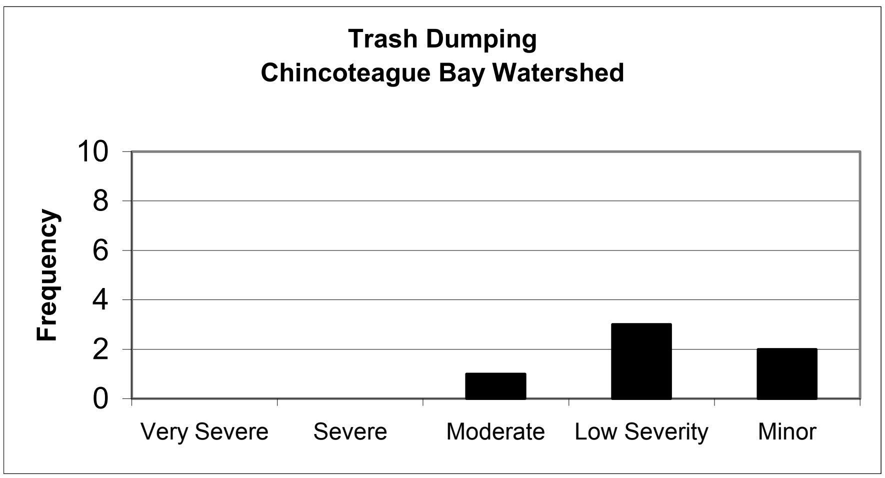

Figure 9a. Histograph showing the frequency of severity ratings given to trash dumping sites during the Chincoteague Bay SCA survey.

Trash Dumping

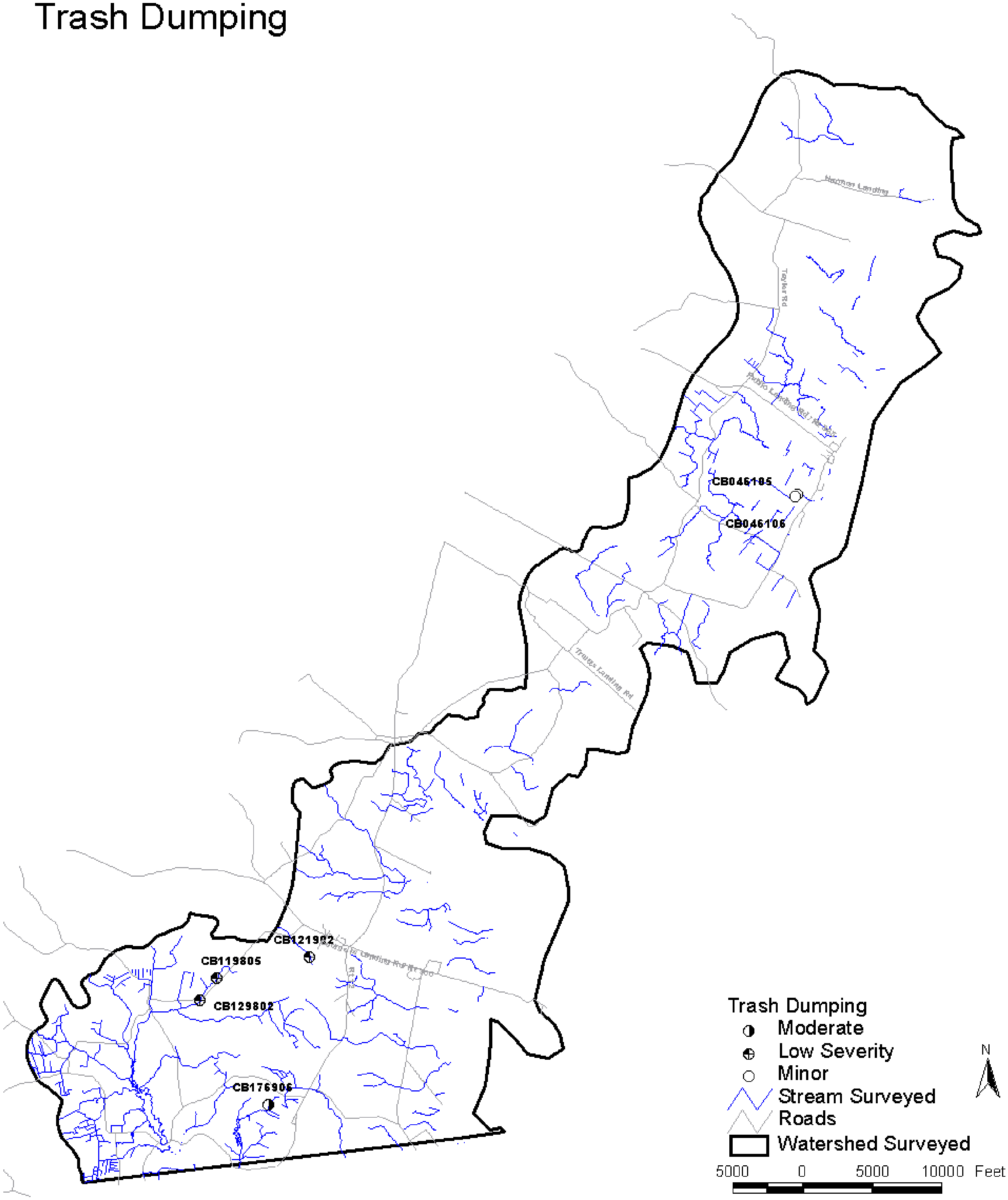

Figure 9b: Map showing the locations of the Trash Dumping in the Chincoteague Bay Watershed

Unusual Conditions or Comments

Survey teams record unusual conditions or comments to note the location of anything out of the ordinary observed during the survey or to provide additional written comments on a specific problem site. The survey crew identified 3 unusual conditions and 21 comments throughout the Chincoteague Bay watershed. The severity and location of unusual condition sites is shown in Figure 10b.

The three unusual conditions were sites with red flock (1), scum (1), and cement blocks used as erosion control (1). The sites ranked as low (1), and minor (2) in severity (Figure 10a).

Comment sites include data on places where survey crews encountered wetland areas, streams not on the map, the stream on the map could not be found, dry streams, and formerly channelized streams that had noticeably naturalized.

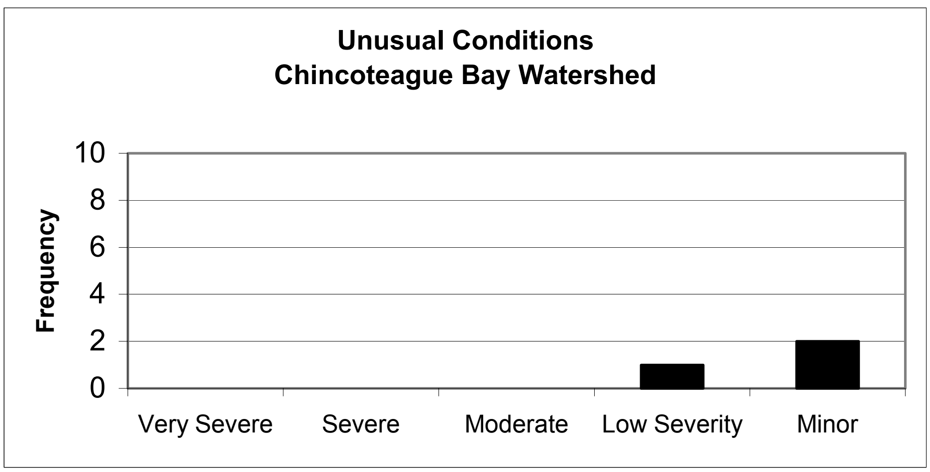

Figure 10a. Histograph showing the frequency of severity ratings given to unusual condition sites during the Chincoteague Bay SCA survey.

Unusual Conditions

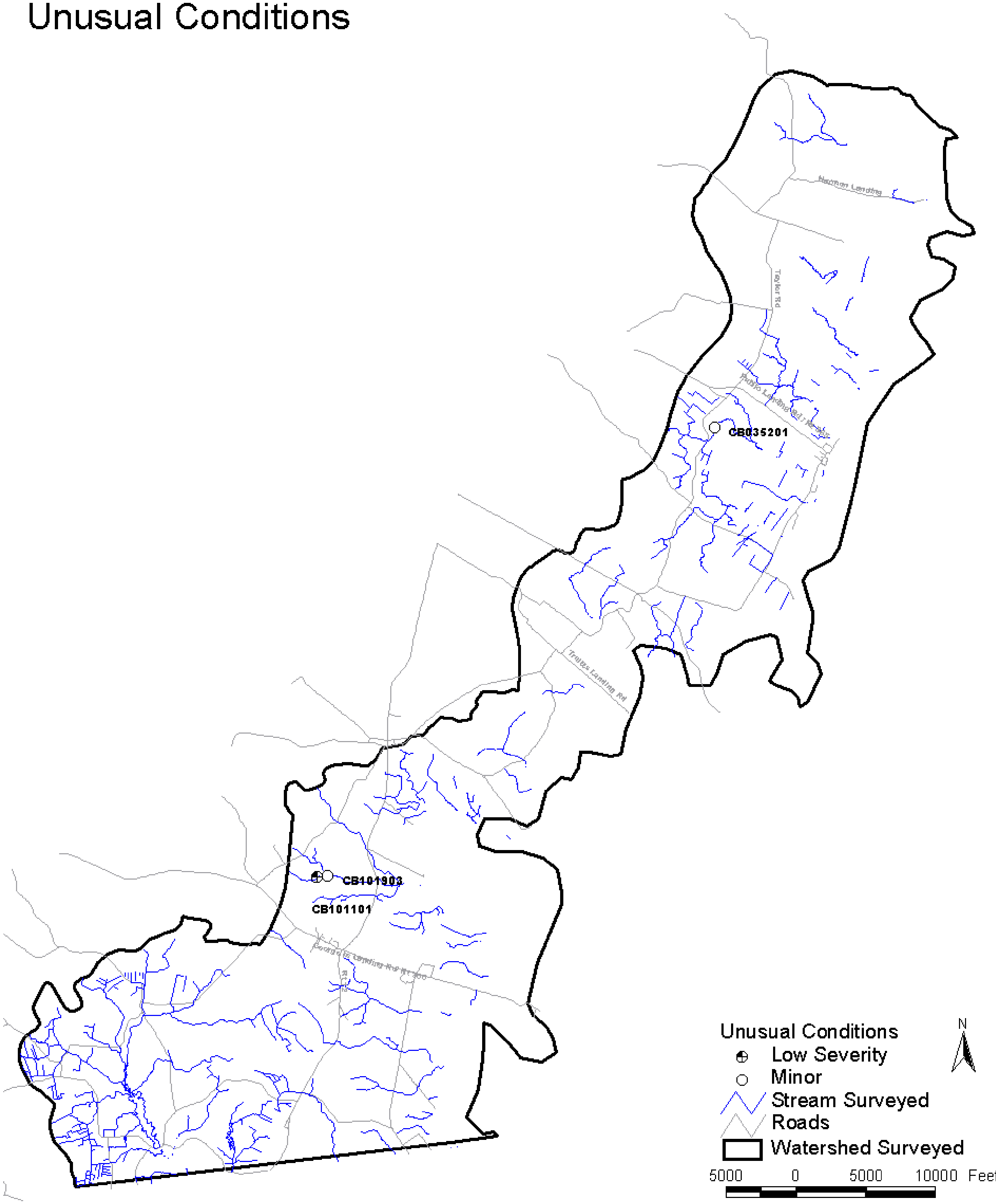

Figure 10b: Map showing the locations of the Unusual Conditions in the Chincoteague Bay Watershed

Pipe Outfalls

Pipe outfalls include any pipes or small, constructed channels that discharge into the stream through the stream corridor. Pipe outfalls are considered a potential environmental problem in the survey because they can carry uncontrolled runoff and pollutants such as oil, heavy metals and nutrients to a stream system. The survey crew identified a total of 2 pipe outfalls. The severity and location of pipe outfall sites is shown in Figure 11a.

