1-31-2005

Implementation of the Dearborn Brook Watershed Management and Protection Plan

Rockingham Planning Commission

Implementation of the *Dearborn Brook Watershed Management and Protection Plan*

A Final Report to

The New Hampshire Estuaries Project

Submitted by the
Rockingham Planning Commission
156 Water Street
Exeter, NH 03833

January 31, 2005

This report was funded by a grant from the New Hampshire Estuaries Project, as authorized by the U.S. Environmental Protection Agency pursuant to Section 320 of the Clean Water Act.

Implementation of the *Dearborn Brook Watershed Management Plan*

Table of Contents

Implementation of the *Dearborn Brook Watershed Management and Protection Plan*

Executive Summary

Dearborn Brook is a small but important stream located in Stratham and Exeter, New Hampshire. The Brook flows into the Town of Exeter Reservoir and is used to supply drinking water to the Town of Exeter and portions of Stratham. The Dearborn Brook Watershed Committee was established in 2001 to develop a management and protection plan for the Brook. Committee members represent the Conservation Commissions, Open Space Committees, Planning Departments, Water and Sewer Commissions, and Department of Public Works in the Towns of Exeter and Stratham. The purpose of this project was to begin implementing the top three recommendations made in the *Dearborn Brook Watershed Management and Protection Plan*: protecting undeveloped land, reviewing land use regulations, and developing public education and outreach campaign.

Implementing the *Dearborn Brook Watershed Management and Protection Plan*

Introduction

Dearborn Brook is a small but important stream that begins in Stratham, New Hampshire, flows under NH Route 101 into Exeter, New Hampshire, and on to the Town of Exeter's Reservoir. The Brook supplies the Town of Exeter's municipal drinking water system, providing water to Exeter and portions of Stratham. The Dearborn Brook Watershed Committee was formed in 2001 to develop a management plan for the Brook and its watershed. The *Dearborn Brook Watershed Management and Protection Plan* was completed in 2003. The purpose of the Plan was to identify threats to water quality and water quantity and recommend ways in which the two communities could work together to protect drinking water resources.

Project Goals

The goal of this project was to being implementing high priority recommendations outlined in the *Dearborn Brook Watershed Management and Protection Plan.* The top three recommendations made by the Committee and outlined in the plan are: protecting undeveloped land in the watershed from development, reviewing land use regulations and identifying ways to strengthen protection of the Brook, and developing a public education and outreach program to increase awareness of Dearborn Brook and the role it plays in providing public drinking water.

Activities

Staff from the Rockingham Planning Commission worked with the Dearborn Brook Watershed Committee to conduct the following activities:

Task 1 – Meeting Facilitation:

- Worked with the Exeter Conservation Commission and the Stratham Conservation Commission to discuss land protection priorities for each community and the rationale for protecting land in the Dearborn Brook watershed;
- Worked with the Exeter Open Space Committee and the Stratham Ad-hoc Open Space Committee to review land protection criteria and funding options for purchasing land or easements in the watershed.

Task 2 - Landowner Workshop Facilitation:

- Partnered with the Rockingham Land Trust to host a workshop on Estate Planning and Land Protection. The workshop featured presentations by Phil Auger of UNH Cooperative Extension and Exeter Attorney Charles Tucker. Workshop invitations were mailed to landowners in the watershed with parcels over 10 acres, as well as landowners in the Exeter River watershed;

Task 3 - Municipal Workshop Facilitation:

- Reviewed existing land use regulations in Exeter and discussed options for strengthening regulations that protect water quality and quantity in the watershed with town planners in both communities;
- Organized a workshop on the protection and creation of shoreland buffers in the watershed for Exeter DPW, Exeter Water Department, and Exeter Park and Recreation staff responsible for landscape maintenance along Dearborn Brook and the Town Reservoir;
- Attended the Stormwater BMP Technology Demonstration Workshop hosted by the UNH Center for Stormwater Technology Evaluation and Verification. Staff from the RPC and Exeter DPW and Planning Department, as well as members of the Dearborn Brook Watershed Committee, Exeter Water and Sewer Advisory Committee and Stratham Conservation Commission participated in the workshop, which featured research on stormwater BMPs.

Task 4 – Outreach and Education:

- Completed and submitted a grant application to the Conservation Technology Information Center at Purdue University for a EnviroScape Watershed/Nonpoint Source model which would be used to educate Dearborn Brook watershed residents on NPS and associated impacts on the Brook;
- Worked with staff from Exeter DPW and members of the Exeter Water and Sewer Advisory Committee and Stratham Water Commission to develop a public education campaign and outreach materials.

Task 5 - Reporting:

- Completed and submitted to NHEP three quarterly reports and one final report.

Results

Project results were as follows:

Task 1 – Meeting Facilitation:

The Exeter Conservation Commission and Exeter Open Space Committee have placed several parcels in the Exeter portion of the Dearborn Brook watershed on their land protection priorities list. Because the committees have not released this list to the general public a watershed overlay map was not produced as part of this report. The criteria used to place parcels in the watershed on the land protection priorities list was protection of drinking water resources. RPC staff facilitated discussions between the Exeter Open Space Committee and an owner of a large parcel in the heart of the watershed. The landowner is considering two options, placing a conservation easement on the property or fee simple sale of the parcel to the Town.

The Stratham Conservation Commission and the Stratham Ad-hoc Open Space Committee are less inclined to use Stratham funding to protect undeveloped land in the watershed given the number of parcels they have identified for protection in other parts of town. Discussions with the Town Planner and members of the Planning Board revealed the opinion held by many local decision makers in Stratham, which is Dearborn Brook serves Exeter residents and very few Stratham residents and the Town of Stratham should not spend money to protect Exeter's water supply. The Stratham Conservation Commission and Ad-hoc Open Space Committee suggested the Boards of Selectmen in both Exeter and Stratham should meet to talk about regional water use and supply in order to start a discussion on joint watershed protection efforts.

Task 2 – Landowner Workshop Facilitation:
The Estate Planning and Land Protection Workshop held on November 8th at the Senior Center in Exeter was attended by 15 people, four of whom live in the Dearborn Brook watershed, two in Exeter and two in Stratham. Their names were shared with the Exeter and Stratham Open Space Committees for follow-up. The Exeter Open Space Committee has followed up with the Exeter residents but the Stratham Ad-hoc Open Space Committee has not yet followed up with the Stratham residents. RPC staff met with members of the Exeter Open Space Committee about submitting a grant application to the DES Source Water Land Protection Program for funds to purchase easements on parcels in Stratham and Exeter. Handouts distributed at the workshop are in Appendix A.

Task 3 – Municipal Workshop Facilitation:
RPC met with Town Planners in Stratham and Exeter to discuss the proposed workshop for Planning Boards in both communities to review existing land use regulations. Both planners felt the local land use regulations had been extensively reviewed during the recent NROC Squamscott project and that their Planning Boards would resent this process again.

RPC staff asked the Conservation Commissions and Planning Boards in both towns for a new workshop topic and the Exeter Conservation Commission suggested a workshop for town employees responsible for landscaping along the Town Reservoir/Dearborn Brook and other municipally owned shoreland parcels. RPC staff worked with staff from UNH Cooperative Extension, members of the Exeter Conservation Commission, and members of the Dearborn Brook Watershed Committee to develop a workshop on shoreland buffer protection for Exeter DPW and Exeter Parks and Recreation employees.

The workshop was held on August 31, 2004 and attended by six employees and volunteers. There was consensus and agreement among Exeter DPW and Exeter Parks and Recreation to work with the Conservation Commission to identify "no mow" areas and areas where native vegetation could be allow to grow more fully, as well as areas where native vegetation could be planted to restore eroded areas. In addition, the group agreed to establish a demonstration

site in Swasey Parkway to educate residents about the purpose and benefits of shoreland buffer vegetation. Handouts from the workshop are in Appendix B.

Task 4 – Outreach and Education
RPC staff and the Dearborn Brook Watershed Committee reviewed samples of public education and outreach materials from several sources. The group designed an outreach strategy which includes the following activities and materials:

- Storm drain stenciling in four large subdivisions in the watershed in Exeter and Stratham;
- Storm drain stenciling in the parking lots along Portsmouth Avenue;
- Door hangar type pamphlet distributed in large subdivisions;
- Brochures to businesses in watershed;
- Coasters/tabletop card for display in restaurants along Portsmouth Avenue;
- Bookmarks to schools, libraries, bookstores, and town offices;
- Static cling art for display in businesses along Portsmouth Avenue;
- Show the EPA documentary "After the Storm" on local cable access channels.

Public outreach materials are in Appendix C. Printed materials will credit the NHEP and media coverage will be arranged for the stormdrain stenciling activity.

Conclusion
The Dearborn Brook Watershed Committee has concluded that in order to get the communities of Stratham and Exeter to work together on protecting Dearborn Brook that a great deal of fence mending needs to take place first. Disagreement between the two towns over sharing water resources has been on-going for several years. Developers have requested the Town of Exeter provide public water service along Portsmouth Avenue in Stratham to service the existing commercial development in that area, especially for fire protection. The Town of Exeter does not want to negotiate with developers on this issue and has repeatedly stated that it will deal only with the Town of Stratham. The Town of Stratham is reluctant to offer municipal water resources because of the increased development which could take place if that service was provided. In the meantime, the Stratham Planning Department is eyeing the headwaters of Dearborn Brook as the site of a potential community septic system to serve proposed commercial development along Portsmouth Avenue. The lack of communication between communities makes it difficult for the Watershed Committee to work together in the interest of both towns.

Given this situation, the Watershed Committee will continue to focus its efforts on voluntary land protection in the watershed and educating landowners and residents in the watershed about reducing nonpoint source pollution and protecting water quality. The Committee will also work behind the scenes with the Exeter Water and Sewer Advisory Committee and the Stratham Water

Commission to urge the Boards of Selectmen in both communities to meet to discuss sharing and protecting water resources.

Recommendations

The Dearborn Brook Watershed Committee recommends the following actions take place to further efforts to protect Dearborn Brook:

- The Dearborn Brook Watershed Committee begin working immediately with the Exeter Department of Public Works, Exeter Conservation Commission, Stratham Water Commission, and Stratham Conservation Commission to implement the public education and outreach campaign;
- The Exeter Water and Sewer Advisory Committee and the Stratham Water Commission invite the Boards of Selectmen of both communities to a joint meeting to discuss Dearborn Brook in general and sharing water resources specifically;
- The Exeter Open Space Committee and the Stratham Ad-hoc Open Space Committee hold a joint meeting to discuss land protection in the watershed to identify opportunities to work together on voluntary land protection efforts.

It should be noted that enormous time and effort has been spent and is being spent by volunteers in both Exeter and Stratham to protect Dearborn Brook. Without the hard work of members of the Dearborn Brook Watershed Committee, Stratham and Exeter Conservation Commissions and Open Space Committees, and the Exeter Water and Sewer Advisory Committee and Stratham Water Commission this small but important stream would go unnoticed by local decision makers and residents.

Appendix A
Handouts from the November 8, 2004 Estate Planning and Land Protection Workshop

Workshop Dates and Locations:

Monday, November 8th
7pm—9pm
Senior Citizen Center
30 Court Street (Rt. 108)
Exeter, NH

Tuesday, November 16th
7pm—9pm
Sandown Town Hall
NH Route 121 A
Sandown, NH

These workshops are funded by a grant from the New Hampshire Estuaries Project

New Hampshire Estuaries Project

Land Protection and Estate Planning Workshops

FREE Workshops for Landowners Designed to Discuss the Options Available for Protecting Your Land

---

Workshop dates and locations:

Mon. Nov. 8th: Exeter
Tues. Nov. 16th: Sandown
7pm—9pm both locations

ROCKINGHAM LAND TRUST

Rockingham Land Trust
8 Center Street, Floor 2
Exeter, NH 03833

NON PROFIT ORG
US POSTAGE
PAID
MAILFORCE, INC.

IF YOU OWN LAND AND HOPE TO PASS IT ON to your heirs…
If you own land and hope to keep it undeveloped…
If you just inherited land and are not sure what this means for your taxes…
Then this free, informative workshop is for you.

RECENT CHANGES IN FEDERAL LAW increase the available tax incentives for landowners who conserve their land through conservation easements. These changes may help you achieve your personal or family goals while providing you with income tax deductions and reducing the taxable value of your estate.

THIS WORKSHOP, LED BY TWO OF the region's leaders in estate planning and land conservation, will introduce participants to the basics of estate planning and federal tax law regarding conservation easements and estates. In addition, participants will learn about the options available to them for conserving their land, from the donation of conservation easements to the bargain sale of the property to a conservation organization. Finally, participants will be introduced to the work of one of the region's non-profit land protection organizations, who will outline recent projects completed with landowners in your community.

WITH THE INCREASE IN REAL ESTATE values, all landowners should have an estate plan and should understand all of the options available to them. Learn more and ask your questions during this free, educational workshop.

