# Moving Forward
# An Environmental Management Plan
## for the
# Annapolis Watershed

Heather Sutherland
Environmental Planner
Clean Annapolis River Project
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# 1. Introduction

The Annapolis Watershed, the third largest watershed in Nova Scotia, comprises all surface and groundwater routes that converge on the Annapolis River and ultimately flow out to the Bay of Fundy. It covers an area of approximately 2250 square kilometres and is part of the Gulf of Maine watershed. The Annapolis Watershed includes the uplands, lakes, streams and wetlands that flow into the Annapolis River and the Annapolis Basin.

The resources of the Annapolis Watershed provided Mi'kmaq residents with prosperous livelihoods for thousands of years. Over the past 400 years, since settlement by Europeans, changes in the natural environment have been continuous and the watershed no longer has the ability to provide its residents the quality of life and enjoyment it once did. Many residents are unable to use surface water for drinking, watering livestock, or even recreational purposes. The banks of the Annapolis and its tributaries are eroding due to such things as destruction of riparian areas and unsustainable land use practices. Fish populations have diminished and aquatic habitat has also been detrimentally affected.

In 1990 the Clean Annapolis River Project (CARP) was formed as a charitable, community-owned corporation *created to work with community and interested organizations to promote awareness about, and to foster the conservation, restoration and sustainable use of, the freshwater and marine ecosystems of the Annapolis Watershed*. In October 1991 CARP was invited to participate in Environment Canada's Atlantic Coastal Action Program (ACAP), as its first member site. Since then CARP has been involved in over 100 projects related to volunteer water quality monitoring, fish habitat restoration, public education, coastal zone management, private stewardship initiatives, sustainable agriculture, pollution prevention and many other issues.

In 1996 CARP released its first Comprehensive Environmental Management Plan (CEMP), *Our Watershed, Our Responsibility: Annapolis Watershed Environmental Management Handbook*. Since that time new issues have been brought to light in the Annapolis Watershed and the original management plan has become outdated. This document will serve as its replacement.

The comprehensive environmental management plan has several purposes:

- To identify the relevant environmental issues in the Annapolis Watershed;
- To develop actions to address the issues through establishment of goals and discussion of what information must be known or what actions must be taken to achieve that goal;
- To identify actions already undertaken toward achieving goals;
- To assign priority to each action recommended;
- And to promote the positive economic effects of a conservation ethic.

This document provides a broad outline of where CARP would like to focus its efforts over approximately the next five years. It provides focus to address those issues which will achieve the greatest benefit in the Annapolis Watershed and will give direction to the organization in the development of new projects.

# 2. Methodology

A thorough understanding of the Annapolis Watershed and the environmental issues affecting it was essential in the completion of this document. Extensive background research was conducted to determine the current condition of the watershed, the remedial and preventive activities that have taken place and what successes have been achieved.

Also vital to the development process was public involvement. Meetings with stakeholders throughout the watershed were conducted over the course of five months to gauge their perspective on the environmental issues affecting the Annapolis watershed and possible solutions to the problems. Stakeholder participants included individuals from government offices, local business operators and environmental experts. They provided valuable insight into how environmental issues affect all aspects of the watershed.

A series of five open houses was conducted within the watershed to target community members and provide an opportunity for them to have input into the plan. Open houses were held on:

- November 2nd - Digby
- November 5th - Middleton
- November 6th - Annapolis Royal
- November 8th - Kingston
- November 12th - Lawrencetown

Display material was developed specifically for the open houses. It was designed to inform the participants on the major environmental issues that CARP has identified in the past. A survey was distributed to each participant of the open houses to gauge the relative importance of each issue, possible solutions to the problems and any other issue the attendee thought was important but had not been mentioned. Advertisements for the open houses were purchased in community newspapers the week preceding the event. As well, phone calls were made to individuals identified as having an interest in attending such an event, in an attempt to improve attendance.

Focus groups were conducted to allow specific targeted sectors of the community to impart their perspective of the environmental issues affecting the watershed. The following organizations were targeted:

- Annapolis Basin Working Group
- Western Valley Development Authority (WVDA)

Input from the Annapolis Basin Working Group was obtained during a facilitated discussion for interested citizens, specifically those involved in fishery, on the state of the environment of the Annapolis Basin. The WVDA Board of Directors was asked to complete a survey in which they prioritized a list of environmental problems in the watershed and suggested possible solutions to those problems.

CARP's Board of Directors was given the opportunity to have input into the document through email, phone conversations and completion of a survey similar to that used for the open houses.