Both of the pipes had a discharge. The first CB093902, had ayellowish discharge. This pipe was rated as moderate. The second pipe was a clear discharge. This pipe could be from a drain tile. It was given a low severity ranking.

No immediate follow up actions were taken as part of this study to determine the source of the color coming from the pipe. In addition, we made no estimate of the amount of fluid released from the pipes.

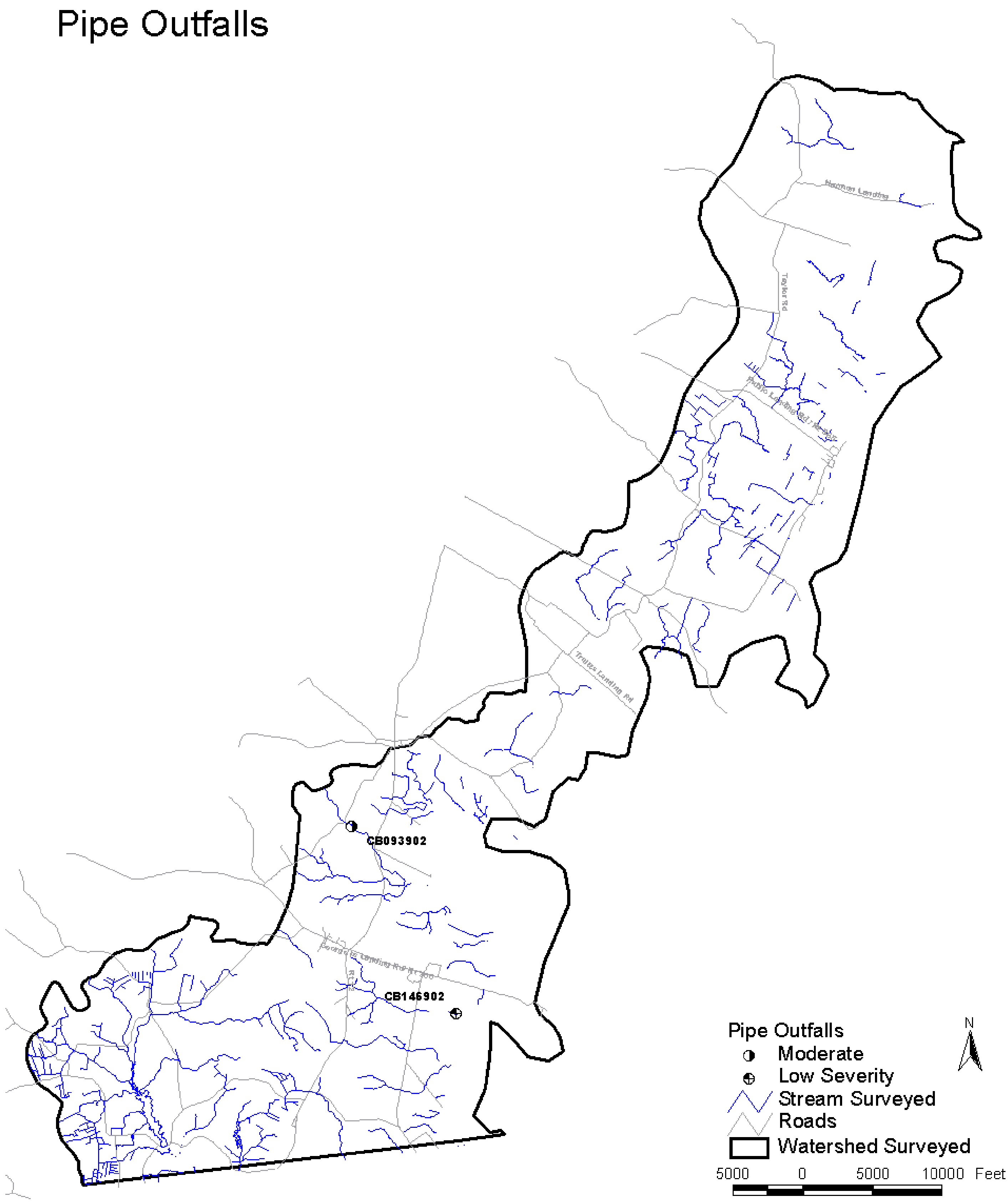

Figure 11a: Map showing the locations of the Pipe Outfalls in the Chincoteague Bay Watershed

Exposed Pipes

Any pipes that are in the stream or along the stream's immediate banks that could be damaged by a high flow event are recorded as exposed pipes in the SCA survey. Exposed pipes include: 1) manhole stacks in or along the edge of the stream channel, 2) pipes that are exposed along the stream banks, 3) pipes that run under the stream bed and were exposed by stream down-cutting, and 4) pipes built over a stream that are low enough to be affected by frequent high storm flows. Exposed pipes do not include pipe outfalls, where only the open end of the pipe is exposed to the stream bed.

In urban areas, it is very common for pipelines and other utilities to be placed in the stream corridor. This is especially true for gravity sewage lines, which depend on the continuous downward slope of the pipeline to move sewage to a pumping station or treatment plant. Since streams flow through the lowest points of the local landscape, engineers often build sewage lines paralleling streams to collect sewage from adjacent neighborhoods. While the pipelines are stationary, streams migrate to different areas within the floodplain. Over time, this variance in stream location can expose previously buried pipelines, making them vulnerable to puncture by debris in the stream. Fluids in the pipelines can be discharged into the stream, causing a serious water quality problem.

Field crews observed one exposed pipe during the survey, rated as minor in severity. Figure 12a shows the location of this site.

Exposed Pipe

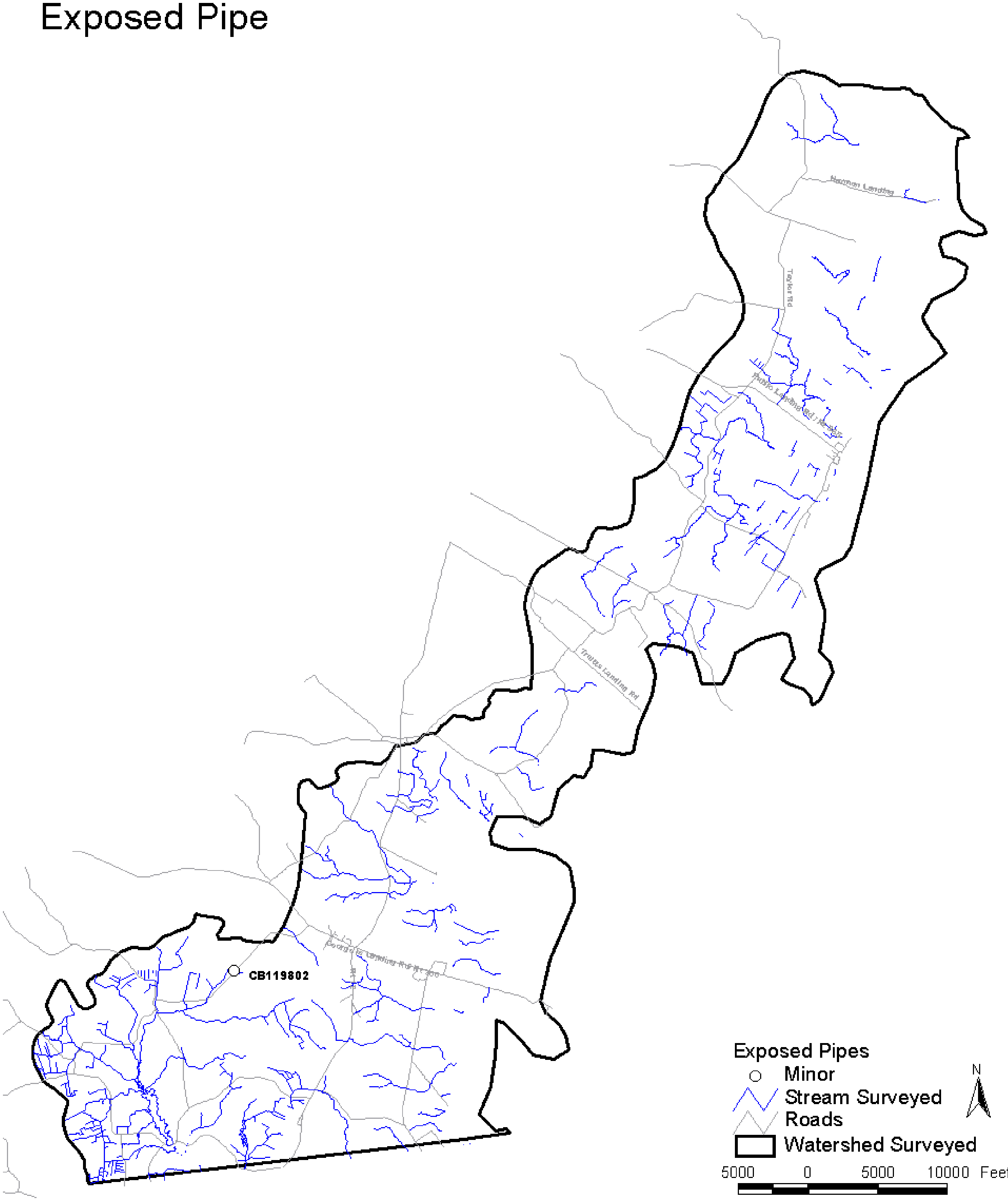

Figure 12a: Map showing the location of the Exposed Pipe in the Chincoteague Bay Watershed