Workshop Agenda

Light Refreshments
Will be Served

- **7:00pm—7:15pm**

WELCOME AND REFRESHMENTS

- **7:15pm—8:00pm**

THE LAND PROTECTION BENEFITS OF ESTATE PLANNING
Charles Tucker, Attorney and Partner, Donahue, Tucker and Ciandella, Exeter, NH

- **8:00pm—8:45pm**

LAND PROTECTION OPTIONS
Phil Auger, Extension Educator, UNH Cooperative Extension, Brentwood, NH

- **8:45pm—9:00pm**

CONCLUDING REMARKS
Brian Hart, Executive Director, Rockingham Land Trust, Exeter, NH

Registration

The workshops are free but pre-registration is required.

Please call or email Karin Rubin at the Rockingham Land Trust to register:

Telephone:
603-778-6088

Email :
krubin@rockinghamlandtrust.org

PLEASE LET US KNOW WHICH WORKSHOP YOU WILL ATTEND AND HOW MANY PEOPLE WILL PARTICIPATE SO WE CAN PREPARE WORKSHOP MATERIALS FOR YOU.

The Rockingham land Trust is a membership based, non-profit organization serving greater Rockingham County. Our mission is to conserve the region's open spaces, including forestland, farm land, water resources and wildlife habitat. Founded in 1980, the Trust has helped protect nearly 3,000 acres of land through more than 55 conservation easements. The Trust is governed by a volunteer board of directors and has two full-time staff members.

ATTORNEYS
DTC
AT LAW
DONAHUE, TUCKER & CIANDELLA, PLLC

MICHAEL J. DONAHUE
CHARLES F. TUCKER
ROBERT D. CIANDELLA
LIZABETH M. MACDONALD
JOHN J. RATIGAN
DENISE A. POULOS
ROBERT A. BATTLES
SHARON CUDDY SOMERS
CHRISTOPHER L. BOLDT
DOUGLAS M. MANSFIELD

OF COUNSEL
ROBERT M. DEROSIER
ROBERT B. DONOVAN
KATHERINE B. MILLER

WATER STREET
PROFESSIONAL BUILDING
225 WATER STREET
P.O. BOX 630
EXETER, NEW HAMPSHIRE
03833-0630
TELEPHONE
603-778-0686
TOLL FREE
800-566-0506
FAX
603-772-4454
WWW.DTCLAWYERS.COM
GENERALMAIL@DTCLAWYERS.COM

Estate Planning and Conserving Your Land

Charles F. Tucker, Esquire

Estate plans should fit your particular circumstances. If you own undeveloped land, there may be an opportunity to conserve the land and benefit your heirs as well! Important factors are:

(1) How much money (or money's worth in property) do you have now, and how much do you expect to have during your lifetime?

(2) How many dependents do you have, and for how long will they be dependent upon you?

(3) How old are you, and what is your life expectancy?

(4) How much does it cost you to live, and how does this compare with your income now, and in the future?

(5) What are the Federal and State laws regarding gifts and inheritances now, and what are they likely to be in the future?

(6) What do you own that has significant value, but which you do not use, and will not ever need again?

(7) How much trust do you have in your children to be financially prudent?

(8) Do you have a favorite charity, or charities?

(9) Do you own real estate which you would like to see maintained "as is" forever, even though it may mean a smaller inheritance for your children?

(10) Can you "have your cake and eat it too"?

Possibilities

Joint tenancies with rights of survivorship.

A simple Will.

A Will with Testamentary Trust.

A Revocable (Living) Trust.

An Irrevocable Trust.

An Irrevocable Life Insurance Trust.

A Charitable Remainder Unitrust.

Conservation Easement by gift or devise.

Annual Gifts.

Durable Power of Attorney.

Living Will/Health Care Power of Attorney.

Guardianship/Conservatorship.

Investments and Annuities of various sorts held in your name, or in the name of a revocable trust or an irrevocable trust.

Insurance - Life Insurance/Nursing Home Insurance.

Retirement Communities and Continuing Care Retirement Communities.

Rental Communities.

Nursing Homes.

Medicaid.

"Conserving Your Land: Options for New Hampshire Landowners" by Brenda Lind, Center For Land Conservation, 2004

An introduction to CONSERVATION EASEMENTS

What is a Conservation Easement?

A conservation easement is a legally binding agreement between a landowner (the Grantor) and an eligible conservation organization or agency (the Grantee) that permanently restricts future development of a property. The Rockingham Land Trust is a 501(c)(3) non-profit conservation organization and is eligible to hold conservation easements.

Property ownership brings with it inherent rights, including the right of development, which includes construction, subdivision, mining, and water withdrawals. These rights can be separated from the underlying ownership of the property and sold or given away. A conservation easement legally separates some of your rights of ownership and transfers them to a qualified organization, such as the Rockingham Land Trust. **The receiving organization does not actually hold the development rights as they are in fact extinguished. Rather the easement holder is responsible for enforcing the restrictions both parties have outlined in the easement contract.**

In general, a conservation easement forbids or limits future residential or commercial development. In some cases, a limited number of specified subdivisions may be allowed. Additional restrictions include prohibiting the removal of topsoil, the construction of cell towers and billboards and burying of trash. These restrictions apply to the current and all future landowners.

ROCKINGHAM LAND TRUST

Founded in 1980, the Rockingham Land Trust is a membership-based, non-profit conservation organization dedicated to conserving the farms, forests, and water resources of Rockingham County. The Trust has helped conserve more than 2,000 acres of land. For more information, call us at 603/778-6088 or visit www.rockinghamlandtrust.org. Our mailing address is 14 Center St., Exeter, NH 03833.

It is important to note that each easement is specifically tailored to protect the important values of the land, and to the extent feasible and practicable, the individual desires and goals of the landowner. For instance, an easement may specifically permit educational activities like archaeological digs or annual public events like a fishing derby.

Once signed by the landowner and the easement holder, the conservation easement deed is recorded at the county Registry of Deeds as a permanent public record, thus allowing all future owners and lenders to be aware of the conservation easement on the property.

Does an easement require public access?

No. Generally, landowners retain the right to determine public access to their property. Some landowners convey specific public access rights, such as allowing access for fishing, or hiking along a clearly defined trail. Public access is more often granted when the property has a history of public use and is perceived to be a recreational resource. When a town owns the easement, public access is typically granted.

What land can have a conservation easement?

Properties that have agricultural, recreational, forestry, water resources, wildlife habitat, or scenic or historic qualities may be protected with a conservation easement.

Who owns land with a conservation easement?

Privately owned land that has been permanently protected with a conservation easement remains in private ownership. Conservation easements can also be used to protect publicly owned lands. Current and future owners of conservation easement land may sell, give, or transfer the property at anytime to a new owner.

Who can grant an easement?

Any owner of property with significant conservation values may grant an easement.

Continued on reverse side

Who can grant an easement? (continued)

All property owners must consent to the granting of an easement. If the property is mortgaged, the owner must obtain an agreement from the lender to subordinate its interests to that of the easement holder. This ensures that the easement cannot be extinguished in the event of foreclosure. Most conservation easements accepted by the Rockingham Land Trust are generously donated by landowners. In some instances, the Trust will acquire an easement for its full or partial value.

How much land may be included in a conservation easement?

A conservation easement may be used to protect a relatively small parcel with outstanding natural resource features or defensible public benefits. It does not have to cover an entire property. Depending on your goals, a conservation easement may apply to all of your land or only a small part of it.

How are conservation easements enforced?

Once a conservation easement is signed and recorded, the easement holder, such as the Rockingham Land Trust, is responsible for regularly monitoring the property for compliance with the terms of the agreement. For an easement held by the Rockingham Land Trust, a staff member or volunteer will visit the property periodically, usually annually, to determine whether any violations of the easement terms have occurred. The steward takes photographs and extensive notes to document the periodic visits. In the case of violations, the Rockingham Land Trust is responsible to enforce the provisions of the easement, which may require, as a last resort, legal action.

After the writing and recording of the conservation easement, the long-term monitoring of the property (known as conservation stewardship) is the most critical component of ensuring your property is permanently conserved as you desired. As most land trusts do, the Rockingham Land Trust requests that landowners contribute to our permanent fund for stewardship, known as the *Forever Fund*. This fund covers the long-term costs of monitoring and enforcing conservation easements (see our *Forever Fund Fact Sheet* for more information).

How long does it take to complete an easement?

From start to finish, a typical easement takes at least three months and often much longer to complete.

Are there financial benefits to placing a conservation easement on your property?

There may be significant estate, income, or property tax benefits from placing a conservation easement on your property, depending on your financial situation. The granting of a conservation easement does constitute a charitable gift that may be deductible for federal income tax purposes if the property meets conservation standards established by the federal government. Further, a conservation easement may reduce the value of your estate, thereby resulting in a reduction of the estate taxes levied on your heirs. Finally, a conservation easement may also reduce property taxes.

The Rockingham Land Trust can offer basic information about the tax implications of donating a conservation easement. However, we strongly recommend that landowners consult with a tax advisor or attorney on the potential implications of a conservation easement donation.

This fact sheet was funded by a grant from the New Hampshire Estuaries Program pursuant to an award from the federal Environmental Protection Agency. Thanks to the Monadnock Conservancy, Society for the Protection of New Hampshire Forests, and Upper Valley Land Trust for allowing the liberal use of their materials in writing of this fact sheet.

New Hampshire Estuaries Project

ROCKINGHAM LAND TRUST

Since 1980, conserving a legacy of open space in Rockingham County

The Rockingham Land Trust is a membership-based, non-profit organization dedicated to permanently protecting the region's open spaces, including farmland, forestland, water resources, and wildlife habitat. As a regional land trust, we serve the 39 communities of greater Rockingham County. Established in 1980, the Trust has helped landowners and communities protect nearly 2,700 acres of land.

How does the Rockingham Land Trust protect land?

The Trust works in cooperation with communities and landowners to voluntarily conserve land through the use of conservation easements. Conservation easements are legally binding agreements that permanently restrict the future development of a property but allow the landowner to continue to use the property for forestry, farming, recreation and other compatible, non-development uses.

The Trust seeks and facilitates the donation of land or conservation easements and often works in cooperation with municipalities and other non-profit conservation organizations. While most conservation easements held by the Trust are generously donated by the landowner, the Trust does work to raise private and public funding for purchasing conservation easements from willing sellers. (Please see the separate fact sheet for a complete list of the Trust's conservation easements.)

The Rockingham Land Trust is governed by an eleven member Board of Directors who meet monthly to set policy on the Trust's conservation activities and to review each proposed conservation easement. The Trust has one full-time staff person, Brian Hart, who serves as the Executive Director.

2003-2004 Board of Directors

Joanna Pellerin, President, Exeter
Tom Chamberlin, Vice President, Exeter
Betsy Sanders, Treasurer, Danville
Forest Griffin, Secretary, Exeter
Phil Auger, Strafford/Brentwood
Paul Dionne, Derry
Dianna Fallon, Windham
Tim Fortier, Portsmouth
Camilla Lockwood, Chester
Rick Russman, Kingston
Roger Stephenson, Stratham
Dick Wollmar, North Hampton

By joining the Rockingham Land Trust, you will help protect the special places of our communities – including the lands that purify your drinking water, grow your fresh food locally, provide you and your family with opportunities for hiking, canoeing or hunting, and help maintain our high quality of life here in southeastern New Hampshire.

Rockingham Land Trust
8 Center Street
Exeter, NH 03833
603/ 778-6088
f 603/ 778-0007
info@rockinghamlandtrust.org
www.rockinghamlandtrust.org

ROCKINGHAM LAND TRUST

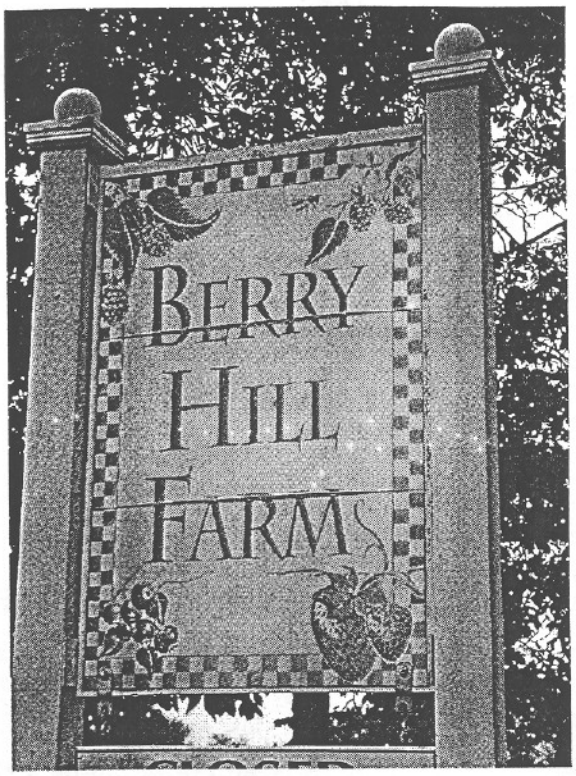
What is the Rockingham Land Trust working on right now?
Over the past two years, the Rockingham Land Trust has conserved more than 700 acres of open space. These lands include:

- **Forested uplands and wetlands** in **Kensington** and **Exeter**, containing a rare stand of swamp white oak and habitat for moose, deer, and bobcat.
- Twenty-six acres of forestland surrounding a recreational pond in **Newmarket.**
- The Preston Tree Farm in **Auburn**, including 52-acres of well managed woodland.
- 27 acres of wildlife habitat on the Lamprey River in **Epping**, now owned by the Trust and managed as the Lamprey River Wildlife Preserve.