The information gathered from all activities was compiled and analyzed to determine the importance of all environmental concerns to each group. From that, the environmental concerns were grouped into six major issues consisting of:

- Water Quality
- Water Quantity
- Air Quality
- Climate Change
- Restoration of Habitats
- Legislation Enforcement

A table format was developed with these six major issues in as a way to clearly organize the details of the management plan and present them in a clear way. The Board of Directors Executive Committee approved the proposed format of the document and the first draft was completed and submitted to the Executive for review.

Revision of the first draft was then undertaken based on the suggestions of the Executive and project advisors and a second draft was submitted to the entire Board of Directors for review. Corrections were made based on their suggestions and a final draft was then produced with the endorsement of the Board of Directors.

# 3. Detailed Action Plan

The grouping of the specific environmental concerns in the Annapolis Watershed, into the broad issues of Water Quality, Water Quantity, Air Quality, Climate Change, Restoration of Habitats and Legislation Enforcement was done to ensure completeness in addressing the issues and to allow presentation in a coherent manner. It should not be assumed that each issue exists in isolation but rather that all are a part of the complex system in which we live.

The Annapolis Watershed has a limited ecological base from which resources are gathered and wastes are deposited. Past and present practices within the watershed have reduced it to its present condition. Sustainable practices combined with remedial activities must now be implemented to maintain the watershed and restore the high quality of life it has the potential to provide.

This section contains one table for each broad issue organized under the following headings:

- Goals regarding each general environmental issue
- Methods of achieving that goal
- What needs to be known or done to accomplish that goal
- What is already known, and what has already been done to accomplish that goal
- The identifiable gaps in knowledge and in achievements
- Actions which should be taken to accomplish goals
- The priority of each action identified

Specific details of the actions to accomplish a goal, outlined in the tables, as well as individuals and organizations with which CARP may partner, will be determined during the development of new projects.

As CARP is a non-profit organization and is dependent on funding from outside sources it is inevitable that the accomplishment of projects may shift given the types of funding available at any time. Priority is therefore assigned from 1 to 3, 1 being highest priority, based on what is perceived to be urgent for the health of the environment in addressing an issue.

## 3.1. Water Quality

The Annapolis River system is composed of three main parts. The Annapolis River and its tributaries comprise the freshwater portion of the system. The Annapolis Basin is composed of seawater from the Bay of Fundy. The Annapolis Estuary is a mixture of both the fresh- and salt-water portions of the watershed. Water quality monitoring has been one of CARP's core projects since the formation of the organization. The vision for the watershed has always included clean water and CARP is in a position to actively pursue that goal.

Currently within the watershed, areas of water are unsuitable for different uses due to high fecal coliform levels in the water. These bacteria are an indication of fecal pollution in the water and though most are not harmful themselves, they may co-occur with many other disease-causing pathogens. The Canadian Council of Ministers of the Environment (CCME) have compiled the Canadian Water Quality Guidelines, including in it information from Health Canada guidelines. The guidelines for fecal coliform densities per 100ml have been compiled into the following table:

| Colonies per 100 ml water sample | Water Use | Source |
|---|---|---|
| 0 | Acceptable for drinking | Health Canada, no fecal coliforms/100ml. |
| $< 50$ | Acceptable for livestock watering | CARP interpretation of CCME Guidelines "high-quality water given to livestock." |
| $< 100$ | Acceptable for food crop irrigation | CCME Guidelines, maximum concentration/100ml. |
| $< 200$ | Acceptable for recreational use | Health Canada, Geometric Mean should not exceed 2000/L. |

Many areas of the watershed are used only for recreational purposes and therefore, a goal of a geometric mean under 200 colonies per 100 ml sample is acceptable but, where water use is of a different nature, a more stringent water quality goal must be achieved.

Common sources of fecal coliform contamination include poorly functioning on-site and municipal sewage treatment mechanisms, unrestricted livestock access to waterways and pollution from farm runoff. Mitigation of contaminant transport from these sources to water bodies is an objective that can be achieved.

Concern for water quality is not restricted to surface water. The quality of groundwater is directly affected by activities that take place in or on the soils above an aquifer, especially in recharge areas. Little is known about the quality of groundwater resources in the Annapolis watershed at this time. Leaking storage tanks which could contain such substances as fuel oil, road salt or industrial chemicals are often the cause of groundwater contamination. Poorly functioning septic systems are also a source of groundwater contamination. The types of soil surrounding a groundwater aquifer and recharge area play a part in how easily this water resource can be affected. Larger particle soils provide a less restricted pathway for contaminants to enter an aquifer.