Representative Sites

Representative sites are used to document the general condition of both in-stream habitat and the adjacent riparian corridor (including and up to 50 feet beyond the stream bank). The SCA survey's representative site evaluations are based on the habitat assessment procedures outlined in EPA's rapid bioassessment protocols (Plafkin, et. al., 1989), and they are very similar to the habitat evaluations of Maryland Save-Our-Stream's Heartbeat Program. At each representative site, the following 10 separate categories related to stream habitat health are evaluated:

* Attachment Sites for Macroinvertebrates
* Shelter for Fish
* Sediment Deposition
* Channel Flow Status
* Condition of Banks
* Embeddedness
* Channel Alteration
* Velocity and Depth Regime
* Bank Vegetation Protection
* Riparian Vegetative Zone Width

Under each category, field crews base a rating of optimal, suboptimal, marginal or poor on established grading criteria developed to reflect ideal wildlife habitat for rocky bottom streams. In addition to the habitat ratings, teams collect data on the stream's wetted width and pool depths at both runs and riffles at each representative site. Depth measurements are taken along the stream thalweg (main flow channel). At representative sites, field crews also indicate whether the bottom sediments are primarily silt, sand, gravel, cobble, boulder, or bedrock. Representative sites are located at approximately ½- to one-mile intervals along the stream. Survey crews evaluated 49 representative sites in the Chincoteague Bay watersheds.

Representative Sites

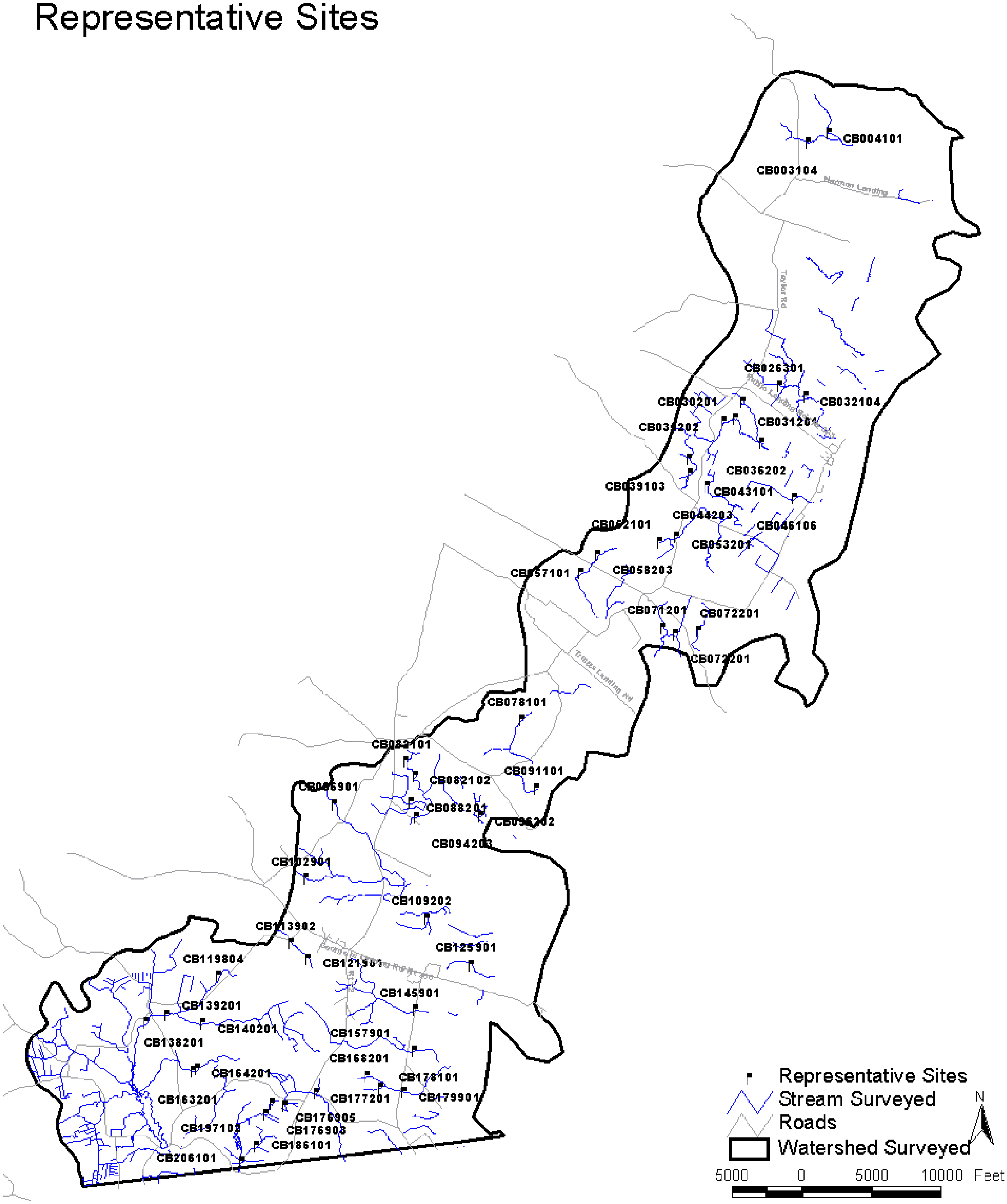

Figure 13a: Map showing the locations of the Representative Sites in the Chincoteague Bay Watershed

DISCUSSION

The results of the Chincoteague Bay SCA survey list, summarize, and show the location of the observable environmental problems along the stream corridor network in these watersheds. Each potential problem site has a corresponding ranking for severity, correctibility, and access and a photograph of the site. The data from this effort can be used to target future restoration efforts. After this list of potential problem sites is compiled and distributed, county planners, resource managers, and others can initiate a dialog to cooperatively set the direction and goals for the watersheds' management and plan future restoration work at specific problem sites. In addition, this data can be combined with other GIS data and local information to prioritize areas for restoration.

The GIS and attribute data for the sites described in the SCA survey can be combined with other existing GIS datasets to even further prioritize areas for restoration. Projects can be further targeted to restoring areas where rare or threatened species, gaps in continuous forest or the state's Green Infrastructure, or quality fish and wildlife habitat are found. In addition, sites can be prioritized for restoration based on their location in headwater areas, streams that deposit directly into the Chesapeake Bay, areas of specific local interest, or sites where the surrounding land use is particularly suited to restoration projects.

As mentioned earlier, the Maryland Department of Natural Resources has formed a partnership with Worcester County to develop a Watershed Restoration Action Strategy (WRAS) for the Chincoteague Bay watershed. Results from this survey will be combined with other GIS data and local information about the area to help establish priorities for the types and location of restoration projects that will be pursued in the watershed in the future. The value of the present survey is its help in placing individual stream problems into their watershed context and its potential common use among resource managers and land-use planners to cooperatively and consistently prioritize future restoration work. Results of the present survey will be given to the Chincoteague Bay Watersheds WRAS committee, which is developing a Watershed Restoration Action Strategy for the Chincoteague Bay. Information on the Chincoteague Watershed Action Strategy can be found on the Department of Natural Resources' website (www.dnr.maryland.gov/wras).

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Appendix A

Listing of sites by site number

Appendix A

Site Number	Problem	Severity	Correctability	Access	X Coordinate	Y Coordinate	Stream
CB002101	Channel Alteration	5	3	4	549981.26855	62388.36240	Waterworks Creek
CB003101	Channel Alteration	2	2	1	549376.38493	61782.42509	Waterworks Creek
CB003102	Inadequate Buffer	1	3	1	548970.90711	62130.36889	Waterworks Creek
CB003103	Erosion Site	4	3	3	549480.49410	61757.76765	Waterworks Creek
CB003104	Representative Site				549579.12384	61713.93221	Waterworks Creek
CB004101	Representative Site				550036.65624	61916.67112	Waterworks Creek
CB008101	Channel Alteration	4	3	1	551998.63587	60391.17389	Waterworks Creek
CB008101	Inadequate Buffer	5	3	1	551786.59328	60451.26944	Waterworks Creek
CB008102	Channel Alteration	3	3	1	551782.21401	60452.72919	Waterworks Creek
CB008102	Inadequate Buffer	4	3	1	551656.25411	60703.31832	Waterworks Creek
CB016101	Channel Alteration	2	3	2	548777.11161	57542.63380	Scarboro Creek
CB016101	Inadequate Buffer	4	3	2	548789.96601	58084.35479	Scarboro Creek
CB019301	Channel Alteration	5	3	1	548859.47094	57043.88484	Scarboro Creek
CB019301	Inadequate Buffer	5	2	1	548689.93190	57137.73680	Scarboro Creek
CB019302	Channel Alteration	3	5	1	548419.75563	56751.49594	Scarboro Creek
CB019302	Inadequate Buffer	4	3	1	548165.95466	56971.69854	Scarboro Creek
CB020302	Erosion Site	4	3	2	549190.98030	56818.33737	Scarboro Creek
CB021901	Comment				550348.94463	56755.02446	Cotter Creek
CB021902	Comment				550615.54896	57045.37992	Cotter Creek
CB024201	Channel Alteration	3	1	1	548040.70792	56226.06816	Paw Paw Creek
CB024201	Inadequate Buffer	5	1	1	547933.18788	56371.22022	Paw Paw Creek
CB025301	Channel Alteration	5	3	4	548760.12946	56030.34746	Scarboro Creek
CB026101	Channel Alteration	4	2	3	549407.44531	56576.13875	Scarboro Creek
CB026101	Inadequate Buffer	5	3	3	549487.67360	56777.46636	Scarboro Creek
CB026301	Representative Site				548963.58830	56426.77224	Scarboro Creek
CB029101	Channel Alteration	4	3	4	547227.37686	55655.63495	Paw Paw Creek
CB030201	Representative Site				548001.78272	55696.67490	Paw Paw Creek
CB030202	Channel Alteration	4	2	1	547477.52249	55794.20116	Paw Paw Creek
CB030202	Inadequate Buffer	4	1	1	547086.66172	56292.17314	Paw Paw Creek
CB031201	Representative Site				548160.58945	56067.81871	Paw Paw Creek
CB032101	Channel Alteration	5	1	1	549421.53075	55895.27620	Scarboro Creek
CB032101	Inadequate Buffer	5	1	1	549451.12686	55687.81016	Scarboro Creek
CB032102	Channel Alteration	5	1	2	549313.11270	55920.16310	Scarboro Creek
CB032102	Inadequate Buffer	5	1	2	549323.59479	55789.13700	Scarboro Creek
CB032103	Comment				549800.60257	56092.71719	Scarboro Creek
CB032104	Comment				549537.82246	56183.99870	Scarboro Creek
CB032104	Representative Site				549537.82246	56183.99870	Scarboro Creek
CB034101	Comment				547100.56377	55618.01455	Paw Paw Creek
CB035201	Unusual Condition	5	1	1	547672.14549	55512.33147	Paw Paw Creek
CB035202	Representative Site				547751.03567	55635.87647	Paw Paw Creek
CB035203	Erosion Site	5	3	4	547768.89760	55640.34196	Paw Paw Creek
CB036201	Comment				548616.60753	55074.73947	Paw Paw Creek
CB036202	Representative Site				548568.21891	55177.42031	Paw Paw Creek
CB037101	Comment				549197.85189	55226.54061	Paw Paw Creek
CB038101	Channel Alteration	1	3	2	550147.74893	55280.86494	Public Landing
CB038101	Inadequate Buffer	4	3	2	549904.33156	55875.57783	Public Landing
CB039101	Channel Alteration	4	3	4	546992.17427	54856.69704	Paw Paw Creek
CB039102	Inadequate Buffer	3	2	4	546743.79794	54951.05230	Paw Paw Creek
CB039103	Representative Site				546994.94942	54838.65854	Paw Paw Creek
CB039104	Inadequate Buffer	3	2	4	547080.97921	54575.01886	Paw Paw Creek
CB040202	Channel Alteration	3	3	2	547505.57786	55235.50564	Tanhouse Creek
CB040202	Inadequate Buffer	5	3	2	547505.57786	55235.50564	Tanhouse Creek
CB043101	Representative Site				547022.56218	54510.61967	Paw Paw Creek
CB043102	Inadequate Buffer	2	3	3	546560.55709	54520.98517	Paw Paw Creek
CB044201	Erosion Site	5	1	2	547265.41101	54147.82721	Tanhouse Creek
CB044202	Channel Alteration	3	3	2	547491.70209	54454.29964	Tanhouse Creek
CB044202	Inadequate Buffer	5	3	2	547505.57786	55235.50564	Tanhouse Creek
CB044203	Representative Site				547391.27778	54227.78963	Tanhouse Creek