2004 promises to be even more successful, with twelve pending projects protecting more than 1,000 acres!

Help Create a Legacy of Open Space – Join the Rockingham Land Trust

As a member, you will receive our quarterly newsletter *This Land* and special updates on specific conservation projects. You will also be invited on tours of conservation lands to see what your gift helped accomplish. Finally, you will have the satisfaction of knowing that you made a difference by helping conserve critical land. To join, please send your check payable to the Rockingham Land Trust to 8 Center St., Exeter, NH 03833. The Trust is a 501(c)(3) non-profit organization. All donations are tax-deductible to extent allowed by law.



Berry Hill Farm, located on Stratham Heights Road in Stratham, is just one of the more than 60 properties the Rockingham Land Trust has helped conserve since 1980. Photo courtesy of Carol Walker Aten.

ROCKINGHAM
LAND TRUST


RIVER
EXETER
RESERVOIR
Parkman
Brook
Brook
Deakford
60
100
30
15

RIVER BANKS & BUFFERS

Introduction to Riparian Buffers

No. 1

for the Connecticut River Watershed

Riparian buffers are the single most effective protection for our water resources in Vermont and New Hampshire. These strips of grass, shrubs, and/or trees along the banks of rivers and streams filter polluted runoff and provide a transition zone between water and human land use. Buffers are also complex ecosystems that provide habitat and improve the stream communities they shelter.

Natural riparian buffers have been lost in many places over the years. Restoring them will be an important step forward for water quality, riverbank stability, wildlife, and aesthetics in the Connecticut River Valley. Landowners, town road agents, local governments, farmers, and conservation organizations can all help restore and protect the riparian buffers which in turn restore and protect the quality of our streams.

HOW BUFFERS GO TO WORK

Sediment Filter

For water quality

Riparian buffers help catch and filter out sediment and debris from surface runoff. Depending upon the width and complexity of the buffer, 50–100% of the sediments and the nutrients attached to them can settle out and be absorbed as buffer plants slow sediment-laden runoff waters. Wider, forested buffers are even more effective than narrow, grassy buffers.

Pollution Filter, Transformer, and Sink

The riparian buffer traps pollutants that could otherwise wash into surface and groundwater. Phosphorus and nitrogen from fertilizer and animal waste can become pollutants if more is applied to the land than plants can use. Because excess phosphorus bonds to soil particles, 80–85% can be captured when sediment is filtered out of surface water runoff by passing through the buffer. Chemical and biological activity in the soil, particularly of streamside forests, can capture and transform nitrogen and other pollutants into less harmful forms. These buffers also act as a sink when nutrients and excess water are taken up by root systems and stored in the biomass of trees.

Stream Flow Regulator

By slowing the velocity of runoff, the riparian buffer allows water to infiltrate the soil and recharge the groundwater supply. Groundwater will reach a stream or river at a much slower rate, and over a longer period of time, than if it had entered the river as surface runoff. This helps control flooding and maintain stream flow during the driest time of the year.

Bank Stabilizer

For bank stability

Riparian buffer vegetation helps to stabilize streambanks and reduce erosion. Roots hold bank soil together, and stems protect banks by deflecting the cutting action of waves, ice, boat wakes, and storm runoff.

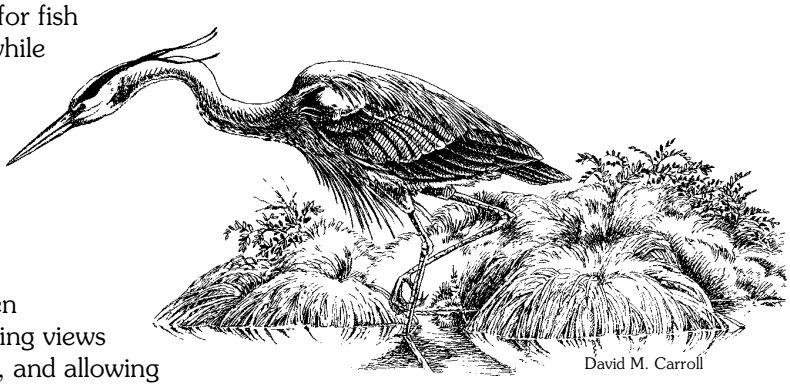
Bed Stabilizer

Riparian buffers can also reduce the amount of streambed scour by absorbing surface water runoff and slowing water velocity. When plant cover is removed, more surface water reaches the stream, causing the water to crest higher during storms or snowmelt. Stronger flow can scour streambeds, and can disturb aquatic life.

Wildlife Habitat
The distinctive habitat offered by riparian buffers is home to a multitude of plant and animal species, including those rarely found outside this narrow band of land influenced by the river. Continuous stretches of riparian buffer also serve as wildlife travel corridors.

For fish and wildlife

Aquatic Habitat
Forested riparian buffers benefit aquatic habitat by improving the quality of nearby waters through shading, filtering, and moderating stream flow. Shade in summer maintains cooler, more even temperatures, especially on small streams. Cooler water holds more oxygen and reduces stress on fish and other aquatic creatures. A few degrees difference in temperature can have a major effect on their survival. Woody debris feeds the aquatic food web. It also can create stepped pools, providing cover for fish and their food supply while reducing erosion by slowing flow.


David M. Carroll

Recreation and Aesthetics
Forested buffers are especially valuable in providing a green screen along waterways, blocking views of nearby development, and allowing privacy for riverfront landowners. Buffers can also provide such recreational opportunities as hiking trails and camping.

THE BETTER BUFFER

For every buffer there is a reason. Whether it is pollution filtration, erosion control, wildlife habitat, or visual screening, the size and vegetation of the buffer should match the land use and topography of the site.

Topography
A buffer is more important for water quality in areas that collect runoff and deliver it to streams, and less critical on land that tips away from the water. Steeper slopes call for a wider riparian buffer below them to allow more opportunity for the buffer to capture pollutants from faster moving runoff. This is also true at both ends of a flood chute, or the path a river takes across a meander at high water.

Hydrology and Soil
The ability of the soil to remove pollutants and nutrients from surface and ground water also depends upon the type of soil, its depth, and relation to the water table. On a wetter soil, a wider buffer is needed to get the same effect.

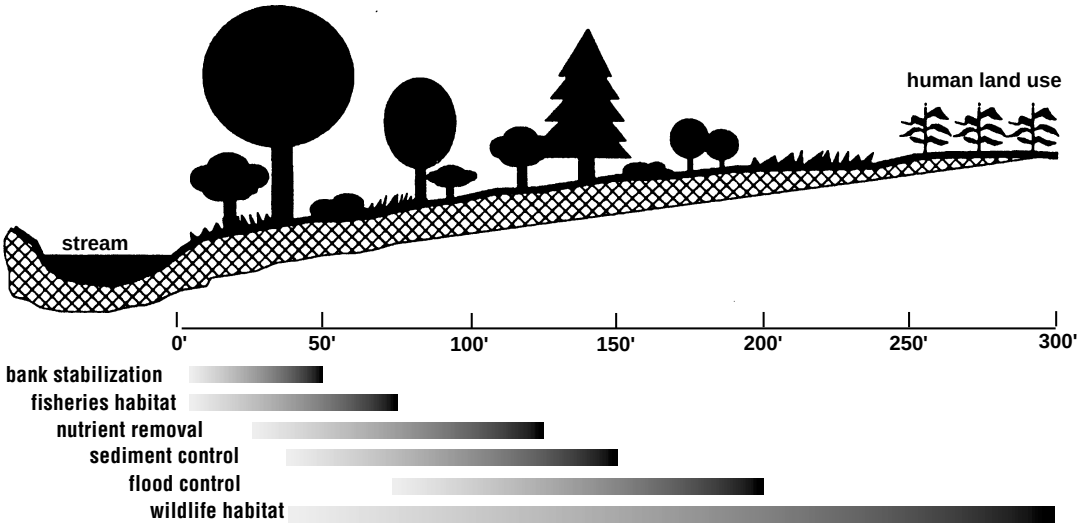
Vegetation
The purpose(s) of the buffer will influence the kind of vegetation to plant or encourage. In urban and residential areas, trees and shrubs do a better job at capturing pollutants from parking lots and lawn runoff and providing visual screening and wildlife habitat.

Between cropland and waterways, a buffer of shrubs and grasses can provide many of the benefits of a forested buffer without shading crops, and trees can be used on the north side of fields.

Trees have several advantages over other plants in improving water quality and offering habitat. Trees are not easily smothered by sediment and have greater root mass to resist erosion. Above ground, they provide better cover for birds and other wildlife using waterways as migratory routes. Trees can especially benefit aquatic habitat on smaller streams. Native vegetation is preferable to non-native plants.

BUFFER WIDTH

How big should a buffer be? One size doesn't fit all. It depends on what you want the buffer to do. There isn't one generic buffer which will keep the water clean, stabilize the bank, protect fish and wildlife, and satisfy human demands on the land. The minimum acceptable width is one that provides acceptable levels of all needed benefits at an acceptable cost. **The basic bare-bones buffer is 50' from the top of the bank. You get more with every foot.**



To Stabilize Eroding Banks

On smaller streams, good erosion control may require only covering the bank with shrubs and trees, and a 35' managed grass buffer. If there is active bank erosion, or on larger streams, going beyond the bank at least 50' is necessary. Severe bank erosion on larger streams requires engineering to stabilize and protect the bank - but this engineering can be done with plants. For better stabilization, put more of the buffer in shrubs and trees.

To Filter Sediment and Attached Contaminants from Runoff

For slopes gentler than 15%, most sediment settling occurs within a 35' wide buffer of grass. Greater width is needed on steeper slopes, for shrubs and trees, or where sediment loads are particularly high.

To Filter Dissolved Nutrients and Pesticides from Runoff

A width up to 100' or more may be necessary on steeper slopes and less permeable soils to allow runoff to soak in sufficiently, and for vegetation and microbes to work on nutrients and pesticides. Most pollutants are removed within 100', although in clay soils, this may not happen within 500'.

To Protect Fisheries

Buffer width depends on the fish community. For cold water fisheries, the stream channel should be shaded completely. Unless there are problems with algae blooms, warm water fisheries do not require as wide a buffer or as much shade, but they still benefit from water cleaned by a buffer's filtering action. Studies show that at least up to 100', the wider the buffer, the healthier the aquatic food web.

To Protect Wildlife Habitat

Buffer width depends upon desired species: 300' is a generally accepted minimum. Much larger streamside forest buffer widths are needed for wildlife habitat purposes than for water quality purposes. The larger the buffer zone, the more valuable it is. Larger animals and interior forest species generally require more room. Some use so much habitat that it

would be nearly impossible to protect the size buffers they require. A narrow width may be acceptable for a travel corridor to connect larger areas of habitat. Continuity is important — even small patches of trees are better than none at all when it comes to migrating birds.

To Protect Against Flood Damage

Smaller streams may require only a narrow width of trees or shrubs; a larger stream or river may require a buffer that covers a substantial portion of its flood plain. This is why it is not a good idea to build a permanent structure where a river can get at it.

To Grow Valuable Products

Buffer width depends upon the desired crop and its management. Don't forget to consider tax incentives and cost-share programs when looking at the economic return from a riparian buffer.

DECIDING ON THE RIGHT WIDTH FOR YOUR PROPERTY

From the top of the streambank, turn back and take 15 long paces. This should carry you 50' from the bank. This area should be covered with native vegetation. Another 15 paces brings you about 100' from the bank. The ability of a buffer to remove pollutants is uncertain if it is narrower than this. A 100' buffer will generally remove 60% or more of pollutants, depending on local conditions. It will also provide food, cover and breeding habitat for many kinds of wildlife but only fulfill a few needs for others, such as travel cover.

Remember, a bigger buffer is needed to do the job if:

- the riverside land is sloped and runoff is directed here
- the land above is sloped (the steeper the slope, the wider a buffer should be)
- land use is intensive (crops, construction, development)
- soils are erodible
- the land is floodplain
- the stream naturally meanders
- the land drains a large area (ratio of drainage area to buffer area is more than 60:1; based on the soil loss factor in the Connecticut River Valley)
- more privacy is desired

Fact sheets in the series *Riparian Buffers for the Connecticut River Watershed*

No. 1 Introduction to Riparian Buffers
No. 2 Backyard Buffers
No. 3 Forestland Buffers
No. 4 Buffers for Habitat
No. 5 Buffers for Agricultural Land
No. 6 Urban Buffers
No. 7 Guidance for Communities
No. 8 Planting Riparian Buffers (& plant list)
No. 9 Field Assessment
No. 10 Sources of Assistance

See also the companion series for land owners:
The Challenge of Erosion in the Connecticut River Valley, Connecticut River Joint Commissions, 1998.