The Annapolis Watershed includes the physiographic regions of the North Mountain, South Mountain and the valley floor. The soils of these regions vary, but generally they are a mixture of glacial fluvial deposits and particles derived from the underlying bedrock. The majority of soil in the watershed is well drained and sandy, thereby facilitating pollutant transport.

Many of the potential causes of poor water quality and mechanisms for improvements to water quality are already known. It is now a matter of making the necessary modifications to thinking and lifestyles to improve the quality of water in the watershed.

| Goals re Water Quality | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Improvement and maintenance of water quality in the watershed so that fecal coliform densities do not exceed a geometric mean of 50 per 100ml, a median of 50 per 100ml and that no more than 15% of the samples exceed 200 fecal coliform per 100ml at sites sampled by the various water quality monitoring projects at CARP. | Define areas where more rigorous water use categories of standards apply | Determine areas where water is being used for purposes other than recreational activities |
| | Ensure on-site septic systems are present, properly installed and maintained | Determine location and current state of on-site treatment systems |
| | | Educate homeowners on how to properly care for their septic systems |
| | Control livestock access to waterways | Identify areas where livestock are allowed free access to waterways |
| | | Educate farmers about the advantages of restricting access and using an alternative watering source |
| | Encourage the improvement of manure management practices through better composting and reduction of runoff | Determine what current practices are and where improvements could be made in practices and in land management |
| | Ensure sewage treatment facilities are adequate and functioning properly | Review current sewage treatment practices and effectiveness |
| Elevated level of community awareness on water quality issues | Develop and distribute educational materials centred on water quality issues | Determine current water quality conditions and implications of deteriorating water quality |
| Elimination of other forms of water pollution | Determine if and what other forms of pollution exist in the watershed | Determine other forms present |
| | Eliminate other forms of pollution | Promote methods of eliminating other forms once known |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Standards for water quality | Location and types of other water uses | Survey the region for water use activities and locations | 1 |
| Current regulations for on-site septic systems | Locations and status of on-site septic systems | Survey the region for on-site septic system use and status | 1 |
| | Compliance of existing on-site septic systems with regulations | Evaluate existing septic systems with respect to regulations | 2 |
| Distribution of on-site septic system booklets for educational purposes | Identifying homeowners who weren't previously contacted | Ensure all homeowners have access to the necessary information and tools to make informed decisions | 1 |
| Identification of some locations within the watershed where livestock access is unrestricted | Locations where livestock have unrestricted access to waterways | Continue to identify more areas where access is unrestricted and encourage responsible parties to restrict livestock access | 1 |
| Completion of Atmosfarm pilot project which identified actions and advantages of restricted livestock access | Farmers who would benefit and be willing to implement suggestions from the Atmosfarm project | Distribute the required information and support the implementation of suggested activities | 1 |
| Completion of Atmosfarm pilot project which identified proper manure management procedures | Farmers who would benefit and be willing to implement suggestions from the Atmosfarm project | Distribute the required information and supporting the implementation of suggested activities | 1 |
| Location of current sewage treatment facilities | Effectiveness of current sewage treatment facilities | Monitor water quality in areas near sewage treatment facilities | 3 |
| Methods of septage disposal | Safety issues associated with current septage disposal practices | Determine other options available for septage disposal | 3 |
| State of water quality in specific areas of the river and some tributaries | Current knowledge and interest level of the community with regard to water quality | Develop and distribute educational materials and continue to act as a resource for concerned citizens | 1 |
| Potential sources of water pollution | Type and quantity of other forms of pollution | Determine requirements and procedures for testing.<br>Begin testing to determine types and quantities of other pollutants present | 2 |
| Potential sources of water pollution | Other forms of pollution and methods of elimination | Determine sources of other forms of pollution and develop measures to prevent release | 2 |

## 3.2. Water Quantity

The quantity of surface and ground water available for consumption in the Annapolis watershed is not known at this time. The total demand for water has also never been evaluated. Although water shortages have not yet posed a widespread problem in this, the western area of the Annapolis Valley, the eastern portion has frequently experienced shortages and therefore, this is an issue that must be addressed. Water consumption in the Annapolis Watershed is increasing. Caution must be exercised in extraction and use of this resource so that sustainability remains. It is important that an understanding of the sources and quantities of water in the watershed be developed so that information can be used to preserve this valuable, non-renewable resource.