Appendix A

Site Number	Problem	Severity	Correctability	Access	X Coordinate	Y Coordinate	Stream
CB044204	Erosion Site	3	4	5	547374.98914	54130.05778	Tanhouse creek
CB046101	Channel Alteration	5	1	1	549566.13011	54415.44747	Stagg Creek
CB046101	Inadequate Buffer	5	1	1	549489.81336	54706.83870	Stagg Creek
CB046102	Channel Alteration	5	2	2	549058.27683	54246.16304	Stagg Creek
CB046102	Inadequate Buffer	5	1	2	549231.72399	54605.54556	Stagg Creek
CB046103	Channel Alteration	3	1	2	549477.70464	53980.49844	Stagg Creek
CB046103	Inadequate Buffer	4	2	2	548244.21027	54226.30885	Stagg Creek
CB046104	Inadequate Buffer	3	1	2	549111.95060	53971.61373	Stagg Creek
CB046105	Trash Dumping	5	1	2	549338.58469	54018.32082	Stagg Creek
CB046106	Representative Site				549289.64487	53992.34473	Stagg Creek
CB046106	Trash Dumping	5	1	2	549289.64487	53990.86394	Stagg Creek
CB049901	Channel Alteration	5	1	2	548514.56768	53921.72638	Tanhouse Creek
CB049901	Inadequate Buffer	5	1	2	548979.46374	53608.00487	Tanhouse Creek
CB049902	Channel Alteration	5	3	2	548979.62500	53607.88281	Tanhouse Creek
CB049902	Inadequate Buffer	5	1	2	548514.56768	53921.72638	Tanhouse Creek
CB050101	Channel Alteration	5	1	2	549649.81065	53883.84783	Stagg Creek
CB050102	Comment				549649.81065	53883.84783	Tanhouse Creek
CB050103	Channel Alteration	3	1	2	548888.13793	53291.91540	Stagg Creek
CB050103	Inadequate Buffer	5	1	1	549274.33478	53767.23461	Stagg Creek
CB052101	Representative Site				546349.92748	53029.98109	Tanhouse Creek
CB053103	Channel Alteration	4	4	4	546683.90975	53113.66774	Tanhouse Creek
CB053103	Inadequate Buffer	4	3	3	546303.90694	53014.37427	Tanhouse Creek
CB053201	Representative Site				546723.47783	53129.34566	Tanhouse Creek
CB053202	Erosion Site	4	2	2	547187.64993	53697.24066	Waterworks Creek
CB054201	Comment				547386.14973	52899.28624	Tanhouse Creek
CB055201	Channel Alteration	3	3	2	548560.82691	53248.07321	Tanhouse Creek
CB055201	Inadequate Buffer	4	2	2	548034.73018	52699.81276	Tanhouse Creek
CB055203	Channel Alteration	4	2	2	548402.18133	53406.71878	Tanhouse Creek
CB055203	Inadequate Buffer	3	3	3	548194.54227	53200.24623	Tanhouse Creek
CB057101	Representative Site				544619.99469	52350.27501	Boxiron Creek
CB058101	Erosion Site	4	3	4	544703.45311	52363.00595	Boxiron Creek
CB058202	Fish Barrier	5	2	2	544949.58473	52640.25765	Boxiron Creek
CB058203	Representative Site				545000.50851	52744.93432	Boxiron Creek
CB058204	Channel Alteration	4	4	3	545215.92712	52540.23286	Boxiron Creek
CB058204	Inadequate Buffer	5	3	3	545383.54928	52891.51061	Boxiron Creek
CB060101	Channel Alteration	4	3	3	546276.28394	52669.46013	Tanhouse Creek
CB060101	Inadequate Buffer	1	3	2	546559.97956	52874.76617	Tanhouse Creek
CB062101	Channel Alteration	1	2	2	548531.22404	52742.10522	Tanhouse Creek
CB062101	Inadequate Buffer	3	3	2	548032.31250	52697.08594	Tanhouse Creek
CB063101	Erosion Site	3	3	5	544596.72638	52321.81529	Boxiron Creek
CB063102	Fish Barrier	5	1	5	544602.88495	52009.26747	Boxiron Creek
CB064101	Channel Alteration	4	3	1	545482.86988	52088.58335	Boxiron Creek
CB064102	Inadequate Buffer	4	3	1	545577.64470	52551.14104	Boxiron Creek
CB069201	Channel Alteration	3	4	2	546829.21084	51357.99786	Brimer Gut
CB069201	Inadequate Buffer	1	3	2	547006.26996	51842.98587	Brimer Gut
CB070201	Channel Alteration	3	3	2	547171.68637	51164.59614	Hallbrooks Gut
CB070201	Inadequate Buffer	2	3	2	547252.36400	51701.18313	Hallbrooks Gut
CB071201	Representative Site				546406.67788	51182.14170	Brimer Gut
CB072201	Representative Site				547187.64573	51113.92882	Brimer Gut
CB072201	Representative Site				546701.80298	51038.75544	Brimer Gut
CB078101	Representative Site				543342.49996	49188.39605	Rowley Creek
CB081101	Fish Barrier	3	3	3	543070.90423	48484.62468	Rowley Creek
CB081102	Comment				543060.05774	48490.82268	Rowley Creek
CB082101	Representative Site				540837.78849	48275.28363	Scarboro Creek 2
CB082102	Representative Site				541029.54550	47971.57377	Scarboro Creek 2
CB082201	Channel Alteration	5	1	4	540499.70582	48070.90116	Scarboro Creek 2
CB085101	Channel Alteration	4	3	2	543352.91290	47764.10803	Rowley Creek
CB085101	Inadequate Buffer	4	3	2	543083.30021	48122.04211	Rowley Creek