Part of the ***Living with the River*** series. May be reprinted without permission.
Riparian Buffers for the Connecticut River Watershed was prepared by the Connecticut River Joint Commissions of NH & VT with support from the Silvio O. Conte National Fish & Wildlife Refuge Challenge Cost Share Program, PG&E National Energy Group, NH Dept. of Environmental Services, and EPA. Technical assistance was provided by UNH Cooperative Extension Service, USDA Natural Resources Conservation Service, VT Dept. of Environmental Conservation, Connecticut River Conservation District Coalition, Upper Valley Land Trust, Environmental Protection Agency, Appalachian Mountain Club, NH Dept. of Environmental Services, US Fish & Wildlife Service, PG&E National Energy Group, CRJC river commissioners and local river subcommittee members. September 2000

CONNECTICUT RIVER JOINT COMMISSIONS INC

PO Box 1182 • Charlestown NH 03603 • 603-826-4800 • WWW.CRJC.ORG

RIVER BANKS & BUFFERS

Buffers for Habitat

No. 4

for the Connecticut River Watershed

Down by the river exist habitats unlike any other in the Valley. Blanketed against killing cold by shrouds of fog, this riparian region is the last to freeze in the fall and the first to green up in spring. Soils fertilized by spring freshets drink in the moisture that hovers over even the smallest brook. Life is simply richer along rivers and streams.

Stream corridors are prime real estate for birds and other wildlife.

More species of wildlife use the delicate edge between and land and water than any other habitat in Vermont and New Hampshire. Because the riparian zone is a transition between upland and water, it supports plants and animals from both.

This is an area in high demand, however: trout, herons, and turtles face stiff competition from bulldozers, Holsteins, and chainsaws. Landowners who encourage riparian buffers are good hosts to native wildlife.

CONTE NATIONAL FISH & WILDLIFE REFUGE

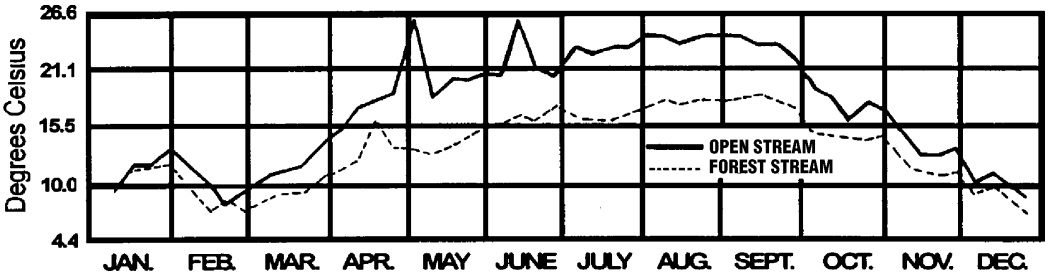
The Connecticut River Watershed's remarkable natural wealth prompted Congress to designate the entire 7.2 million acre basin as the selection area for the Silvio O. Conte National Fish and Wildlife Refuge in 1991. No ordinary refuge, its work depends substantially upon the participation of private property owners in protecting and improving the fish and wildlife habitat under their care. Restoring riparian buffers may be the single most effective means of achieving this goal.

HOW LAND USE AFFECTS AQUATIC HABITAT

Trout and other aquatic life don't always take well to changes on the land around their home. Trading naturally vegetated riparian buffers for open, managed landscapes such as lawns, golf courses, and cropland can harm water quality when chemical pesticides and fertilizers wash into the stream. Some stream life is more tolerant of this pollution than others, but caddis and mayflies, the favorite food of trout, are usually the first to go.

The shade which keeps the water cool also helps it store oxygen. Aquatic weed growth from excess nutrients also reduces oxygen, causing a shift to carp, catfish, suckers, and other rough fish more tolerant of poor oxygen supplies. Sediment eroding off construction sites abrades fish gills and covers spawning areas. The human instinct to tidy up a yard steals the woody debris that provided food and hiding places for fish and their prey.

Weekly Maximum Temperature for Open and Forested Streams



Forested buffers keep streams cool.

BUFFER BENEFITS

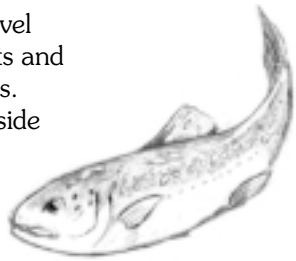
To Life in the Stream

A brook trout is as dependent upon trees as a squirrel.

Keeping a forested buffer along a stream is the single most important thing landowners can do to improve or maintain fish habitat both at home and in the river beyond. Even tiny brooks not big enough to hold trout can benefit, because shade keeps the water cool and rich in oxygen for trout habitat downstream. Small brooks are actually more vulnerable since they have less water to flush pollutants, and since they are shallower, they can dry out, heat up, or freeze more easily.

A good trout stream first needs to be a good insect stream. Insects, the favorite food of trout, are abundant in waters kept cool by streamside forests. Streams flowing through older, more complex forests receive the biggest buffet. Leaves, twigs, and other organic matter from streamside vegetation are both lunch and breeding ground for instream invertebrates which then in turn feed many others in the food chain. This means that a brook trout is as dependent upon trees as a squirrel. Studies show that the wider the buffer, the more kinds of aquatic insects appear on the menu, at least in streams with buffers up to 100' wide.

Woody debris stabilizes the stream, and helps create plunge pools, riffles, and gravel beds. Fallen logs deflect current, exposing more of the rocky substrate used by insects and many fish to lay their eggs, and provide cover for fish to rest and hide from predators. Debris dams keep natural organic litter and food from washing downstream. Streamside forests capture rainfall better than any other kind of land use, and keep groundwater recharged so that their streams don't dry out in summer.



On the Land and in the Air

The Connecticut River and its tributaries conveyed European settlers on their migration into the valley. So it has been every spring with migrating songbirds and waterfowl, who depend upon the early-greening riparian habitat along the larger rivers for food and cover until upland areas are ready to receive them.

Streamside buffers provide wildlife foods, such as seeds, buds, fruits, berries, and nuts, in addition to cover and nesting places. Birds, mammals, and amphibians use streams as travel corridors and breed or hunt along them. Continuous travel corridors for wildlife are key to genetically healthy populations.

Riparian land tends to have an abundance of cavity trees and woody debris that is useful to many kinds of wildlife. Osprey, kingfishers, flycatchers, and other birds use snags along the water as feeding perches. Bats roost under the loose bark of dying trees when they're not out catching insects. The microclimate and moist soils near streams also offer the right conditions for delicate ferns and wildflowers such as water lilies, orchids, and gentians, as well as others less celebrated.

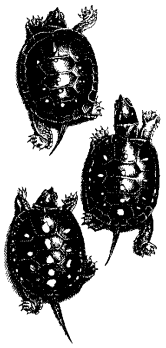
ROUNDUP OF RIPARIAN LIFE

Mammals dependent upon water habitat include mink, muskrat, otter, water shrew, beaver, and moose. Those using mixed upland and lowlands include raccoon and deer. Bats forage on insects above water. All use river corridors as travel routes.

Birds that use rivers for breeding and migrating include shorebirds, ducks, teal, mergansers, grebes and geese, belted kingfishers, osprey (not nesting in the Upper Connecticut River Valley yet but often seen), eagles (nesting as of 2000), herons, bittern, water thrushes, cormorants, and gulls. Woodcock prefer wet meadows as their primary feeding and nesting habitat.

The Connecticut River is a major migration route for many species of songbirds, such as vireos, flycatchers, thrushes, tanagers, and wood warblers, and also larger birds such as northern harrier and peregrine falcons. A recent study of spring bird migration on the Connecticut, Ashuelot, and White rivers by the Silvio O. Conte National Fish & Wildlife Refuge, in partnership with Smith College and the Audubon Society of New Hampshire, found that this is especially true for insect-eating birds early in the season, and on the first leg of their return to NH and VT.

Amphibians and reptiles: salamanders, frogs, turtles, and their kin require water or damp habitats to reproduce and disperse, although many then leave for upland habitats. Much less mobile than birds and mammals, they require unbroken riparian corridors of natural habitat because they may be unable to cross even small areas of unsuitable habitat, such as parking lots. Stormwater catch drains are insidious amphibian traps, and to a salamander whose life history revolves around its river, a granite curb might as well be the Great Wall of China.



Insects: cobblestone tiger beetles, damselflies, butterflies, dragonflies…the parade of insect life in and near rivers and streams is the number one attraction for birds, amphibians, and other creatures of the wild and wet.

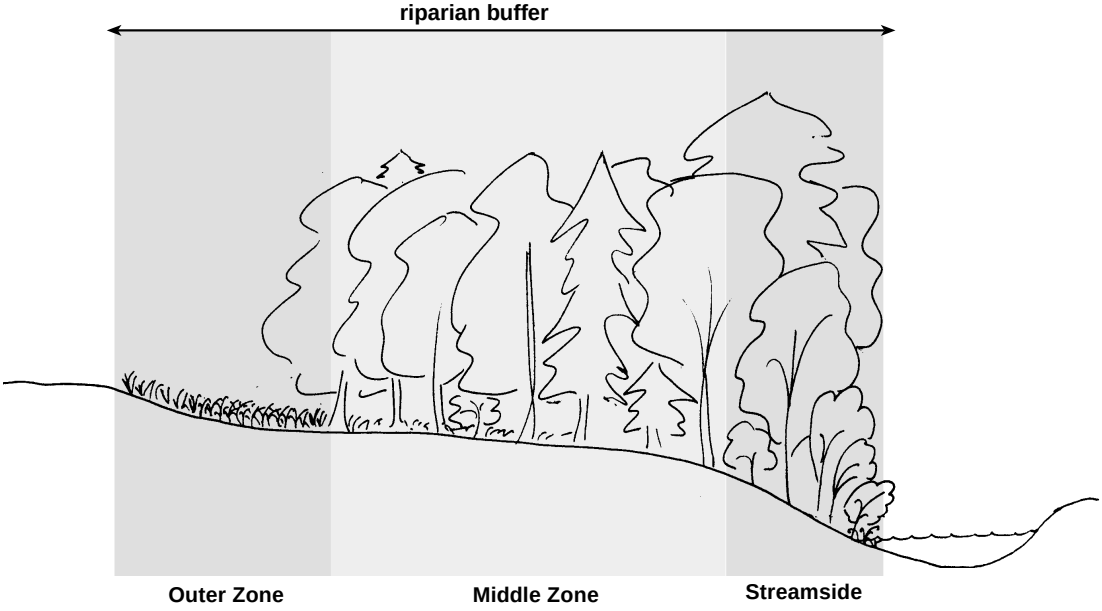
Rare and endangered species: The riparian zone of the Connecticut River Valley is home to a significant concentration of rare, threatened, and endangered plant and animal species. The mainstem from the mouth of the White River to Weathersfield Bow is especially rich, and has caught the attention of biologists who refer to it as the "Connecticut River Rapids Macrosite."

ANATOMY OF A RIPARIAN BUFFER

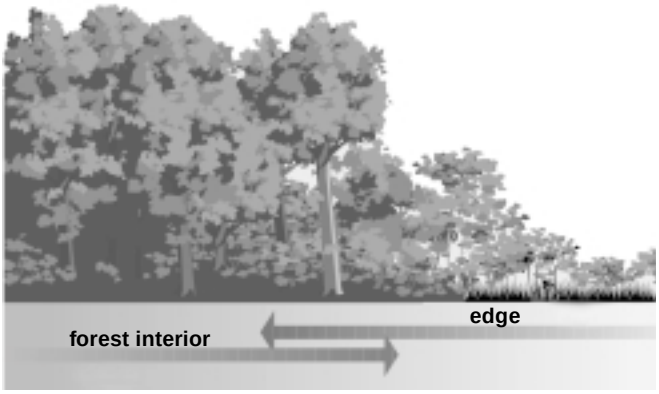
The Three-Zone Buffer System

The most effective buffers for fish and wildlife have three zones:

1. **Streamside**: protects the stream bank from erosion and offers habitat. The best buffer has mature forest for shade and erosion protection. Large shrubs may be a better choice where large trees have collapsed a bank.
2. **Middle Zone**: protects water quality and offers habitat. Slows flow, catches sediment. Width depends on size of stream and the slope and use of nearby land. The best buffer has trees, shrubs, and ground plants, and may allow some clearing for recreational use, depending on the species it is intended to accommodate.
3. **Outer Zone**: yard or woods between the nearest permanent structure and the rest of the buffer; play areas, gardens, compost piles, and other common residential activities are suitable here.