There are many benefits to conserving water. For example, septic systems require less maintenance and perform more efficiently if there is less wastewater to be treated. The same applies to municipal sewage treatment facilities. Individual household conservation methods include use of water saving devices, use of efficient appliances and a general awareness of the amount of water being used. Commercial and industrial facilities, which may be required to treat large quantities of wastewater before release, would save by reducing that amount of water through conservation measures. To do so would be beneficial to all.

It is important that the value of clean water be established now, while it is somewhat readily available. Currently, large scale consumers are often given volume discounts which would suggest that water is an unwanted item and the more you can use the cheaper it should be. If a flat residential rate is charged it leaves no room for benefits to those who use water conservatively. It would be most beneficial to the environment and to consumers actively conserving water to charge a rate which increases with water volume use.

Climate change scenarios that have been developed for temperature and precipitation for the Annapolis Watershed predict an amplification of water availability problems for the region. Generally, precipitation events are to become more severe and less frequent, which will alter water storage cycles for natural surface and groundwater reservoirs, possibly leading to insufficient water quantities available to fill the demand. The issue of water quantity should be attended to sooner rather than later so that water availability and consumption do not become more problematic in the future.

| Goals re Water Quantity | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Adequate water supply maintained for all current users | Determine current users by area and by source (groundwater and surface water) | Identify users by area and by source |
| | Determine current demand by area and by source (groundwater and surface water) | Determine quantity each user group consumes and from what source |
| | Determine current supply by area and by source (groundwater and surface water) | Determine source and recharge quantities |
| Adequate water supply ensured for all future users | Predict future supply and demand for all users | Use predictions of precipitation to develop scenarios of water availability in the future |
| | | Predict growth/ decline of demand by user and by source |
| Water conservation methods practiced by all users in the watershed | Educate community members on the benefits of water conservation | Determine number of homes practicing water conservation |
| | | Determine current practices of commercial/industrial and agricultural users and where water use can be improved |
| | Establish a value for clean water as a resource | Identify current valuation of clean water |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Utility demand or use (assumed household use) | Commercial/ industrial and agricultural usage | Inventory commercial/ industrial and agricultural usage | 2 |
| | Residential private well water quantity use | Inventory private residential well water usage | 2 |
| Utility water sources | Other sources being utilized and the demand from those other sources | Determine source type and amount of water drawn from currently unknown sources | 2 |
| Surface water sources | Current groundwater recharge and aquifer areas and rate of recharge | Develop project to determine groundwater quantities and recharge areas to develop a water budget | 1 |
| It is predicted that more precipitation will be received over fewer days. Less water will be available for groundwater recharge according to climate change research. Evaporation rates are also predicted to be higher. | Relationship of frequency of precipitation to infiltration in watershed and aquifer potential | Determine surface and groundwater aquifer potentials with respect to frequency of precipitation and infiltration rates | 2 |
| | Effect of climate change on available surface water and groundwater volumes | Determine surface and groundwater aquifer potentials with respect to frequency of precipitation and infiltration rates | 2 |
| Current utility demand | Other current demands and predicted future use | Develop scenarios to predict future use from current available data | 2 |
| Pilot projects have been completed in Middleton and to a limited degree in Bridgetown and Annapolis Royal | Residential areas where water conservation is not practiced | Develop and execute more pilot projects to target those not presently conserving water | 2 |
| Some successes have been achieved outside the watershed in the eastern end of the Annapolis Valley | Current commercial/ industrial, agricultural practices | Develop water conservation strategies based on an examination of current practices and successful water conservation methods | 2 |
| Volume discounts are often given to large quantity consumers | Charges for small quantity users by volume | Support changes in water use fees so that lower rates are charged to those who conserve water | 2 |

## 3.3. Air Quality

In the Annapolis Watershed air quality problems are awkward to address in terms of prevention of poor quality air. As much as 90 % of the air pollution in the Annapolis Valley is brought here with the prevailing winds from more heavily populated areas in the eastern United States and central Canada. The topography of the Annapolis Valley appears to restrict air movement, limiting the dispersal of pollutants from both local sources and air transported here from other locations. Local sources of air pollution are from many small quantity emitters such as household combustion of wood and oil for heat and vehicle exhaust, but also include agricultural and forestry sources.

Ground level ozone (GLO) is a threat to both humans and animals. GLO is used as an indicator of the air quality being measured. Ozone is a major constituent of smog and measurements in the watershed of this pollutant have exceeded the air quality objectives of 82 parts per billion averaged over a one-hour period on numerous occasions. Exceedence generally occurs on average four or five times during the summer season. GLO concentrations are generally higher during the summer months due to the stronger sunlight and warmer temperatures.