Appendix A

Site Number	Problem	Severity	Correctability	Access	X Coordinate	Y Coordinate	Stream
CB085102	Channel Alteration	5	2	2	543542.64056	48205.29871	Rowley Creek
CB085103	Erosion Site	4	2	2	543081.75071	48476.87719	Rowley Creek
CB086901	Representative Site				539271.26253	47346.77459	Pikes Creek
CB086902	Comment				539100.78131	47506.63274	Pikes Creek
CB087201	Channel Alteration	4	3	2	540720.98652	47492.59587	Scarboro Creek 2
CB087201	Inadequate Buffer	4	2	1	540242.54256	47540.21719	Scarboro Creek 2
CB088201	Representative Site				540954.42648	47379.57082	Scarboro Creek 2
CB089201	Channel Alteration	3	2	1	542087.09537	47219.36780	Scarboro Creek 2
CB089201	Inadequate Buffer	3	3	1	541644.83576	47685.41696	Scarboro Creek 2
CB090201	Channel Alteration	4	1	1	542372.89779	47279.62672	Scarboro Creek 2
CB090201	Inadequate Buffer	3	3	1	542290.13574	47594.65645	Scarboro Creek 2
CB090202	Comment				542418.32208	47428.68352	Scarboro Creek 2
CB091101	Representative Site				543654.37467	47689.43234	Rowley Creek
CB092901	Erosion Site	4	3	3	539481.25055	46972.20304	Pikes Creek
CB093201	Channel Alteration	5	3	2	540425.31468	47255.12659	Scarboro Creek 2
CB093201	Inadequate Buffer	4	2	1	540026.77244	47374.84592	Scarboro Creek 2
CB093902	Pipe Outfall	3	3	3	539636.91040	46876.51976	Pikes Creek
CB094201	Channel Alteration	4	1	3	541022.91482	47404.39523	Scarboro Creek 2
CB094201	Inadequate Buffer	4	1	3	541021.18409	47406.85708	Scarboro Creek 2
CB094203	Representative Site				541064.58438	47075.27882	Scarboro Creek 2
CB094204	Comment				541080.20849	47082.22286	Scarboro Creek 2
CB094205	Comment				540861.47099	47269.71214	Scarboro Creek 2
CB094206	Channel Alteration	4	1	3	541030.46678	47322.40063	Scarboro Creek 2
CB095201	Fish Barrier	5	1	1	541288.52991	47158.60738	Scarboro Creek 2
CB096201	Channel Alteration	5	2	1	542580.12273	47078.75084	Scarboro Creek 2
CB096202	Representative Site				542430.82571	47090.90292	Scarboro Creek 2
CB099901	Channel Alteration	4	4	2	539852.75000	46731.54297	Pikes Creek
CB099901	Inadequate Buffer	5	1	2	539852.75000	46731.54297	Pikes Creek
CB100101	Comment				538491.39384	45841.27081	Pikes Creek
CB101101	Unusual Condition	4	4	3	539040.95759	45780.82711	Pikes Creek
CB101901	Comment				538874.59900	46096.02760	Pikes Creek
CB101902	Comment				538947.83553	46196.00127	Pikes Creek
CB101903	Unusual Condition	5	3	4	539272.16869	45806.56897	Pikes Creek
CB102901	Representative Site				538657.19549	45728.41175	Pikes Creek
CB106201	Channel Alteration	5	3	1	540619.71183	45346.62819	Pikes Creek
CB109202	Representative Site				541286.57816	44859.58706	Pikes Creek
CB109203	Channel Alteration	5	3	1	541276.20272	44998.91436	Pikes Creek
CB109204	Channel Alteration	3	3	2	541038.26677	44647.88341	Pikes Creek
CB109204	Inadequate Buffer	3	3	3	541038.26677	44647.88341	Pikes Creek
CB110201	Comment				541794.97458	44695.06227	Pikes Creek
CB113901	Channel Alteration	3	4	1	537993.69172	44614.46540	Riley Creek
CB113901	Inadequate Buffer	3	2	1	537993.69172	44614.46540	Riley Creek
CB113902	Representative Site				538325.54703	44327.32790	Riley Creek
CB114201	Channel Alteration	3	3	2	542524.21960	44377.87034	Beasey Creek
CB114201	Inadequate Buffer	4	3	2	541919.47983	44271.15155	Beasey Creek
CB115201	Comment				542660.58249	44551.28836	Beasey Creek
CB117801	Channel Alteration	5	3	1	534765.75000	43648.01563	Paradise Branch
CB117801	Inadequate Buffer	5	3	1	534765.75000	43648.01563	Paradise Branch
CB117802	Channel Alteration	5	3	1	534837.00000	43688.59375	Paradise Branch
CB117802	Inadequate Buffer	5	3	1	534837.00000	43688.59375	Paradise Branch
CB119802	Exposed Pipe	3	3	1	536947.09953	43692.20010	Little Mill Creek
CB119804	Representative Site				536735.79467	43612.31101	Little Mill Creek
CB119805	Trash Dumping	4	2	2	536690.50200	43500.22199	Little Mill Creek
CB120801	Channel Alteration	2	4	2	537391.76824	43844.06584	Little Mill Creek
CB120801	Inadequate Buffer	3	3	2	537391.76824	43844.06584	Little Mill Creek
CB121901	Representative Site				538704.81715	43996.27595	Riley Creek
CB121902	Trash Dumping	4	1	1	538719.19052	43959.34287	Little Mill Creek
CB123801	Inadequate Buffer	5	5	1	539612.56250	44010.97266	Riley Creek

Appendix A

Site Number	Problem	Severity	Correctability	Access	X Coordinate	Y Coordinate	Stream
CB124901	Inadequate Buffer	5	3	4	541812.69870	43909.34655	Cottman Creek
CB125901	Representative Site				542257.08631	43857.34375	Cottman Creek
CB127801	Channel Alteration	4	2	3	534947.18750	43180.15625	Paradise Branch
CB127801	Inadequate Buffer	4	4	1	534947.18750	43180.15625	Paradise Branch
CB128801	Channel Alteration	4	2	3	536089.31250	43284.63281	Little Mill Creek
CB128801	Inadequate Buffer	2	2	2	536089.31250	43284.63281	Little Mill Creek
CB129802	Trash Dumping	4	3	2	536317.61187	43021.56083	Little Mill Creek
CB131201	Channel Alteration	3	4	3	538262.50000	43101.41016	Little Mill Creek
CB131201	Inadequate Buffer	2	4	4	538262.50000	43101.41016	Little Mill Creek
CB132901	Channel Alteration	4	3	2	539270.88385	43498.53119	Riley Creek
CB132901	Inadequate Buffer	4	1	2	539247.64760	43326.58293	Riley Creek
CB138201	Representative Site				535164.25910	42597.79602	Little Mill Run
CB139201	Representative Site				535620.73376	42774.32333	Little Mill Creek
CB140201	Representative Site				536398.16717	42583.53119	Marshall Mill Run
CB141202	Erosion Site	5	2	3	537411.34005	42660.25722	Little Mill Creek
CB145901	Representative Site				541035.59286	42877.26746	Riley Creek
CB146901	Inadequate Buffer	5	3	3	541304.70184	42832.81752	Riley Creek
CB146902	Pipe Outfall	4	4	3	541915.00214	42780.87707	Riley Creek
CB155201	Inadequate Buffer	3	2	3	539947.43750	42102.48828	Hancock Creek
CB157901	Representative Site				541004.37246	41996.99200	Hancock Creek
CB163201	Channel Alteration	5	3	3	536182.18182	41543.47523	Payne Ditch
CB163201	Representative Site				536182.18182	41543.47523	Payne Ditch
CB164201	Representative Site				536275.93548	41608.24744	Payne Ditch
CB164202	Comment				536695.86462	41816.89148	Payne Ditch
CB168201	Representative Site				539972.27242	41433.99129	Hancock Creek
CB170901	Inadequate Buffer	4	4	4	541219.63828	41212.55705	Hancock Creek
CB176801	Channel Alteration	3	3	3	538072.12500	40751.16406	Powell Creek
CB176801	Inadequate Buffer	5	3	3	538072.12500	40751.16406	Big Mill
CB176903	Representative Site				538181.08092	40784.42085	Powell Creek
CB176905	Representative Site				537911.71442	40849.91657	Powell Creek
CB176906	Trash Dumping	3	4	3	537813.07977	40740.59508	Sand Branch
CB177201	Representative Site				538871.50035	41066.51953	Powell Creek
CB178101	Representative Site				540269.11334	41187.29520	Hancock Creek
CB178102	Channel Alteration	2	4	1	540084.87500	41142.83203	Hancock Creek
CB179901	Representative Site				540795.71057	41097.53899	Bessen Creek
CB183901	Channel Alteration	4	3	2	534608.23636	40133.74864	Unnamed trib 2
CB183901	Inadequate Buffer	5	1	2	534365.92036	40122.51545	Unnamed trib 2
CB186101	Representative Site				537780.44306	40616.01893	Sand Branch
CB187901	Channel Alteration	3	3	2	538053.12500	40488.57031	Sand Branch
CB187901	Inadequate Buffer	4	2	3	538053.12500	40488.57031	Sand Branch
CB190901	Channel Alteration	4	4	2	541436.71105	40198.44357	Bessen Creek
CB190901	Inadequate Buffer	3	4	2	540745.69621	40203.14436	Bessen Creek
CB190902	Channel Alteration	4	3	2	541491.92546	40605.87843	Bessen Creek
CB190902	Inadequate Buffer	3	4	2	540921.19204	40541.60060	Bessen Creek
CB194901	Channel Alteration	4	1	2	534843.18750	40054.77734	Unnamed trib 3
CB194901	Inadequate Buffer	4	3	2	534843.18750	40054.77734	Unnamed trib 3
CB195901	Fish Barrier	3	5	1	535600.25003	39904.26364	Swans Gut Creek
CB197102	Representative Site				537567.76132	39920.16796	Sand Branch
CB197103	Comment				537203.30768	40028.03741	Sand Branch
CB197104	Fish Barrier	4	3	2	537544.61956	39903.07389	Sand Branch
CB198101	Channel Alteration	1	3	2	538007.56250	40094.80859	Sand Branch
CB198101	Inadequate Buffer	2	3	2	538007.56250	40094.80859	Sand Branch
CB205901	Inadequate Buffer	5	1	1	536988.45101	39560.13715	Sand Branch
CB206101	Representative Site				537239.80174	39581.04630	Sand Branch

Appendix B

Listing of sites by problem category

Channel Alterations

Problem	Site Number	Type	BottomWidth(in)	Length(ft)	Perennial Flow	Sedimentation	Veg in Channel	Road Crossing	LengthAbove(ft)	LengthBelow(ft)	Severity	Correctability	Access
Channel Alteration	CB038101	Earth channel	18	6000	Yes	No	Yes	No			1	3	2
Channel Alteration	CB062101	Earth channel	30	7500	Yes	No	Yes	No			1	2	2
Channel Alteration	CB198101	Earth channel	24	7000	No	No	Yes	No			1	3	2
Channel Alteration	CB003101	Earth channel	24	3400	Yes	No	Yes	No			2	2	1
Channel Alteration	CB016101	Earth channel	36	2100	Yes	Yes	No	No			2	3	2
Channel Alteration	CB120801	Earth channel	24	3300	Yes	Yes	Yes	No			2	4	2
Channel Alteration	CB008102	Earth channel	114	1700	Yes	No	Yes	No			3	3	1
Channel Alteration	CB019302	Earth channel	48	4000	Yes	No	Yes	No			3	5	1
Channel Alteration	CB024201	Earth channel	12	1000	Yes	Yes	No	No			3	1	1
Channel Alteration	CB040202	Earth channel	24	3800	Yes	No	Yes	No			3	3	2
Channel Alteration	CB044202	Earth channel	24	1200	Yes	No	Yes	No			3	3	2
Channel Alteration	CB046103	Earth channel	48	4700	Yes	Yes	Yes	No			3	1	2
Channel Alteration	CB050103	Earth channel	48	2000	Yes	Yes	Yes	No			3	1	2
Channel Alteration	CB055201	Earth channel	84	1800	Yes	No	Yes	No			3	3	2
Channel Alteration	CB069201	Earth channel	12	1700	Yes	No	Yes	No			3	4	2
Channel Alteration	CB070201	Earth channel	24	2200	Yes	No	Yes	No			3	3	2
Channel Alteration	CB089201	Earth channel	96	5000	Yes	No	No	No			3	2	1
Channel Alteration	CB109204	Earth channel	48	1300	Yes	No	Yes	No			3	3	2
Channel Alteration	CB113901	Earth channel	180	1200	Yes	No	Yes	No			3	4	1
Channel Alteration	CB114201	Earth channel	24	2000	Yes	Yes	Yes	No			3	3	2
Channel Alteration	CB131201	Earth channel	36	4000	Yes	No	No	No			3	4	3
Channel Alteration	CB176801	Earth channel	36	4100	Yes	Yes	Yes	No			3	3	3
Channel Alteration	CB187901	Earth channel	18	2400	Yes	Yes	Yes	No			3	3	2
Channel Alteration	CB008101	Earth channel	48	700	Yes	No	No	No			4	3	1
Channel Alteration	CB026101	Earth channel	12	700	No	No	Yes	No			4	2	3
Channel Alteration	CB029101	Earth channel	36	1700	Yes	No	No	No			4	3	4
Channel Alteration	CB030202	Earth channel	12	6000	Yes	No	No	No			4	2	1
Channel Alteration	CB039101	Earth channel	18	800	Yes	No	No	No			4	3	4
Channel Alteration	CB053103	Earth channel	108	1400	Yes	No	No	No			4	4	4
Channel Alteration	CB055203	Earth channel	24	1000	Yes	No	Yes	No			4	2	2
Channel Alteration	CB058204	Earth channel	36	1000	Yes	No	No	No			4	4	3
Channel Alteration	CB060101	Earth channel	36	1200	Yes	No	Yes	No			4	3	3
Channel Alteration	CB064101	Earth channel	24	2000	Yes	No	No	No			4	3	1