A Word on Width



A buffer that will truly benefit wildlife often means a much larger streamside forested buffer than for water quality purposes alone. A generally accepted minimum width is 300', but it depends upon how much land is available, and what species the landowner hopes to accommodate (see chart below). Narrow buffers are often edge type habitat which can attract disproportionate numbers of predators such as blue jays, crows, raccoons, skunks, foxes, and domestic cats and dogs, as well as parasites like the brown-headed cowbird. However, because small or isolated patches of habitat can be so important to migrating birds, even patches are better than no buffer at all.

Recommended Minimum Buffer Widths for Wildlife

A buffer must not only provide enough room for an animal to take shelter, find food, successfully raise young, and hide from predators, but must also provide the right conditions, such as water that is clean and cool enough, suitable vegetation, and freedom from disturbance the animal cannot tolerate. For instance, while we often observe wildlife such as mink moving along a riverbank, there is more to a mink's life that requires other habitat space. Here are some other examples:

SPECIES	DESIRED WIDTH (in feet)
Wildlife dependent on wetlands or watercourses	**30-600'**
Bald eagle, nesting heron, cavity nesting ducks	600
Pileated woodpecker	450
Beaver, dabbling ducks, mink	300
Bobcat, red fox, fisher, otter, muskrat	330
Amphibians and reptiles	100-330
Belted kingfisher	100-200
Songbirds	**40-660**
Scarlet tanager, American redstart, rufous-sided towhee	660
Brown thrasher, hairy woodpecker, red-eyed vireo	130
Blue jay, black capped chickadee, downy woodpecker	50
Cardinal	40
Cold water fisheries	**100-300**

A GOOD BEGINNING

On small streams, the streamside zone 1 may be all that is needed if the sole purpose is to safeguard aquatic habitat. On larger streams, locate new buffers to connect existing natural patches of vegetation to create corridors. Surround spring seeps, wetlands, brooks, and wet or highly erodible soils with a minimum of 100' of native vegetation. Cross streams with the narrowest possible bridge, rather than a culvert, to present less of a barrier to fish movement. For streams less than 60' wide, measure the width and add or encourage trees on at least the south and west sides which will grow tall enough to shade the stream. On larger rivers, a shaded bank won't have much influence on water temperature, but it can provide cooler cover. Select native plants for the buffer based on requirements of desired wildlife or insects (see No. 8 in this series).

THE BETTER BUFFER

Maintain or restore as much space as possible in an undisturbed, naturally vegetated state. Identify and safeguard natural features valuable to wildlife, such as:

- large dead standing trees (hawks, osprey, and eagles use for nesting and roosting)
- large cavity trees (nesting by owls, wood ducks, hooded mergansers & others)
- large dying trees (bats roost under loose bark)
- seasonal and vernal pools (used by amphibians for breeding)
- understory tangles (cover for many wildlife species)
- large woody debris in streams (basking areas for turtles; cover for fish)
- streambank burrows (homes of weasels, otters, muskrats)
- sandy soils with good sun exposure (used by turtles as nesting areas)
- stone walls and rock piles (snakes and small mammals)
- large trees overhanging the water (flycatchers, kingfishers, osprey, and other birds use for feeding perches)
- large stands of conifer trees (used by deer as wintering areas)
- hollow trees and logs (suitable as dens for some mammals)
- fallen shaded logs (preferred habitat for some salamanders)

BUFFER MANAGEMENT

To aim for maximum wildlife diversity, manage for maximum vegetation diversity. Timber harvesting in zones 2 and 3 is compatible with buffers for habitat, although trees within 25' of the stream should be left undisturbed. Remove large trees on the riverbank only if they threaten to fall and open the bank to erosion; leave the root system intact. Allow natural woody debris to remain in a stream unless it causes flooding. Elsewhere, use small scale harvesting, cutting single trees or small groups. Use long rotations, allowing older, uneven-aged stands to develop. Operate timber harvests in late summer or during frozen ground to minimize disturbance to forest floor and understory vegetation. This also avoids conflicts with wildlife breeding periods (April–June). Locate log landings or haul roads outside the riparian area, or at least 200' from the stream. Exclude vehicles and livestock from the buffer during the nesting season of desired species. For grassland birds, wait to mow until their nesting cycle is complete in July. Encourage runoff to spread rather than enter the buffer as concentrated flow, and remove sediment if it accumulates in zone 3.

Plant diversity means animal diversity

Buffer Plants to Please Everyone

Grouse, engineers, and gardeners agree: grey dogwood—*Cornus racemosa*—is a great choice for the riparian buffer. This native deciduous shrub provides excellent riverbank protection, forming a handsome hedge or barrier, and grows in both wet and dry soils and in sun or part shade. The plant's striking red stems are especially attractive in winter against the snow. Pale flower clusters are followed by distinctive white fruits beloved by grouse, turkey, thrushes, bluebirds, grosbeaks, woodpeckers, vireos, catbirds, and more.

Another native equally valuable around the home and in the buffer is American cranberry bush—*Viburnum trilobum*—an outstanding plant with year-round interest. Showy white flowers in a halo arrangement are followed by scarlet fruits which persist into winter to offer food much appreciated by wildlife when the cupboard is otherwise bare. Its handsome foliage turns deep red and purple in fall. This very hardy deciduous shrub tolerates dry soil or wet feet and grows in sun or part shade. Grouse, pheasant, and small birds use the plant for cover, and bluebirds, finches, thrushes, cedar waxwings, cardinals, flickers, and robins eat the fruit.

For more information on native plants for wildlife, see No. 8 in this series.

FURTHER READING

Buffers for Wetlands and Surface Waters: A Guidebook for NH Municipalities, Chase, Deming, & Latawiec. ASNH, NH Office of State Planning, NRCS, UNH Cooperative Extension, 1997

Stream Buffers in Urban Landscapes, USDA, EPA, Norwalk River Watershed Initiative, Fairfield County Conservation District, CT DEP, Oct 1998

Information provided by the Connecticut River Conservation District Coalition for the Wildlife Habitat Incentives Program (WHIP).

Turtle illustration courtesy of NH author and naturalist David M. Carroll; fish and eagle illustrations courtesy of VT artist Angela Faeth; final drawing by Susan Berry Langsten, NH artist.

Fact sheets in the series *Riparian Buffers for the Connecticut River Watershed*

No. 1 Introduction to Riparian Buffers
No. 2 Backyard Buffers
No. 3 Forestland Buffers
No. 4 Buffers for Habitat
No. 5 Buffers for Agricultural Land
No. 6 Urban Buffers
No. 7 Guidance for Communities
No. 8 Planting Riparian Buffers (& plant list)
No. 9 Field Assessment
No. 10 Sources of Assistance

See also the companion series for land owners:
The Challenge of Erosion in the Connecticut River Valley, Connecticut River Joint Commissions, 1998.

Part of the ***Living with the River*** series. May be reprinted without permission.
Riparian Buffers for the Connecticut River Watershed was prepared by the Connecticut River Joint Commissions of NH & VT with support from the Silvio O. Conte National Fish & Wildlife Refuge Challenge Cost Share Program, PG&E National Energy Group, NH Dept. of Environmental Services, and EPA. Technical assistance was provided by UNH Cooperative Extension Service, USDA Natural Resources Conservation Service, VT Dept. of Environmental Conservation, Connecticut River Conservation District Coalition, Upper Valley Land Trust, Environmental Protection Agency, Appalachian Mountain Club, NH Dept. of Environmental Services, US Fish & Wildlife Service, PG&E National Energy Group, CRJC river commissioners and local river subcommittee members. September 2000

CONNECTICUT RIVER JOINT COMMISSIONS INC

PO Box 1182 • Charlestown NH 03603 • 603-826-4800 • WWW.CRJC.ORG

Wildlife Habitat Within a 30 Meter (100 Ft) Buffer

from *Buffers for Wetlands and Surface Waters, A Guide for New Hampshire Municipalities*
(Chase, et al 1995)

Wildlife species	What 30 meters (100 feet) provides	What 30 meters (100 feet) does not provide
Stream invertebrates and fish	shading, bank stability, organic debris, prevention of siltation & nutrient input	adequate floodwater abatement
Eastern (red-spotted) newt *Notophthalmus v. viridescens*	maintain water quality of wetlands and surface waters	habitat for terrestrial juveniles (efts) - travel for 2-7 year olds
Four-toed salamander *Hemidactylium scutatum*	habitat for breeding (lays eggs near stream edge)	dispersal routes to neighboring wetlands beyond 30 m (100 ft.)
Northern dusky salamander *Desmognathus f. fuscus*	habitat for breeding (lays eggs near stream edge) and most activity	dispersal habitat
Northern 2-lined salamander *Eurycea b. bislineata*	habitat for breeding (lays eggs near stream edge) and most activity	foraging area - adults may wander 100 meters on rainy nights; dispersal of juveniles (only 25% return to natal streams
Green frog *Rana clamitans melanota*	usually stay within 20 m (65 ft.) of water	dispersal habitat
Wood frog *Rana sylvatica*	breeding habitat, if buffer habitat protects ephemeral woodland pools	habitat for most terrestrial activity, often well away from water
Spotted turtle *Clemmys guttata*	shading, large organic debris, streambank stability, protective cover, invertebrate and small vertebrate prey, winter hibernating habitat	habitat for most terrestrial activity - will travel up to 800 m (>2600 ft.) from water to find temporary food sources
Wood turtle *Clemmys insculpta*	see above for spotted turtle; basking habitat in early spring, within 20 m (65 ft.) of water	habitat for most activities; spend most of their time within 328 m (1000 ft) of water, but will travel up to 1.6 km (1 mile) to search for food; nest up to 100 m (330ft) away; hatchlings stay within 426 m (130 ft) of water
Northern water snake *Nerodia s. sipedon*	habitat for most aquatic activities	habitat for dispersal and hibernation

Eastern ribbon snake *Thamnophis s. sauritis*	foraging habitat	may travel several hundred meters from water to mate; hibernate in upland sites
Bats *Myotis & other spp.*	foraging habitat - commonly hunt over open water	roosting sites - prefer to roost within <426 m (1300 ft) of water
Beaver *Castor canadensis*	habitat for aquatic activity, lodge site, some foraging habitat	enough foraging habitat - most foraging within 100 m (330 ft); dispersal routes
Mink *Mustela vison*	most foraging habitat and den sites	hunt up to 1968 m (600 ft) from water,; den sites may be up to 100 m (330 ft) from water
Black Bear *Ursus americanus*	foraging habitat, cover, travel corridors	den sites; enough area for travel - adult males require up to 4921 ha (19 sq. miles) depending on habitat and food sources
Bald eagle *Haliaeetus leucocephalus*	foraging, perching and roosting sites	nest sites - most eagle nests are within 426 m (1300 ft) of shorelines; protection from human disturbance
Red-shouldered hawk *Buteo lineatus*	foraging habitat	nesting sites - this species is found only where buffers are 100 m (330 ft) or more
Area sensitive forest birds	some foraging and nesting habitat; problems characteristic of edge habitat (increased predation and nest parasitism)	sufficient breeding habitat for species that need buffers wider than 100 m (330 ft)

RIVER BANKS & BUFFERS

Urban Buffers

No. 6

for the Connecticut River Watershed

Cities and towns all over America are recapturing their river fronts. Local officials are looking at ways to make responsible, river-friendly use of public lands, to develop public recreation and enjoyment of the waterfront. They may wish to encourage owners of commercial and industrial sites to improve their riverfront property. Such a natural amenity is a key to economic growth and quality of life.

Once America's "best landscaped sewer," the Connecticut River is now not only a recreation magnet, but the heart of a national fish and wildlife refuge.

The Connecticut River and its tributaries, large and small, once provided both the original avenue for settlement of the Valley and power for the towns which grew around them. Somewhere along the way, however, the byproducts of our communities turned these waters into open sewers, and our forebears responded by turning their backs on the river. Although its 11,720 square mile, four-state watershed remains largely rural, sprawling development still threatens the Connecticut River and its tributaries. Now that public and private investment in pollution control has given people rivers to enjoy once again, riverfront lands are needed to do more than ever before: protect the waterway from land-based pollution, and provide a place to recreate.

THE CHALLENGE

Water flowing over parking lots, industrial sites, roads, and lawns picks up heavy metals, toxics, trash, pathogens, sediment, hydrocarbons, fertilizers, pesticides, and other pollutants. Removal of streamside vegetation for land development and rip-rap has reduced the natural ability of streams to cleanse themselves.

Development, particularly in narrow side valleys, has brought traffic close to water, with longer lasting effects on riparian areas than any other type of disturbance. Roadside snowbanks can be stockpiles of such pollutants as petroleum byproducts, salt, metals, and anti-skid grits, which can get into streams.

Development also typically increases the amount of impervious or compacted surfaces such as roofs, roads, sidewalks, and parking lots. The result is cumulative changes in the dynamics of nearby streams. Since rainwater cannot penetrate such surfaces, it runs off, reaching the stream faster than it would naturally, increasing flood hazard and making streambanks unstable.