Currently, few air quality-monitoring stations are in use in the Annapolis Watershed. An evaluation of the existing monitoring stations is needed to ensure that a complete picture of air quality is being projected.

There is a direct connection between air quality and water quality. Air pollutants, such as ground level ozone, influence the environment by damaging vegetation and affecting respiration in humans and wildlife. Other pollutants react in the atmosphere to form sulphuric and nitric acids which fall as acid precipitation. Acid precipitation, and the contaminants contained within it, fall into lakes and streams and is absorbed by vegetation and consumed by animals.

Although much of the air pollution affecting the Annapolis watershed originates elsewhere there is still much that can be done in the watershed to improve the quality of the air.

| Goals re Air Quality | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Maintain and improve the current air quality throughout the region | Monitor and record air quality data in the region to determine current air quality conditions | Determine whether appropriate sites have been chosen to represent local air quality |
| | Encourage reduction of air pollutants in distant locations | Identify types of pollutants transported from distant locations and opportunities to support pollutant reduction in those locations |
| | Reduce emission of harmful air pollutants locally generated | Determine generators of air pollution in the watershed |
| | | Determine what can be done to reduce local air pollutant generation |
| | Encourage lifestyle and business choices to promote improved air quality | Identify possible options for better air quality |
| Increased community awareness of air quality issues affecting the Annapolis Watershed | Create demonstration projects centred on the effects of poor air quality, focusing on the Annapolis watershed | Determine the sources of air pollution in the Annapolis region and the relationship of poor air quality to human health, the environment and the economy |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Current locations of provincial and federal air quality monitors | Validity of current monitoring locations as representative sites | Test validity of current sites as representative of the region | 1 |
| Current air quality data | Recent trends in air quality | Examine available recorded data from current monitors | 1 |
| Long range transport of pollutants from the eastern United States, Quebec and Ontario is largely responsible for poor air quality in the Annapolis Valley | Identification of opportunities to encourage reduction of pollutants from distant sources | Partner with the Atlantic Salmon Federation to reduce acid rain sources | 1 |
| | | Generate petition to politicians to reduce harmful emissions | 2 |
| | | Send our air quality observations to distant source areas as press releases | 2 |
| Smaller scale sources of air pollutant emissions such as: exhaust from vehicles, construction, inefficient wood-burning stoves, etc. | The scale of local contributions to poor air quality | Educate the public on such topics as: how to reduce their emissions of air pollutants, the benefits of doing so, what constitutes an air pollutant | 1 |
| | Seasonal variability of local pollutant generation | | |
| Potential sources have been identified | Actions which can be taken to reduce that air pollution | Identify all local sources and actions which would reduce local pollutant emissions | 1 |
| Long range transport is the major contributor to poor air quality but local contributions such as that from wood stoves, could be lowered | Identity of local contributors<br>Type and quantity of contributions to poor air quality | Identify local contributors and the type, the amount of contribution they are making and methods of reducing their pollutant contributions | 1 |
| Some smaller scale sources of air pollutant emissions have been identified | Complete understanding of the effects of poor air quality on human health and natural habitat | Direct attention to air quality forecasts and smog alerts | 1 |
| | | Develop, locate and adapt suitable educational materials specific to the region | 1 |

## 3.4. Climate Change

Climate change has recently become an issue of focus for not only the Annapolis Watershed but also the world. The ratification of the Kyoto Protocol in Canada may be a starting point from which to curb human effects on climate.

The Earth's temperature appears to be rising due to the Greenhouse Effect. The increases in carbon dioxide, methane and other greenhouse gases in the atmosphere are factors that reduce the amounts of heat leaving the Earth, making the temperature rise. The presence of chlorofluorocarbons (CFC's) in the atmosphere is depleting the ozone layer, allowing more ultraviolet radiation to penetrate our atmosphere.

Humans contribute to the amount of greenhouse gases in the atmosphere with many of our daily activities. The burning of any fossil fuel releases carbon dioxide into the atmosphere and waste in landfills produces methane as it decomposes. Human influence of regional and global climate did not just begin with the onset of the modern industrial period. Humans have been modifying the environment over extensive areas for thousands of years, quite possibly since the invention of fire.

The current concentration of carbon dioxide ($CO_2$) in the atmosphere is the highest it has been in 20 million years. If it continues to increase at the present rate, in 100 years it will be the highest since the Eocene Epoch, 50 million years ago, when there were no ice caps at all. Efforts must be made now to reduce $CO_2$ concentrations and even though the benefits of doing so may not be evident for decades, to ignore the problem would further degradation and prolong recovery time.