Channel Alterations

Problem	Site Number	Type	BottomWidth(in)	Length(ft)	Perennial Flow	Sedimentation	Veg in Channel	Road Crossing	LengthAbove(ft)	LengthBelow(ft)	Severity	Correctability	Access
Channel Alteration	CB085101	Earth channel	12	1300	Yes	No	Yes	No			4	3	2
Channel Alteration	CB087201	Earth channel	60	1700	Yes	No	Yes	No			4	3	2
Channel Alteration	CB090201	Earth channel	24	2000	No	No	Yes	No			4	1	1
Channel Alteration	CB094201	Earth channel	48	1900	Yes	No	No	No			4	1	3
Channel Alteration	CB094206	Earth channel	36	4000	Yes	No	No	No			4	1	3
Channel Alteration	CB099901	Earth channel	48	1600	Yes	No	No	No			4	4	2
Channel Alteration	CB127801	Earth channel	24	1400	Yes	No	No	No			4	2	3
Channel Alteration	CB128801	Earth channel	24	3700	No	No	Yes	No			4	2	3
Channel Alteration	CB132901	Earth channel	24	2000	No	No	Yes	No			4	3	2
Channel Alteration	CB178102	Earth channel	36	800	Yes	Yes	No	No			4	4	1
Channel Alteration	CB183901	Earth channel	12	1800	No	No	Yes	No			4	3	2
Channel Alteration	CB190901	Earth channel	24	3500	Yes	Yes	Yes	No			4	4	2
Channel Alteration	CB190902	Earth channel	24	2000	Yes	Yes	Yes	No			4	3	2
Channel Alteration	CB194901	Earth channel	20	2000	No	No	Yes	No			4	1	2
Channel Alteration	CB002101	Earth channel	60	600	Yes	No	No	No			5	3	4
Channel Alteration	CB019301	Earth channel	12	800	Yes	No	Yes	No			5	3	1
Channel Alteration	CB025301	Earth channel	40	500	Yes	No	Yes	No			5	3	4
Channel Alteration	CB032101	Earth channel	36	900	Yes	No	Yes	No			5	1	1
Channel Alteration	CB032102	Earth channel	36	500	Yes	Yes	No	No			5	1	2
Channel Alteration	CB046101	Earth channel	48	1200	Yes	No	Yes	No			5	1	1
Channel Alteration	CB046102	Earth channel	12	1400	Yes	Yes	Yes	No			5	2	2
Channel Alteration	CB049901	Earth channel	36	1300	No	Yes	Yes	No			5	1	2
Channel Alteration	CB049902	Earth channel	36	1000	No	Yes	Yes	No			5	3	2
Channel Alteration	CB050101	Earth channel	30	700	Yes	No	No	No			5	1	2
Channel Alteration	CB082201	Earth channel	36	1900	Yes	No	No	No			5	1	4
Channel Alteration	CB085102	Earth channel	60	800	Yes	No	No	No			5	2	2
Channel Alteration	CB093201	Earth channel	72	1650	Yes	No	Yes	No			5	3	2
Channel Alteration	CB096201	Earth channel	24	900	No	No	Yes	No			5	2	1
Channel Alteration	CB106201	Earth channel	18	600	Yes	No	Yes	No			5	3	1
Channel Alteration	CB109203	Earth channel	36	300	Yes	No	Yes	No			5	3	1
Channel Alteration	CB117801	Earth channel	24	2900	No	No	Yes	No			5	3	1
Channel Alteration	CB117802	Earth channel	24	2300	No	Yes	Yes	No			5	3	1
Channel Alteration	CB163201	Earth channel	48	1100	Yes	No	Yes	No			5	3	3

Inadequate Buffers

Problem	Site	Sides	Unshaded	WidthLeft(ft)	WidthRight(ft)	LengthLeft(ft)	LengthRight(ft)	LandUseLeft	LandUseRight	Recentlyestablished	Livestock	Type of Livestock	Severity	Correctability	Access	Wetland
Inadequate Buffer	CB003102	Both	Both	0	0	4000	3000	Crop field	Crop field	No	No		1	3	1	5
Inadequate Buffer	CB060101	Both	Both	0	0	1200	1200	Logging	Logging	No	No		1	3	2	1
Inadequate Buffer	CB069201	Both	Both	0	0	1700	1700	Crop field	Crop field	No	No		1	3	2	2
Inadequate Buffer	CB043102	Both	Both	5	20	1400	1400	Shrubs & small trees	Shrubs & small trees	No	No		2	3	3	3
Inadequate Buffer	CB070201	Both	Both	0	0	1400	1600	Crop field	Crop field	No	No		2	3	2	2
Inadequate Buffer	CB128801	Both	Both	0	0	3000	3000	Crop field	Crop field	No	No		2	2	2	4
Inadequate Buffer	CB131201	Both	Both	0	0	4000	4000	Crop field	Crop field	No	No		2	4	4	4
Inadequate Buffer	CB198101	Both	Both	0	0	7000	7000	Crop field	Crop field	No	No		2	3	2	5
Inadequate Buffer	CB039102	Right	Right		0		800	Forest	Shrubs & small trees	No	No		3	2	4	3
Inadequate Buffer	CB039104	Right	Right		5		1800	Crop field	Shrubs & small trees	No	No		3	2	4	3
Inadequate Buffer	CB046104	Right	Right		0		1000	Forest	Crop field	No	No		3	1	2	4
Inadequate Buffer	CB055203	Right	Neither		5		1000	Lawn	Lawn	No	No		3	3	3	1
Inadequate Buffer	CB062101	Both	Both	0	0	3300	3300	Crop field	Crop field	No	No		3	3	2	3
Inadequate Buffer	CB089201	Right	Right	50	5		2000	Forest	Crop field	No	No		3	3	1	4
Inadequate Buffer	CB090201	Right	Right	50	0		1800	Forest	Crop field	No	No		3	3	1	4
Inadequate Buffer	CB109204	Both	Both	0	0	1600	1600	Pasture	Pasture	No	No		3	3	3	4
Inadequate Buffer	CB113901	Both	Both	0	0	1200	400	Lawn	Crop field	No	No		3	2	1	1
Inadequate Buffer	CB120801	Both	Both	0	0	3500	3750	Crop field	Crop field	No	No		3	3	2	2
Inadequate Buffer	CB155201	Left	Left	0		1500		Crop field	Forest	No	No		3	2	3	2
Inadequate Buffer	CB190901	Right	Neither		0		3500	Forest	Crop field	No	No		3	4	2	4
Inadequate Buffer	CB190902	Right	Neither		0		1050	Forest	Crop field	No	No		3	4	2	4
Inadequate Buffer	CB008102	Both	Both	0	0	1700	1700	Crop field	Paved	No	No		4	3	1	1
Inadequate Buffer	CB016101	Both	Both	0	0	1800	1800	Crop field	Other	No	No		4	3	2	2
Inadequate Buffer	CB019302	Both	Both	0	0	4000	4000	Crop field	Crop field	No	No		4	3	1	1
Inadequate Buffer	CB030202	Both	Both	0	0	5700	5700	Crop field	Crop field	No	No		4	1	1	5
Inadequate Buffer	CB038101	Both	Both	0	0	6000	6000	Crop field	Crop field	No	No		4	3	2	2
Inadequate Buffer	CB046103	Both	Both	0	0	3300	3300	Crop field	Crop field	No	No		4	2	2	3
Inadequate Buffer	CB053103	Both	Neither	20	10	1400	1400	Shrubs & small trees	Shrubs & small trees	No	No		4	3	3	1
Inadequate Buffer	CB055201	Left	Left	10	50	2000		Crop field	Forest	No	No		4	2	2	2
Inadequate Buffer	CB064102	Both	Both	0	0	1800	2000	Crop field	Crop field	No	No		4	3	1	3
Inadequate Buffer	CB085101	Both	Both	0	0	1600	1600	Shrubs & small trees	Shrubs & small trees	Yes	No		4	3	2	1
Inadequate Buffer	CB087201	Both	Both	0	0	1000	1000	Crop field	Crop field	No	No		4	2	1	3