Runoff from impervious surfaces can turn that tame little backyard stream into a land-eating monster.

That tame little backyard stream suddenly turns into a raging torrent on a regular basis, nearly drying up in between. Too often, this prompts city officials to look at structural attempts at flood control, such as confining waterways into narrow constructed channels, which actually worsens future flooding downstream, relocates flooding from one place to another, and risks greater destruction when the river breaks through such defenses.

A BUFFER IS THE ANSWER

A riparian buffer can offset the effects of development, serve public health, and bring beauty—and pleasure—back to the riverfront.

Protects Public Water Supplies

Many communities take their drinking water directly out of rivers, as Woodsville, NH, does from the Ammonoosuc River. Others depend upon public and private wells drawing from stratified drift aquifers near rivers. These wells can actually be contaminated by

pollutants from parking lots, lawns, or agricultural chemicals in rivers 1000 feet away. Nature has provided a very efficient, low-cost and low-maintenance water treatment system in the form of natural riparian vegetation. Keeping streamside land naturally vegetated is a far more effective and less expensive way to safeguard drinking water over the long term than building elaborate facilities to treat polluted water. Forests are especially good at both cleansing runoff and stowing this water in aquifers. Clearing a forest for development reduces by 33-67% the water infiltrating the soil to become groundwater than if the forest, with its root network and more porous soils, had been left in place.

Protects Property

Streamside land is a high risk area for development even above flood elevation. Public and private investments in property risk damage or loss if stream dynamics are ignored. Using vegetated buffers to set back human developments and land uses from shorelines is cost effective protection against the hazards caused by flooding, shoreline erosion and moving streams. Sheet No. 7 in this series offers guidance for town officials and developers on various ways to promote buffers.

Provides Community Value

Disguise riparian buffers as riverside parks.

Disguised as riverfront parks, riparian buffers can host a range of activities with economic and educational value to the community. Welcome the public to hike or bike, walk or run on trails, or try their luck in fishing tournaments. Excursion boats, water parades, canoeing or kayaking races, and rowing regattas can launch on larger rivers. Riverside festivals and concerts have a special appeal. Forested buffers are good locations for ropes adventure courses, orienteering competitions, or marathons. Public gardens offer pleasant passive recreation. People will notice that a forested buffer/park is especially enjoyable because it reduces noise from nearby roads, development and industry, and offers a cool, shaded place for a picnic with a view. In winter, the riparian buffer offers space for snowshoeing, cross-country skiing, and ice skating.

Riparian forests in heavily developed areas may be the refuge of last resort for a variety of birds and other animals, and offer the best birdwatching in town. A buffer is a good place for river-related school studies and adult workshops in natural history.

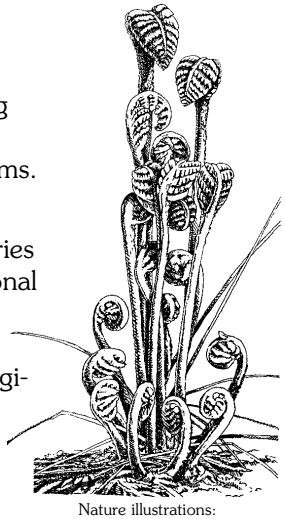
By making riparian buffers people-friendly places, smart communities gather allies for river protection and encourage citizen participation. Citizen groups can develop a feeling of ownership that translates into monitoring, volunteer labor, and a welcome source of stewardship for town property. Corporate citizens owning riverfront property can contribute to the quality of life for their employees and the community at large.

Supports Stream Life

The quality of life in a stream goes distinctly downhill when its watershed reaches 10-15% of impervious cover. Above 25% impervious cover, it can no longer support aquatic life. Heavy metals, common in runoff from urbanized areas, accumulate in fish tissues, threatening fish health as well as those who eat them. However, streams flowing through urbanized areas with intact streamside forests have healthier aquatic life than those that do not. Microbes in forest soil can convert some pollutants into less toxic forms.

Protects Historic and Archeological Resources

To the Valley's native people, rivers provided food and served as transportation arteries and geographic markers. The remains of villages, hunting and fishing camps, and seasonal activity sites are commonly discovered near the water's edge. The Connecticut River's tributaries later provided access into the interiors of Vermont and New Hampshire for 18th century Euro-Americans. Vegetated, stable streambanks help to preserve archeological and historic sites from erosion and other disturbance.



Nature illustrations:
David M. Carroll

GETTING STARTED

Urban situations confront planners, property owners, and city officials with more space and zoning constraints than in more rural areas. Check local zoning and master plan provisions for shoreline setbacks. Perform a visual analysis of existing buffers to see where to focus municipal effort, and perhaps financial incentives, to restore missing buffers.

Limit encroachments through site planning by setting back permanent structures, roads, and paved paths as far as possible, where streamside vegetation exists or could be restored. Avoid creating new bridge, sewer, or utility crossings except where there is no reasonable alternative. Check culverts to ensure that they can handle a 100-year storm and offer fish passage. Arch, or other "bottomless" culverts allow the best fish movement.

A buffer is a river's right-of-way.

For an Unstable Riverbank

Deal with an eroding riverbank first before restoring its buffer. Urban riverbanks often show evidence of past abuse and will benefit from the advice of a trained specialist. Consult *The Challenge of Erosion in the Connecticut River Watershed*, published by the Connecticut River Joint Commissions. Structural solutions, such as rip-rap and retaining walls, are as hard on the river and buffer as they are on the eye. Use them only on the lower portion of the vertical profile to the extent necessary, and only when bio-engineering techniques may not be adequate to prevent significant losses of land and property.

Rip-rap usually results in buffer destruction and can trigger new erosion.

Where Natural Vegetation Exists

Discourage the cutting of existing trees and other vegetation on stream banks. Plans to cut selected trees near the bank or shoreline for views and recreational access should ensure that a canopy is maintained. Maintain the duff layer to the greatest extent possible, and leave stumps with their roots intact to help hold the bank in place. Convert runoff to sheet flow by regrading or using landscape timbers, stone, or other structural devices.

Where Natural Vegetation Has Been Removed

Revegetate streamsides as well as rock rip-rapped areas with native shrubs, trees and grasses on as much of the vertical profile as possible. To avoid raising water temperature live stakes can be driven into joints of rip-rap where they will sprout, shrouding and shading the stone. Vines can also help here. Where native streamside vegetation is gone but soil remains, change mowing and cutting practices to allow gradual natural succession of native plants. Better yet, plant groups of attractive native shrubs and trees to hasten buffer restoration. Since the urban buffer forms the boundary between the natural and man-made worlds, the most successful planting design aims for an unmanicured look. Check the plant list in this series for native plants with ornamental value or those that attract birds, butterflies, or other desirable wildlife. Set them in irregular groups of odd numbers of plants for a naturalistic effect. Where riparian land has been paved, communities such as Hartford, CT, are reversing this all too common riverbank treatment by relocating roads, removing pavement, and restoring vegetation.

Showcase native Connecticut River Valley plants.

DEALING WITH URBAN STORMWATER

Riparian buffers can do only part of the job when there's a man-made stormwater transport system in the picture. An urban buffer's ability to treat stormwater depends on how much the flow has become channelized before it enters, and how long it is detained in the buffer. If a buffer receives stormwater directly from impervious areas, use flow-spreading devices such as multiple curb cuts or spacers to distribute flow. Buffers are useful wherever runoff heads toward a river, such as around storm drains, detention ponds, and drainage ditches.

Where a river front has already been developed and vegetated buffers cannot be restored, turn to structural technology, such as detention ponds, infiltration systems, and commercially available stormwater treatment systems. These may be required if the watershed has a high percentage of impervious surface, since its stream may produce more sediment-laden runoff than a buffer can effectively handle. Note that some urban pollutants pass through a buffer unchanged: salt, heavy metals such as cobalt, lead, and mercury are not removed by natural buffer processes.

The choice to place a stormwater detention pond within a buffer depends upon the relative impacts and performance potential. Ponds can contribute to stream warming, but can also lend habitat diversity to the buffer. Limit such ponds to the outer or middle zones, and avoid placing them where they could threaten bank stability or where groundwater lies close to the surface—the pond could recharge the aquifer with dissolved pollutants.

PLAN FOR RECREATIONAL USE

Guide river access by establishing well defined trails and paths to help keep the streambank stable. Use marker posts, boulders, signs, and fences to direct traffic by people and equipment. Design trails to run across rather than down slope, to avoid creating runoff problems and erosion. A common mistake is to run a bike path right next to a river, which can result in an open swath rather than a closed tree canopy. Instead, locate bike paths at a slight distance, with spurs to the river. Designate sensitive areas, especially steep slopes, for low impact use rather than high impact activities such as off road vehicles, biking, or horseback riding. Restrict access where vegetation is not fully established or is of a rare type. If problems arise, discuss trail closures, tree cutting, or other decisions with interested citizen groups in advance. In high use areas, select structurally reinforced turf systems rather than an impervious surface. Encourage pet owners to avoid walking their dogs in areas where pet droppings could wash off into the stream, and remind them to pick up after their pets. To protect public safety, plant low, deciduous shrubs or ground covers and prune tree branches to 8' above the ground along walkways. Provide carefully selected illumination to avoid over-lighting the landscape.

MANAGING A RIPARIAN BUFFER

Inspect the buffer regularly and remove accumulated sediments in the outer grass zone. Exclude dumping, filling, and construction machinery from the buffer to protect damage to soils and vegetation. Caution road crews to avoid mowing riparian buffers where roadways abut waterways. Mowing of the outer grass buffer, however, is important for vigorous sod growth and helps remove the nutrients and pollutants it has captured. Raking leaves, clearing brush, and removing fallen logs can significantly reduce the time that runoff is detained and cleaned by the buffer. If the public demands it, restrict such tidying up to highly visible areas, and screen the view of the rest with ferns and low growing shrubs.

Reduce water and maintenance needs by mulching with shredded bark, leaf mulch or bark chips. Cedar and redwood bark are not recommended because their chemistry interferes with buffer function. While fresh wood chips are often available from highway crews, they should be composted for six months to avoid introducing disease and other troubles. Use only lime or wood ash to fertilize near a stream, and avoid pesticides.

Cut only trees that threaten to pull the riverbank with them if they fall, but leave their root systems in place to hold the bank. Remove a tree snag from a stream channel only when it clearly presents a flood hazard. Identify and control invasive exotic plants—they can quickly spread and overrun less aggressive native plants. Educate the public about the value and function of the buffer through signage, meetings with homeowner associations, and field demonstrations, to help prevent encroachment.

KNOW STATE AND LOCAL REGULATIONS

Prevent encroachment through public education.

Since riparian buffers are among the best ways to protect the quality of rivers and streams, state and many local authorities have taken steps to protect them. In both Vermont and New Hampshire, septic systems must be set back 75' from rivers and streams, and most municipalities have setbacks for structures. Some require buffers of a standard width, and others prescribe a range and assign a width appropriate to the site.

In New Hampshire, the Comprehensive Shoreland Protection Act (RSA 483-B) protects existing natural woodland buffers within 150' of the public boundary line on all 4th order streams, including lower portions of the Ashuelot, Ammonoosuc, Cold, Gale, Israel, Mascoma, Mohawk, Sugar, Little Sugar, and Upper Ammonoosuc rivers, and Mink, Partridge, and Stocker brooks. On these waterways not more than 50% of the basal area of trees and a maximum of 50% of the total number of saplings can be removed in a 20-year period. A healthy, well-distributed stand of trees, saplings, shrubs, and ground covers and their living, undamaged root systems shall be left in place. While the Connecticut River mainstem was exempt from this law at the time of printing, the law may apply in the future.

In Vermont, the Agency of Natural Resources has adopted a Buffer Procedure pursuant to 3 V.S.A. § 835 which is not a rule or regulation, but may be used as guidance in conditioning permits.