Climate change includes significant changes in temperature and precipitation. These two variables alone affect everything from water availability to growing seasons, to cultivatable land. The distribution of precipitation will change, possibly with peaks of water in the spring and less precipitation in the winter. Sea level could rise by between 30 centimetres and 1 metre by 2100. This could lead to salt water intrusions in groundwater aquifers and reduce the amount of fresh water available for drinking and agriculture. Fish distribution and survival rates will also be affected as water temperatures, streamflows and currents along the Canadian coasts change. The effects of a changing climate specifically on the Annapolis Watershed must be determined so that people within the watershed can adapt and prepare for the future.

| Goals re Climate Change | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Understand the effects climate change will have on the region. | Using historical temperature and precipitation data, develop plausible future climate scenarios for the region | Clarify implications of the plausible future climate scenarios (sea level rise, stream flow, etc) |
| Community awareness of probable local trends, hazards and opportunities due to climate change as well as actions they can take to mitigate and adapt | Develop materials to educate community members, local government, businesses, organizations on climate change, its effects, and preventative measures | Develop an understanding of the effects climate change will have on the region. |
| | | Identify infrastructure and lifestyle changes that could have a positive or negative impact on possible effects of climate change |
| | Develop policies for mitigation and adaptation | Identify stakeholders and other concerned community groups and citizens |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Historical analysis of data has been completed | The implications of sea level rise, coastal erosion, extreme weather events, freshwater availability have not yet been determined | Further refine plausible future climate scenarios | 1 |
| Plausible future scenarios for temperature and precipitation have been developed | Future scenarios other than temperature and precipitation have not been determined | Develop future scenarios other than temperature and precipitation | 2 |
| Historical analysis of data has been completed and plausible future scenarios have been completed | Further refinement of the plausible future climate scenarios is needed | Develop and distribute educational materials detailing current knowledge | 2 |
| Reduction of greenhouse gas emissions will have a positive effect | Unsure of what will be required of the region in terms of mitigation, size and timing of adaptations and the actual effect | Support Canada's commitment to the Kyoto Protocol and assist community members, local government, businesses, organizations in the region in meeting any requirements | 1 |
| Several stakeholders have been identified | Specific concerns for each stakeholder have not been identified | Consult with identified and yet to be identified stakeholders to determine actions available for each stakeholder | 2 |
| | | Assist in implementation of actions | 2 |

## 3.5. Restoration of Habitats

The Annapolis Watershed was once a pristine environment in which native species thrived. Many things have caused degradation of both aquatic and terrestrial habitats. A major cause of both fresh and salt-water habitat destruction is siltation. Soil eroded from land is washed into waterways and severely limits the habitat for fish populations and other organisms. Deposited sediment decreases the depth of the water, which can lead to increased temperatures during warm seasons, reducing the amount of oxygen available in the water and causing stress on stream banks.

Erosion rates are usually increased when some terrestrial environment has been disturbed and new sediment has been exposed. Destruction in the riparian zones along shorelines is especially unfavourable because riparian zones act as a buffer area for any surface runoff entering the water body. Trees and plants in riparian zones also help to anchor the soil.

Wetlands and salt marshes, found throughout the watershed, provide habitat for many species and act as a filter in reducing pollution downstream. Many wetlands are drained or filled in to provide new land for development or farming. This practice has contributed to poor water quality and loss of habitat for many species.

Chemical fertilizers, which contain phosphates and nitrates, can leach into waterways, destroying the natural habitat by causing algal blooms. These blooms reduce oxygen availability in the water and alter the biodiversity in the waterway. The use of the same fertilizers by homeowners and by other facilities such as golf courses also poses a problem. The same algal blooms can occur where outflow from sewage treatment plants (STP's) occur. STP's do not treat effluent for these nutrients and therefore discharge them directly into waterways.

Clearing of forests in the Annapolis Watershed alters habitat for wildlife. The purpose of the cutting may be for development or for the timber itself but regardless, habitat for many interdependent species is reduced and will take many years to recover if ever.