Inadequate Buffers

Problem	Site	Sides	Unshaded	WidthLeft(ft)	WidthRight(ft)	LengthLeft(ft)	LengthRight(ft)	LandUseLeft	LandUseRight	Recentlyestablished	Livestock	Type of Livestock	Severity	Correctability	Access	Wetland
Inadequate Buffer	CB093201	Both	Both	0	0	1650	1650	Crop field	Crop field	No	No		4	2	1	3
Inadequate Buffer	CB094201	Left	Left	0		1400		Crop field	Forest	No	No		4	1	3	3
Inadequate Buffer	CB114201	Both	Left	0	10	1000	2000	Crop field	Crop field	Yes	No		4	3	2	4
Inadequate Buffer	CB127801	Both	Both	0	0	1200	1200	Crop field	Crop field	No	No		4	4	1	2
Inadequate Buffer	CB132901	Both	Both	0	0	2000	2000	Crop field	Crop field	No	No		4	1	2	4
Inadequate Buffer	CB170901	Right	Right		15		2400	Forest	Crop field	No	No		4	4	4	2
Inadequate Buffer	CB187901	Both	Both	0	0	2000	2000	Crop field	Crop field	No	No		4	2	3	2
Inadequate Buffer	CB194901	Both	Both	0	0	1970	1970	Crop field	Crop field	No	No		4	3	2	4
Inadequate Buffer	CB008101	Both	Both	0	0	700	700	Crop field	Paved	No	No		5	3	1	1
Inadequate Buffer	CB019301	Both	Both	0	0	600	600	Crop field	Pasture	No	No		5	2	1	1
Inadequate Buffer	CB024201	Both	Both	0	0	1000	1000	Crop field	Lawn	No	No		5	1	1	4
Inadequate Buffer	CB026101	Both	Both	0	0	700	700	Crop field	Crop field	No	No		5	3	3	2
Inadequate Buffer	CB032101	Both	Both	0	0	600	300	Crop field	Crop field	No	No		5	1	1	3
Inadequate Buffer	CB032102	Left	Neither	20		500		Chicken Houses	Forest	No	Yes		5	1	2	3
Inadequate Buffer	CB040202	Both	Both	0	0	1200	1200	Crop field	Crop field	No	No		5	3	2	1
Inadequate Buffer	CB044202	Both	Both	0	0	1200	1200	Crop field	Crop field	No	No		5	3	2	1
Inadequate Buffer	CB046101	Both	Both	0	0	1600	1600	Other	Crop field	No	No		5	1	1	3
Inadequate Buffer	CB046102	Both	Both	0	0	1200	1200	Crop field	Crop field	No	No		5	1	2	3
Inadequate Buffer	CB049901	Both	Both	0	0	1300	900	Crop field	Crop field	No	No		5	1	2	2
Inadequate Buffer	CB049902	Left	Both	0		225		Crop field	Shrubs & small trees	No	No		5	1	2	3
Inadequate Buffer	CB050103	Both	Both	0	0	1800	1800	Crop field	Crop field	No	No		5	1	1	4
Inadequate Buffer	CB058204	Both	Right	40	0	1700	1700	Crop field	Crop field	No	No		5	3	3	4
Inadequate Buffer	CB099901	Both	Right	20	0	760	1230	Crop field	Crop field	No	No		5	1	2	3
Inadequate Buffer	CB117801	Both	Both	0	0	2900	2900	Crop field	Crop field	No	No		5	3	1	4
Inadequate Buffer	CB117802	Both	Both	0	0	2300	2300	Crop field	Crop field	No	No		5	3	1	4
Inadequate Buffer	CB123801	Both	Neither	10	10	1300	1300	Crop field	Crop field	No	No		5	5	1	2
Inadequate Buffer	CB124901	Right	Neither		10		100	Forest	Crop field	No	No		5	3	4	4
Inadequate Buffer	CB146901	Left	Neither	20		900		Crop field	Forest	No	No		5	3	3	4
Inadequate Buffer	CB176801	Both	Both	0	0	650	950	Crop field	Crop field	No	No		5	3	3	1
Inadequate Buffer	CB183901	Both	Both	0	0	1800	1800	Pasture	Crop field	No	No		5	1	2	4
Inadequate Buffer	CB205901	Both	Neither	5	5	200	200	Crop field	Crop field	No	No		5	1	1	4

Erosion Sites

Problem	Site Number	Type	Possible Cause	Length(ft)	Height(ft)	Land use: left	Land use: right	Infrastructure Threatened?	Describe	Severity	Correctability	Access
Erosion Site	CB044204	Widening	Bend at steep slope	1400	3	Forest	Shrubs & Small Trees	No		3	4	5
Erosion Site	CB063101	Widening	Bend at steep slope	1000	3	Forest	Forest	No		3	3	5
Erosion Site	CB003103	Widening	Below channelization	300	4.5	Lawn	Forest	No		4	3	3
Erosion Site	CB020302	Downcutting	Below road crossing	700	2	Shrubs & Small Trees	Forest	No		4	3	2
Erosion Site	CB053202	Downcutting	Bend at steep slope	2700	1.5	Forest	Forest	No		4	2	2
Erosion Site	CB058101	Widening	Bend at steep slope	500	2.5	Forest	Forest	No		4	3	4
Erosion Site	CB085103	Widening	Pipe outfall	800	2	Forest	Forest	No		4	2	2
Erosion Site	CB092901	Downcutting	Below Road Crossing	700	2	Shrubs/Small Trees	Shrubs/Small Trees	No		4	3	3
Erosion Site	CB035203	Widening	Bend at steep slope	50	3	Forest	Forest	No		5	3	4
Erosion Site	CB044201	Headcutting	Land use change upstream	250	2.5	Crop field	Crop field	No		5	1	2
Erosion Site	CB141202	Unknown	Unknown	20	3	Pasture	Pasture	No		5	2	3

Fish Barriers

Problem	Site Number	Blockage	Type	Reason	Drop(In)	Depth(In)	Severity	Correctability	Access
Fish Barrier	CB081101	Total	Intream Pond	Too high	24		3	3	3
Fish Barrier	CB195901	Total	Intream Pond	Too high			3	5	1
Fish Barrier	CB197104	Total	Intream Pond	Too high	18		4	3	2
Fish Barrier	CB058202	Temporary	Debris dam	Too high	12		5	2	2
Fish Barrier	CB063102	Temporary	Debris dam	Too high	6		5	1	5
Fish Barrier	CB095201	Temporary	Debris dam	Too shallow		1	5	1	1

Trash Dumping

Problem	Site Number	Type	Truckloads	Other measure	Extent	Volunteer Project?	Owner Type	Owner Name	Severity	Correctability	Access
Trash Dumping	CB176906	Residential and Agricultural	50		Large area	Yes	Private		3	4	3
Trash Dumping	CB119805	Residential	4		Single site	Yes	Private		4	2	2
Trash Dumping	CB121902	Residential	4		Single site	Yes	Private		4	1	1
Trash Dumping	CB129802	Residential	3		Single site	Yes	Private		4	3	2
Trash Dumping	CB046105	Tires	1		Single site	Yes	Private		5	1	2
Trash Dumping	CB046106	Metal Roofing, Siding	2		Single site	Yes	Private		5	1	2

Unusual Conditions

Problem	Site Number	Describe	Description	Potential Cause	Severity	Correctability	Access
Unusual Condition	CB101101	Scum	Scum, might be algae		4	4	3
Unusual Condition	CB035201		Cement block pieces along stream bank	Erosion control?	5	1	1
Unusual Condition	CB101903	Red Flock	Red flock in stream	unknown	5	3	4
Comment	CB021901	Dry Stream	dry stream bed				
Comment	CB086902	Dry Stream	dry stream bed				
Comment	CB021902	Dry Stream	dry stream bed				
Comment	CB032103	Marsh	Stream widens into marsh, may join main stem of creak, but do not have that map				
Comment	CB032104		Water in stream channel frozen				
Comment	CB034101	Dry Stream	Stream ends, either dried up or spread across forest				
Comment	CB036201	Marsh	Stream turns into tidal marsh				
Comment	CB037101		Channel as shown with blue line on map, does not exist. No channels off Paw Paw Creek off this side				
Comment	CB050102	Marsh	Stream becomes tidal marsh				
Comment	CB054201	Marsh	Stream turned into swamp and became unpassable				
Comment	CB081102		Wetland drainage pond				
Comment	CB090202	Dry Stream	Very dry area, pond mostly dry	unknown			
Comment	CB094204		Additional branch off of stream, all was formerly channelized, but no longer maintained, returning to natural state, area well forested				

Unusual Conditions

Problem	Site Number	Describe	Description	Potential Cause	Severity	Correctability	Access
Comment	CB094205		Stream channel as shown on map does not exist, re-drawn see 094202CA & 094206CA				
Comment	CB100101	Dry Stream	dry stream bed				
Comment	CB101901	Dry Stream	No perennial flow	unknown			
Comment	CB101902	Dry Stream	dry stream bed				
Comment	CB110201		Old earth channel no longer in use, filled in and overgrown. No H2O present.				
Comment	CB115201		Appears to be an old earthen channel no longer in use that has filled itself in				
Comment	CB164202		Stream channel ends, turns muddy				
Comment	CB197103		Pond was made for irrigation. Trees cut down, large pond area	Irrigation?			

Pipe Outfalls

Problem	Site Number	Outfall Type	Pipe Type	Location of Pipe	Diameter (in)	Channel Width	Purpose	Discharge	Color	Odor	Severity	Correctability	Access
Pipe Outfall	CB093902	Unknown	Smooth Metal	Right Bank	8			Yes	Yellowish	Musky	3	3	3
Pipe Outfall	CB146902	Unknown	Plastic	Left bank	12			Yes	Clear	None	4	4	3

Exposed Pipes

Problem	Site Number	Pipe is	Type of Pipe	Pipe Diameter (in)	Length Exposed (ft)	Purpose of Pipe	Evidence Discharge?	Color	Odor	Severity	Correctability	Access
Exposed Pipe	CB119802	Exposed along stream bank	Plastic	5	5	Unknown	No			5	3	1