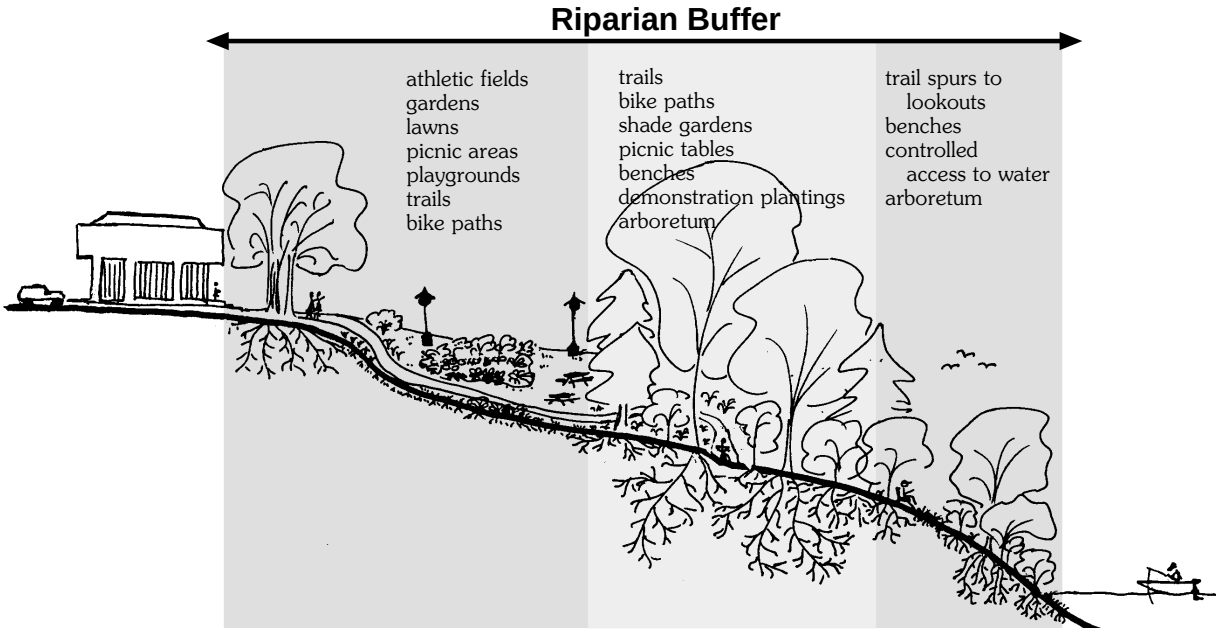
ANATOMY OF A BUFFER

Use the description below as a general guide which can be altered to fit the available space between the river and the built environment. While it is never in the best long-term interest of either the public or the landowner to sacrifice an existing riparian buffer for development next to a river or stream, even a 50' buffer is better than no buffer at all. For more on buffer width, see *Introduction to Riparian Buffers*, No. 1 in this series.

Three Zone Buffer System

The most effective urban buffers have three zones.

- **streamside**: to top of bank for erosion control, shade, visual screen, noise control
- **middle zone**: inland from top of bank; to capture pollutants and recharge groundwater; width should ideally reflect size of stream, extent of 100 year flood plain, and adjacent steep slopes; the goal is a mature woodland, with some clearing for recreational uses
- **outer zone**: between the rest of the buffer and the nearest permanent structure; to capture sediment and absorb runoff; open, unpaved space (turf or lawn); playing fields, gardens, playgrounds, and other common community activities are suitable



THE BETTER BUFFER

Naturally vegetated streamside forests are the best possible use of land when it comes to water quality, land and water recreation, and wildlife habitat. While available open space near waterways is often limited in heavily developed areas, encourage the widest possible forested buffer wherever space permits. The longer runoff is detained in the buffer before entering the stream, the better.

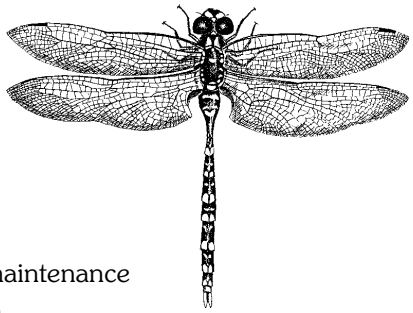
Plant labeled demonstration gardens of native tree, shrub, and herbaceous species for public education and enjoyment, such as a garden of plants valuable to wildlife. Add buffers (disguised perhaps as shrub borders, or flower beds surrounded by filtering grass) between paved areas and storm drains or ditches.

WHAT ABOUT COSTS?

It's hard to put a dollar figure on the value of watching migrating songbirds or the quality of life provided by a public waterfront park. The following list describes some of the costs and benefits involved in adding a buffer in an urban setting.

Costs

- grass or wildflower seed
- correction of compacted soil or other soil problems
- plant material: use cuttings or bare root plants from a native source; nursery grown plants are more expensive but more reliable
- mulch, if not provided by highway crews and composted in advance
- labor in planting, pruning, mowing, sediment removal
- signage and fencing to guide public use if appropriate
- monitoring for signs of erosion and plant damage
- cost of administering buffer program
- land acquisition (if applicable)



Benefits

- reduced costs for mowing and maintaining open fields
- reduced costs for fertilizer, pesticides, herbicides, fuel, equipment maintenance
- avoided costs of engineering design, permits, and bank stabilization
- public land: recreation area and activities within buffer and along waterfront
- cleaner, safer, more attractive water for recreation
- safer, more reliable drinking water from public water supplies
- averted costs of building drinking water treatment system
- flood protection
- improved ambient air temperature and quality in summer
- visual screen and noise buffer between land and water
- preserve important habitat
- better fishing
- increased property values

Further Reading

A Guide to Developing and Re-Developing Shoreland Property in New Hampshire, North Country Resource Conservation & Development Area. 1999

Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in NH. 1992

BMPs for Erosion Control During Trail Maintenance and Construction, NH Department of Resources & Economic Development. 1994

Fact sheets in the series *Riparian Buffers for the Connecticut River Watershed*

No. 1 Introduction to Riparian Buffers
No. 2 Backyard Buffers
No. 3 Forestland Buffers
No. 4 Buffers for Habitat
No. 5 Buffers for Agricultural Land
No. 6 Urban Buffers
No. 7 Guidance for Communities
No. 8 Planting Riparian Buffers (& plant list)
No. 9 Field Assessment
No. 10 Sources of Assistance

See also the companion series for land owners:
The Challenge of Erosion in the Connecticut River Valley, Connecticut River Joint Commissions, 1998.

Part of the ***Living with the River*** series. May be reprinted without permission.
Riparian Buffers for the Connecticut River Watershed was prepared by the Connecticut River Joint Commissions of NH & VT with support from the Silvio O. Conte National Fish & Wildlife Refuge Challenge Cost Share Program, PG&E National Energy Group, NH Dept. of Environmental Services, and EPA. Technical assistance was provided by UNH Cooperative Extension Service, USDA Natural Resources Conservation Service, VT Dept. of Environmental Conservation, Connecticut River Conservation District Coalition, Upper Valley Land Trust, Environmental Protection Agency, Appalachian Mountain Club, NH Dept. of Environmental Services, US Fish & Wildlife Service, PG&E National Energy Group, CRJC river commissioners and local river subcommittee members. September 2000

CONNECTICUT RIVER JOINT COMMISSIONS INC

PO Box 1182 • Charlestown NH 03603 • 603-826-4800 • WWW.CRJC.ORG

Availability of Groundwater Resources in Southeastern New Hampshire

Project Update: Fall, 2004

This newsletter is the first of a new quarterly series intended to keep you informed of our progress. If you have any questions about the project, please contact:

Lindsay Anderson
New Hampshire Coastal Program
landerson@des.state.nh.us
603-559-0026

The proximity of the seacoast region in Southeastern New Hampshire to metropolitan Boston has led to a 36-percent population increase over the past 20 years. This population increase, and associated development, has been accompanied by an estimated 50-percent increase in the use of ground- and surface-water resources for drinking, industrial, and other purposes during the same period. Ensuring the sustainability of water resources into the future will require quantification of water storage and movement in surface- and groundwater systems and a thorough understanding of past, current, and future water demands. To gain a better understanding of these processes, the participants of the seacoast groundwater availability project are working on a 3-year multi-disciplinary project.

Federal and State participants of this project are the U.S. Geological Survey, New Hampshire Coastal Program, and the New Hampshire Department of Environmental Services, (which includes New Hampshire Geological Survey and New Hampshire Water Supply Engineering Bureau). In addition, seacoast communities have contributed substantial resources to the project. Finally, the Groundwater Project Advisory team, made up of water-resource consultants, water suppliers, and planners in southeastern New Hampshire, has contributed their time and knowledge to this undertaking.

New Hampshire Geological Survey

Groundwater Database

The New Hampshire Geological Survey (NHGS) has created a comprehensive database (GeoLogs) of subsurface hydrogeologic conditions. The database currently contains approximately 10,500 locations where exploratory soil borings and/or monitoring wells have been drilled. Parameters collected at the stations include local groundwater levels, soil type, and possibly bedrock types, aquifer properties, and geologic setting properties. Each station is geographically referenced to allow for inclusion in a Geographic Information System (GIS) for future analyses. The analyses will likely include estimation of regional groundwater recharge, identification of groundwater occurrence, and potentially aid in the construction of a regional water flow model.

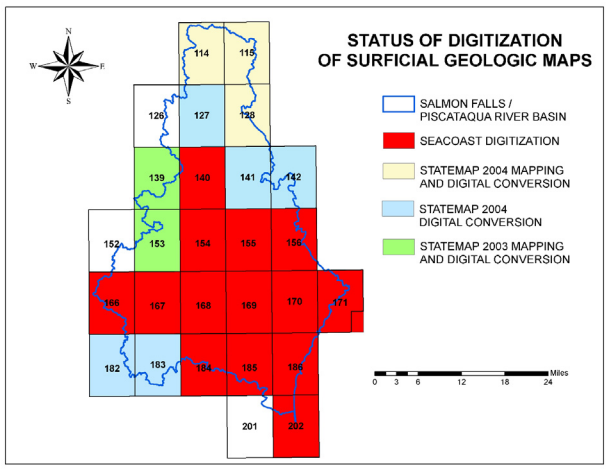
NHGS has been using a desktop GIS method to locate water wells reported by drilling contractors as part of the state's water well inventory program. Nearly 2,400 wells have been located so far in the project area with this method. Although the hydrogeologic data still contained in the well reports is not as detailed as that being compiled in the GeoLogs database described above, it provides valuable insight into subsurface hydrogeologic conditions.

Surficial Geology Map

NHGS has been converting surficial geologic quadrangle maps of the seacoast area to a digital form in order to create a seamless data layer in GIS (map below). Maps for 12 full quadrangles and 2 partial quadrangles have been converted to date. The information in the data layer will provide insight into the distribution and thickness of surficial geologic materials, helping communities to better understand and protect their groundwater resources as they plan for future development. The data layer will be available for download from the GRANIT system at the University of New Hampshire within a few weeks at: *http://www.granit.sr.unh.edu*. An official announcement will be forthcoming.

Regional Recharge Map

NHGS has also begun researching techniques to estimate how much water recharges the aquifers in the entire seacoast area. These techniques will incorporate data from the GeoLogs database, surficial maps and hydrometeorologic datasets. The final recharge analyses will be a resource for future planning and development in the Seacoast Region.



US Geological Survey

Groundwater Model

A groundwater flow model is being developed to quantify groundwater resources in the seacoast. The model covers a 120-mi^2 area east of Great Bay from Seabrook to Portsmouth, and incorporates data from NHGS data collection efforts, USGS hydrologic studies, and other investigations. The model will also use the results of the seacoast water-use analysis to estimate the impact of population growth on future water resources in the model area. For more information about the USGS groundwater flow model see: *http://nh.water.usgs.gov/CurrentProjects/seacoast/gw_model.htm*.

Streamflow Data Collection

The USGS will soon be completing more than a year of continuous streamflow data collection at 6 gaging stations in the groundwater flow model area. During periods of low rainfall most streamflow is composed of discharge from groundwater storage, known as base flow. These data can help determine the aquifer storage and are used in model calibration. The USGS is currently watching for a "low" rainfall period in which to measure additional streams and groundwater levels for a one-time regional measurement. At that time the USGS will be contacting local water suppliers and others who maintain water-level networks for assistance in measuring their networks during this sampling event.

For the purpose of this project 4 new long-term streamflow gages have been installed and are online for data collection. These gages are located at: Winnicut River in Greenland, Isinglass River in Dover, North River in Lee, and Hampton Falls River in Seabrook.

In addition to the long-term streamflow gages, one year of data to be used in calibrating the pilot groundwater flow model has been collected from five short-term streamflow gages. Although these gaging stations are scheduled to be removed this fall, one community is funding continued monitoring of one gage. For more information about streamflow monitoring and how to support continued streamflow gaging, see: *http://nh.water.usgs.gov/CurrentProjects/seacoast/monitor.htm*.

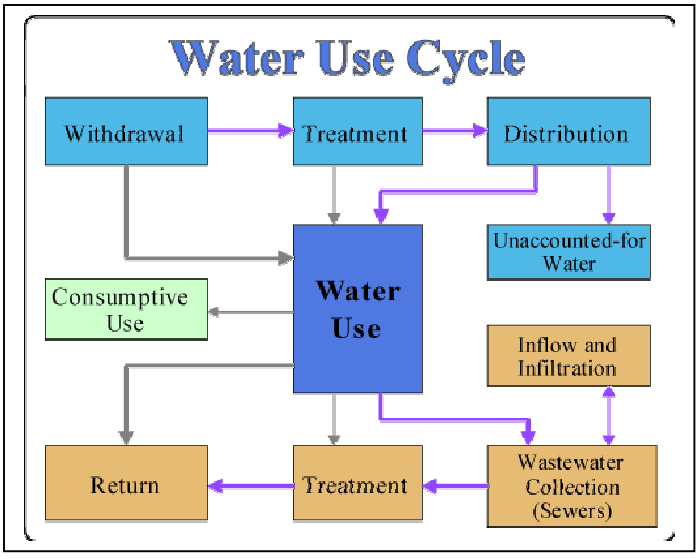
Preliminary simulations using the groundwater flow model were presented by the USGS at the National Groundwater Association Fractured Rock conference recently in Portland, Maine. This presentation discussed the effects of regional geology and fracture zones on groundwater flow to wells.