Protection of all habitats in the Annapolis Watershed is an ideal that may not be attainable. What pristine habitat remains should be closely guarded and already degraded habitats should be rehabilitated so that they may once again be productive.

| Goals re Restoration of Habitats | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Natural habitat maintained or established in order to preserve species diversity and encourage healthy populations of native wildlife | Evaluate habitat quality and suitability within the watershed for native species | Identify native species which need to be preserved and their habitat requirements |
| | Create, rehabilitate and protect vital habitat characteristics | Determine habitat characteristics that are vital to native species populations |
| | Reduce sediment delivery to aquatic habitats | Identify sediment delivery locations and mechanisms |
| | Determine the future of existing habitats regarding climate change | Identify local effects of climate change on native populations |
| Habitat preserved for native species through discouragement of invasive species introduction into the Annapolis watershed | Educate residents about the effects of exotic introduction on local aquatic and terrestrial ecosystems and ways to prevent introducing invasive species | Identify potentially threatening species to native populations and how can they be introduced |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Projects involving fish habitat restoration, nesting box placement, rockweed survey, etc. have been completed | Amount and quality of suitable habitat remaining for native species is unknown | Survey watershed for habitat quality and quantity | 1 |
| | Evaluation of successes of past projects has not yet been completed | Evaluate effectiveness of past projects and develop new projects based on past successes to improve habitat quality | 1 |
| Projects involving fish habitat restoration, nesting box placement, rockweed survey, etc. have been completed | Vital habitat characteristics for native species have not yet been identified | Identify targeted species and habitat characteristics vital to each. | 1 |
| | | From above, develop rehabilitation and protection initiatives. | 2 |
| Properly functioning riparian zones reduce surface delivery of sediment to aquatic habitats<br>Projects involving riparian zone restoration have been completed | An evaluation of the success of previous projects involving riparian zone restoration has not yet been completed | Revegetate and establish degraded riparian zones | 1 |
| Plausible future climate change scenarios for temperature and precipitation have been developed | Effect of plausible scenarios on native population habitats is unknown | Study the effect of plausible future climate change scenarios for temperature and precipitation on species found within the watershed | 2 |
| Some potentially threatening species and their effects have been determined | Awareness of other species and their possible effects is unknown | Develop and distribute materials for educational purposes on the potential effects of non-native species introduction in the watershed | 1 |
| | | Discourage non-native species introduction wherever possible | 1 |

## 3.6. Legislation Enforcement

Environmental legislation exists as a way to regulate activities that are known to have a damaging effect on the natural environment. Adherence to and enforcement of the existing legislation is the first step to protecting the environment. If existing legislation proves ineffective, then the next step is to develop legislation that effectively promotes the perpetuation of a healthy environment.

CARP has an advantage in being a non-regulatory organization because it can provide guidance and advice to interested parties who would be more willing to confide in an organization that is not responsible for enforcement of regulations. Acting as a resource for information on regulations and compliance as well as assisting in compliance is essential in achieving the goals set forth in this document.

Although CARP is not a regulatory institution, the organization has the capacity to assist authoritative agencies of all levels in accomplishing their goals. For example, community members can be educated through CARP to identify activities that do not conform to regulations and CARP can act as a reporting relay to the proper government institution. In this manner, more effective enforcement of legislation can take place without increasing numbers of government personnel to do so.

| Goals re Legislation Enforcement | Methods of achieving that goal | Need to know/do to accomplish that method |
|---|---|---|
| Current environmental legislation adhered to within the watershed | Promote an investigation into whether existing environmental legislation is being enforced | Determine details of existing environmental legislation and enforcement procedures |
| | Provide support to regulatory agencies responsible for enforcement of legislation | Identify current environmental legislation for the watershed from each level of government |
| | | Determine the capacity of each level of government to enforce existing legislation |
| | | Determine impediments to enforcement |
| | | Identify the capacity of each level of government to offer incentives to adhere to regulations |
| Implementation of new, stricter, enforceable environmental legislation to protect and improve the condition of the watershed | Encourage cooperation between government agencies responsible for implementation of new regulations | Determine the degree to which inter-agency cooperation is possible |
| | Identify shortcomings of existing legislation and use that to encourage further development of regulations | Identify the shortcomings of existing legislation |