Representative Sites A

Problem	Site Number	Substrate	Embeddednes s	Shelter for Fish	Channel Alteration	Sediment Deposition	Velocity/Depth	Flow	Vegetation	Bank Condition	Riparian Vegetat
Bessen Creek											
Representative Site	CB179901	Poor	Poor	Optimal	Optimal	Marginal	Optimal	Optimal	Optimal	Optimal	Optimal
Boxiron Creek											
Representative Site	CB057101	Marginal	Marginal	Marginal	Optimal	Suboptimal	Suboptimal	Optimal	Marginal	Optimal	Suboptimal
Representative Site	CB058203	Optimal	Poor	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal	Optimal	Suboptimal
Brimer Gut											
Representative Site	CB071201	Marginal	Marginal	Optimal	Optimal	Optimal	Marginal	Optimal	Optimal	Optimal	Optimal
Representative Site	CB072201	Marginal	Marginal	Suboptimal	Marginal	Optimal	Poor	Optimal	Suboptimal	Optimal	Suboptimal
Representative Site	CB072201	Marginal	Suboptimal	Optimal	Marginal	Optimal	Marginal	Optimal	Optimal	Suboptimal	Optimal
Cottman Creek											
Representative Site	CB125901	Poor	Poor	Poor	Optimal	Optimal	Poor	Marginal	Optimal	Optimal	Optimal
Hancock Creek											
Representative Site	CB157901	Poor	Poor	Suboptimal	Optimal	Marginal	Optimal	Optimal	Optimal	Optimal	Optimal
Representative Site	CB168201	Marginal	Poor	Optimal	Optimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Optimal
Representative Site	CB178101	Poor	Suboptimal	Suboptimal	Optimal	Suboptimal	Marginal	Marginal	Suboptimal	Suboptimal	Optimal
Little Mill Creek											
Representative Site	CB119804	Poor	Poor	Poor	Marginal	Suboptimal	Poor	Optimal	Optimal	Suboptimal	Poor
Representative Site	CB139201	Suboptimal	Poor	Marginal	Suboptimal	Suboptimal	Marginal	Suboptimal	Optimal	Optimal	Optimal
Little Mill Run											
Representative Site	CB138201	Poor	Poor	Marginal	Suboptimal	Poor	Marginal	Marginal	Optimal	Suboptimal	Optimal
Marshall Mill Run											
Representative Site	CB140201	Marginal	Poor	Poor	Suboptimal	Poor	Marginal	Marginal	Optimal	Suboptimal	Optimal
Paw Paw Creek											
Representative Site	CB030201	Marginal	Poor	Marginal	Optimal	Suboptimal	Suboptimal	Marginal	Marginal	Optimal	Optimal
Representative Site	CB031201	Poor	Poor	Poor	Optimal	Poor	Poor	Optimal	Suboptimal	Optimal	Optimal
Representative Site	CB035202	Optimal	Poor	Suboptimal	Suboptimal	Optimal	Optimal	Suboptimal	Suboptimal	Marginal	Optimal
Representative Site	CB036202	Marginal	Poor	Suboptimal	Optimal	Optimal	Marginal	Suboptimal	Suboptimal	Suboptimal	Optimal
Representative Site	CB039103	Suboptimal	Marginal	Suboptimal	Optimal	Optimal	Marginal	Optimal	Marginal	Suboptimal	Optimal
Representative Site	CB043101	Suboptimal	Suboptimal	Marginal	Optimal	Optimal	Optimal	Optimal	Poor	Suboptimal	Poor
Payne Ditch											
Representative Site	CB163201	Suboptimal	Marginal	Marginal	Marginal	Suboptimal	Poor	Suboptimal	Optimal	Optimal	Optimal
Representative Site	CB164201	Marginal	Poor	Marginal	Marginal	Suboptimal	Poor	Suboptimal	Optimal	Optimal	Optimal
Pikes Creek											
Representative Site	CB086901	Marginal	Poor	Marginal	Optimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Suboptimal
Representative Site	CB102901	Poor	Poor	Suboptimal	Optimal	Optimal	Poor	Optimal	Optimal	Optimal	Optimal
Representative Site	CB109202	Marginal	Poor	Poor	Marginal	Suboptimal	Poor	Poor	Optimal	Suboptimal	Optimal

Representative Sites A

Problem	Site Number	Substrate	Embeddednes s	Shelter for Fish	Channel Alteration	Sediment Deposition	Velocity/Depth	Flow	Vegetation	Bank Condition	Riparian Vegetat
Powell Creek											
Representative Site	CB176903	Poor	Poor	Poor	Poor	Marginal	Poor	Optimal	Poor	Marginal	Poor
Representative Site	CB176905	Poor	Poor	Poor	Optimal	Optimal	Poor	Optimal	Optimal	Optimal	Suboptimal
Representative Site	CB177201	Poor	Poor	Suboptimal	Suboptimal	Poor	Marginal	Marginal	Optimal	Suboptimal	Optimal
Riley Creek											
Representative Site	CB113902	Poor	Poor	Marginal	Poor	Suboptimal	Poor	Optimal	Marginal	Optimal	Marginal
Representative Site	CB121901	Poor	Poor	Poor	Optimal	Optimal	Poor	Optimal	Optimal	Optimal	Optimal
Representative Site	CB145901	Marginal	Marginal	Suboptimal	Optimal	Marginal	Optimal	Optimal	Optimal	Optimal	Optimal
Rowley Creek											
Representative Site	CB078101	Poor	Poor	Marginal	Optimal	Suboptimal	Suboptimal	Optimal	Marginal	Suboptimal	Suboptimal
Representative Site	CB091101	Optimal	Poor	Optimal	Marginal	Optimal	Poor	Poor	Suboptimal	Optimal	Marginal
Sand Branch											
Representative Site	CB186101	Optimal	Poor	Optimal	Optimal	Optimal	Suboptimal	Suboptimal	Optimal	Optimal	Suboptimal
Representative Site	CB197102	Poor	Poor	Poor	Marginal	Poor	Suboptimal	Optimal	Suboptimal	Marginal	Marginal
Representative Site	CB206101	Optimal	Poor	Optimal	Optimal	Optimal	Suboptimal	Suboptimal	Optimal	Optimal	Suboptimal
Scarboro Creek											
Representative Site	CB026301	Suboptimal	Optimal	Optimal	Optimal	Optimal	Poor	Marginal	Optimal	Optimal	Optimal
Representative Site	CB032104	Poor	Poor	Marginal	Optimal	Suboptimal	Poor	Suboptimal	Suboptimal	Suboptimal	Optimal
Scarboro Creek 2											
Representative Site	CB082101	Marginal	Suboptimal	Suboptimal	Marginal	Marginal	Marginal	Poor	Suboptimal	Marginal	Optimal
Representative Site	CB082102	Poor	Optimal	Suboptimal	Optimal	Poor	Poor	Marginal	Optimal	Marginal	Optimal
Representative Site	CB088201	Marginal	Poor	Suboptimal	Suboptimal	Marginal	Marginal	Optimal	Suboptimal	Optimal	Optimal
Representative Site	CB094203	Poor	Poor	Poor	Suboptimal	Optimal	Marginal	Optimal	Suboptimal	Suboptimal	Optimal
Representative Site	CB096202	Poor	Poor	Poor	Suboptimal	Poor	Dry	Dry	Optimal	Optimal	Optimal
Stagg Creek											
Representative Site	CB046106	Poor	Poor	Suboptimal	Marginal	Marginal	Poor	Marginal	Suboptimal	Marginal	Suboptimal
Tanhouse Creek											
Representative Site	CB044203	Poor	Poor	Optimal	Optimal	Optimal	Poor	Optimal	Optimal	Optimal	Optimal
Representative Site	CB052101	Optimal	Poor	Optimal	Marginal	Optimal	Poor	Poor	Suboptimal	Optimal	Marginal
Representative Site	CB053201	Marginal	Optimal	Suboptimal	Optimal	Optimal	Suboptimal	Optimal	Suboptimal	Marginal	Optimal
Waterworks Creek											
Representative Site	CB003104	Suboptimal	Suboptimal	Marginal	Suboptimal	Optimal	Suboptimal	Optimal	Optimal	Marginal	Poor
Representative Site	CB004101	Suboptimal	Marginal	Poor	Suboptimal	Suboptimal	Marginal	Optimal	Suboptimal	Optimal	Optimal

Representative Sites B

Problem	Site Number	Width Riffle	Width Run	Width Pool	Depth Riffle	Depth Run	Depth Pool	Bottom Type
Bessen Creek								
Representative Site	CB179901		74			4		Sand
Boxiron Creek								
Representative Site	CB057101	30	60	40	2	8	12	Sand
Representative Site	CB058203	18	48	24	2	6	18	Sand
Brimer Gut								
Representative Site	CB071201		36	24		12	18	Silt
Representative Site	CB072201		48			6		Silt
Representative Site	CB072201		84			18		Silt
Cottman Creek								
Representative Site	CB125901	72			7			Silt
Hancock Creek								
Representative Site	CB157901		60			8		Sand
Representative Site	CB168201	24	224	36	3	6	4	Silt
Representative Site	CB178101	24	48	60	6	4	4	Silt
Little Mill Creek								
Representative Site	CB119804			30			4	Silt
Representative Site	CB139201		60			6		Silt
Little Mill Run								
Representative Site	CB138201		48			8		Silt
Marshall Mill Run								
Representative Site	CB140201		60			13		Silt
Paw Paw Creek								
Representative Site	CB030201	48	86	52	7	10	25	Sand
Representative Site	CB031201			72			7	Silt
Representative Site	CB035202	62	60	36	16	15	10	Sand
Representative Site	CB036202		85	80		10	12	Silt
Representative Site	CB039103		72			12		Sand
Representative Site	CB043101	30	60	36	4	12	12	Sand
Payne Ditch								
Representative Site	CB163201		36			5		Silt
Representative Site	CB164201		24			4		Silt
Pikes Creek								
Representative Site	CB086901	14	27	31	1	2.5	2	Sand
Representative Site	CB102901	42	42	42	11	11	11	Sand
Representative Site	CB109202	24			1			Silt

Representative Sites B

Problem	Site Number	Width Riffle	Width Run	Width Pool	Depth Riffle	Depth Run	Depth Pool	Bottom Type
Powell Creek								
Representative Site	CB176903			18			5	Silt
Representative Site	CB176905			48			8	Silt
Representative Site	CB177201	60	60	72	6	6	6	Silt
Riley Creek								
Representative Site	CB113902			60			4	Silt
Representative Site	CB121901			30			0.5	Silt
Representative Site	CB145901		72			28		Sand
Rowley Creek								
Representative Site	CB078101		48			12		Silt
Representative Site	CB091101		12			1		Silt
Sand Branch								
Representative Site	CB186101	24	24	24	4	4	4	Silt
Representative Site	CB197102	12	12	12	6	6	6	Silt
Representative Site	CB206101	48	48	60	12	12	12	Silt
Scarboro Creek								
Representative Site	CB026301		18			2		Sand
Representative Site	CB032104		36			7		Silt
Scarboro Creek 2								
Representative Site	CB082101	24	24	36	4	4	7	Silt
Representative Site	CB082102			10	3	3	7	Silt
Representative Site	CB088201	15	45		5	10		Sand
Representative Site	CB094203		54			12		Silt
Representative Site	CB096202							Silt
Stagg Creek								
Representative Site	CB046106		16			3		Sand
Tanhouse Creek								
Representative Site	CB044203		10	24		1	3	Silt
Representative Site	CB052101		12			1		Silt
Representative Site	CB053201	12	30	18	4	6	8	Sand
Waterworks Creek								
Representative Site	CB003104	18	40	30	2	4	8	Sand
Representative Site	CB004101		56			8		Silt