| Already know/done | Knowledge Gaps | Actions | Priority |
|---|---|---|---|
| Provisions of current regulations are known | Unsure of what legislation is being enforced and how vigorously | Encourage the Dalhousie Law School to investigate, as a student project, what environmental legislation is being properly enforced | 1 |
| The NS Environment Act has limitations in providing complete environmental protection | Appropriate solutions to address problems need to be determined | Promote public awareness of the parties responsible for regulation of activities, financial and political capacities of enforcement agencies | 2 |
| | | Identify non-regulatory instruments for compliance. | 2 |
| The capacity of government to enforce legislation is limited | Interaction between various levels of and within government agencies needs to be evaluated | Act as an informal agency through which citizens can report perceived infractions | 1 |
| Funding and personnel limitations exist | Financial and political capacities to fill mandates is unknown | Proactively support the identification and correction of impediments | 2 |
| Some incentives exist for on-site septic system regulation compliance | Incentives for compliance with other regulations are unknown | Support incentives wherever possible for legislation compliance through education of residents on the benefits of environmental regulation compliance | 1 |
| Cooperation between all levels of government would promote more effective and less segmented legislation | Interaction between various levels of and within government agencies is unknown | Provide support wherever possible for inter-agency communication and cooperation | 3 |
| Effectiveness of existing legislation and some of its shortcomings are known | Limitations of existing legislation and areas where improvement could be achieved is unknown | Support the identification of limitations and possibilities for improvement through promoting to other groups, through ACAP involvement, etc. | 2 |

# 4. Organizational Policy Considerations

Identification of the issues is only the first step towards initiating change to improve the quality of our environment. All new projects developed at CARP should be designed to address the Goals and Actions outlined in Section 3 of this management plan. Development of new projects is based on funding opportunities and because of this, rather than assign specific tasks to each Goal and Action the following questions have been developed which are to be answered during varying stages of a project. The questions are designed to maintain flexibility in project development, organization, and follow-up but also to maintain a clear structure of activities within the organization.

Before approval of a project by the Board of Directors both the Executive Director and the Board of Directors should address the following questions.

1. Does the proposal match the CEMP? If no, does the Board accept it?
2. Does the proposal fit with the Strategic Plan? If no, does the Board accept it?
3. Does the proposal relate to previous projects? If yes, are changes from previous recommendations and results clearly identified?
4. Are intended results clear?
5. Are there economic benefits and considerations as part of the project results and recommendations?
6. Is implementation clear?
7. Are there any roles for: Board, Executive, Committees, staff, volunteers, other groups, ACAP, etc.? If so, what are they?
8. Is the Board satisfied with the proposed findings?

At presentation of final project recommendations the Board of Directors should answer the following questions.

1. Are the results clear?
2. Are there any implementation/next steps to be taken?
3. Are the responsible parties identified?
4. What other actions are to be taken?
5. How to promote outcomes? By whom? By when?

The Executive of the Board of Directors should follow up on projects to address the following questions.

1. Is any review of status required?
2. Is monitoring of the project required?

By adhering to this format CARP can work effectively as an organization to overcome the problems it was formed to address and to improve the quality of life for all things in the Annapolis Watershed.

# Appendix A - Glossary

| | |
|---|---|
| **Aquifer** | An underground, water-bearing layer of earth, porous rock, sand, or gravel, through which water can seep or be held in natural storage. Aquifers generally hold sufficient water to be used as a water supply. |
| **Degradation** | Implies a decline in quality of habitat. |
| **Ecosystem** | An interrelated and interdependent community of plants and animals and their habitats. |
| **Edaphic** | Of, or relating to soil. |
| **Environment** | The complex climatic, edaphic, and biotic factors that act upon an organism or ecological community and ultimately determine its form and survival. |
| **Erosion** | Wearing away of land by physical and chemical action in moving water or air. |
| **Groundwater** | Subsurface water, accumulating because of seepage and returning to the surface as springs and through wells. Water in the ground that is in the zone of saturation, from which wells, springs, and ground-water run-off are supplied. |
| **Habitat** | The place occupied by an organism, population, or community. It is the physical part of the community structure in which an organism finds its home, and includes the sum total of all the environmental conditions present in the specific place occupied by an organism. Often a habitat is defined to include a whole community of organisms. |
| **Ozone** | A bluish irritating gas of pungent odour that is formed naturally in the upper atmosphere or generated artificially. The gas is a major agent in the formation of smog. |
| **Recharge area** | An area which by nature of surface soil and underlying rock type is particularly important for allowing surface water to percolate to underground storage. |
| **Riparian zone** | A strip of natural vegetation along waterways used to moderate the effects of surface runoff |
| **Sedimentation** | Deposition of eroded fine soil material of the stream bed |
| **Septage** | The waste content found in a septic tank |
| **Silt** | Loose sedimentary material with rock particles usually 1/20 of a millimetre or less in diameter |
| **Stakeholder** | Anyone who is significantly impacted by a decision, anyone who can contribute to quality decisions, and anyone who can contribute to their implementation |
| **Tributary** | A stream that feeds a larger stream or lake. |
| **Watershed** | The total area above a given point on a watercourse that contributes water to its flow; the entire region drained by a waterway or watercourse that drains into a lake or reservoir. |

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