Water Use

In order to determine if homes with metered water use water differently than homes with well water, the USGS asked students and their families from 15 Seacoast Middle Schools in 27 seacoast towns to record home water-use data. Because the data collection was so successful, these data are still in the process of being analyzed. In addition to the primary purpose of determining water use in metered versus well homes, the data that the schools have collected are an integral part of the USGS' water-use model, and have allowed the USGS to capture attitudes about water-use conservation, including seacoast citizens' awareness of water use. Please see the water-use middle school project Web site for more information at: *http://nh.water.usgs.gov/CurrentProjects/seacoast/ed_packet.htm.*

A water-use model of the metered homes in the town of Raymond has been completed and the USGS is in the process of calibrating the Raymond model with census data and home meter readings. An example of a town's water-use model will be available soon at: *http://nh.water.usgs.gov/CurrentProjects/seacoast.*

Finally, USGS is also working to update a water supply and sewer line flow chart for the entire watershed.



***For more information*: An overview of the project can be found at:**
http://nh.water.usgs.gov/CurrentProjects/seacoast

CHALLENGE:
Planning for Future Storms

As New Hampshire recovers from the ice storm damage, there are a number of lessons that may be learned to minimize the damage that is possible during the next heavy ice and snow storm:

- Have overhanging branches and limbs safely cleared from the vicinity of power lines by qualified people.
- Maintain vegetation around a residence in such a manner that it will not damage the structure or take down power lines if subjected to heavy snow and ice.
- Proper pruning guides are available from your local county **UNH Cooperative Extension Office.**
- Clear storm debris in the immediate vicinity of culverts and abutments to prevent flow diversion, damming and flooding.
- Elsewhere, consider leaving woody debris in streams to create important habitat for stream organisms.
- Clear storm debris around your home and road frontage for fire safety.
- Conduct all operations in a low impact, environmentally responsible manner.

MORE INFORMATION

N.H. Department of Environmental Services

- **Air Resources Division** 271-1370
- **Waste Management Division** 271-2900
- **Water Division**
  - Wetlands Bureau 271-2147
  - Shoreland Protection 271-7109

in partnership with

N.H. Office of Emergency Management 271-2231

Federal Emergency Management Agency

N.H. Department of Resources and Economic Development

- **Division of Forests and Lands** 271-2214
- **UNH Cooperative Extension Offices** 271-2214

1998

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

DEPARTMENT OF RESOURCES & ECONOMIC DEVELOPMENT NEW HAMPSHIRE FORESTS & LANDS

STATE OF NEW HAMPSHIRE EMERGENCY MANAGEMENT

Storm Damage Cleanup

Tips for Town Officials and Landowners

PROBLEM: Storm Damage

An ice storm hit New Hampshire and northern New England during January 7-16, 1998 and caused damage to trees, power lines and transportation routes. One hundred and forty New Hampshire towns sustained enough damage to require disaster assistance.

The full scope of damage from this storm is becoming evident as snow melts and downed trees, limbs and branches are exposed. Large quantities of storm debris will require disposal during spring cleanup. Each municipality will decide on recovery according to the extent of damages and local resources available.

This brochure will assist residents and town officials in the clean-up effort. It outlines steps that can be taken to best manage the large quantities of debris in an environmentally responsible manner.

ANSWER: Remedial Options

It is anticipated that trees, branches and limbs brought down by the storm will make up the bulk of the material. The following options are available:

Chipping

- Landowners may chip on their property and dispose of the chips on the ground or by transporting off-site.
- Chips should not be placed into wetlands, watercourses or drainages.

Burial

- Landowners may bury trees, branches, limbs and chips on their property with certain restrictions.
- Contact DES's Waste Management Division.

Piling

- Brush may be temporarily piled or stacked adjacent to roadways where there will be public removal.
- Check with your town road agent.

Burning

- On-site burning is the least preferable option.
- Landowners may burn only trees and branches up to 5 inches in diameter with a written permit from their local fire official.
- If trees or branches exceed 5 inches in diameter, please call DES's Air Resources Division.

Town Managed Sites

- In areas with extensive damage, towns may set up sites for short-term active management of storm debris.
- Active management includes debris collection and sorting, firewood processing, chipping and open burning.
- Chipping is preferred to burning because it results in a reusable product.
- Burning of material is restricted to less than 5 inches in diameter.
- A written permit from the local fire official is required.
- Above-ground active management sites do not require DES permits.
- However, requests to burn material larger than 5 inches in diameter must be submitted to DES's Air Resources Division.

Removal from Streams and Near Lakes and Ponds

- Removal of trees and branches from streams is allowed without a DES permit provided such removal does not require utilization of tracked or wheeled vehicles in the stream.
- Work may be conducted in streams using cables and winches. Call DES's Wetlands Bureau.
- For work within the 150-foot protected shoreland zones around lakes and ponds, consult with DES for specific restrictions on cutting trees and removing stumps.

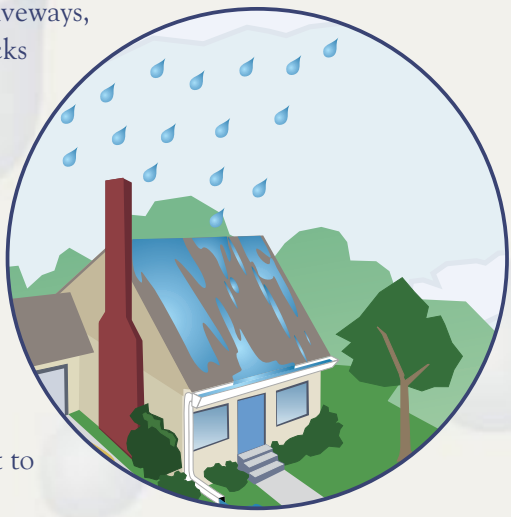
Embedded Secure Document

The file *http://ceinfo.unh.edu/Pubs/PubsSG/shoreland.pdf* is a secure document that has been embedded in this document. Double click the pushpin to view.

Click on the Red Pin to read the "Protecting and Enhancing Shorelands for Wildlife" by the University of New Hampshire Cooperative Exension Service.

"Landscaping with Native Plants" can be found at www.nh.nrcs.usda.gov/features/ Backyard_Conservation/native.html

As stormwater flows over driveways, lawns, and sidewalks, it picks up debris, chemicals, dirt, and other pollutants. Stormwater can flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water. Polluted runoff is the nation's greatest threat to clean water.



By practicing healthy household habits, homeowners can keep common pollutants like pesticides, pet waste, grass clippings, and automotive fluids off the ground and out of stormwater. Adopt these healthy household habits and help protect lakes, streams, rivers, wetlands, and coastal waters. Remember to share the habits with your neighbors!

Healthy Household Habits for Clean Water

Vehicle and Garage

- Use a commercial car wash or wash your car on a lawn or other unpaved surface to **minimize** the amount of dirty, soapy water flowing into the storm drain and eventually into your local waterbody.

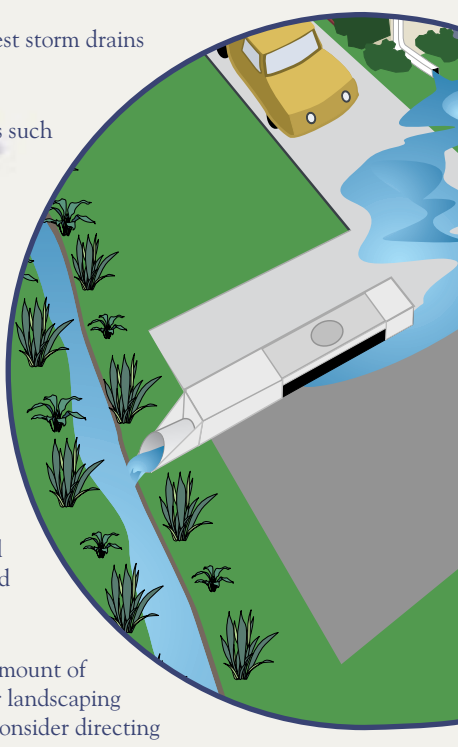
- Check your car, boat, motorcycle, and other machinery and equipment for leaks and spills. Make repairs as soon as possible. Clean up **spilled fluids** with an absorbent material like kitty litter or sand, and don't rinse the spills into a nearby storm drain. Remember to properly dispose of the absorbent material.
- **Recycle** used oil and other automotive fluids at participating service stations. Don't dump these chemicals down the storm drain or dispose of them in your trash.

Lawn and Garden

- Use pesticides and fertilizers **sparingly**. When use is necessary, use these chemicals in the recommended amounts. Avoid application if the forecast calls for rain; otherwise, chemicals will be washed into your local stream.
- Select **native** plants and grasses that are drought- and pest-resistant. Native plants require less water, fertilizer, and pesticides.
- **Sweep up** yard debris, rather than hosing down areas. Compost or recycle yard waste when possible.
- Don't overwater your lawn. Water during the **cool** times of the day, and don't let water run off into the storm drain.
- Cover piles of dirt and mulch being used in landscaping projects to prevent these pollutants from blowing or washing off your yard and into local waterbodies. **Vegetate** bare spots in your yard to prevent soil erosion.

Home Repair and Improvement

- Before beginning an outdoor project, locate the nearest storm drains and **protect** them from debris and other materials.
- **Sweep up** and properly dispose of construction debris such as concrete and mortar.
- Use hazardous substances like paints, solvents, and cleaners in the **smallest amounts possible**, and follow the directions on the label. Clean up spills **immediately**, and dispose of the waste safely. Store substances properly to avoid leaks and spills.
- Purchase and use **nontoxic**, **biodegradable**, **recycled**, and **recyclable** products whenever possible.
- **Clean** paint brushes in a sink, not outdoors. Filter and reuse paint thinner when using oil-based paints. Properly dispose of excess paints through a household hazardous waste collection program, or donate unused paint to local organizations.



- **Reduce** the amount of paved area and increase the amount of vegetated area in your yard. Use native plants in your landscaping to reduce the need for watering during dry periods. Consider directing downspouts away from paved surfaces onto lawns and other measures to increase infiltration and reduce polluted runoff.

Pet Care

- When walking your pet, remember to **pick up** the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Swimming Pool and Spa

- **Drain** your swimming pool only when a test kit does not detect chlorine levels.
- Whenever possible, drain your pool or spa into the **sanitary** sewer system.
- Properly store pool and spa chemicals to **prevent** leaks and spills, preferably in a covered area to avoid exposure to stormwater.

Septic System Use and Maintenance

- Have your septic system **inspected** by a professional at least every 3 years, and have the septic tank **pumped** as necessary (usually every 3 to 5 years).
- Care for the septic system drainfield by **not** driving or parking vehicles on it. Plant only grass over and near the drainfield to avoid damage from roots.
- Flush responsibly. Flushing household chemicals like paint, pesticides, oil, and antifreeze can **destroy** the biological treatment taking place in the system. Other items, such as diapers, paper towels, and cat litter, can **clog** the septic system and potentially damage components.

Storm drains connect to waterbodies!

Internet Address (URL) • HTTP://www.epa.gov
Recycled/Recyclable • Printed With Vegetable Oil Based Inks on 100% Postconsumer, Process Chlorine Free Recycled Paper

EPA 833-B-03-003
January 2003

THE YEAR OF CLEAN WATER
Celebrate • Rejuvenate!

Remember: Only rain down the drain!

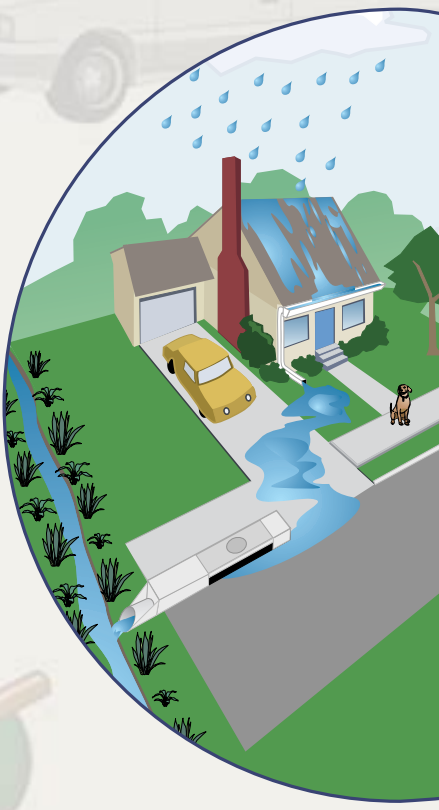
For more information, visit
www.epa.gov/npdes/stormwater
or
www.epa.gov/nps

Make your home

The

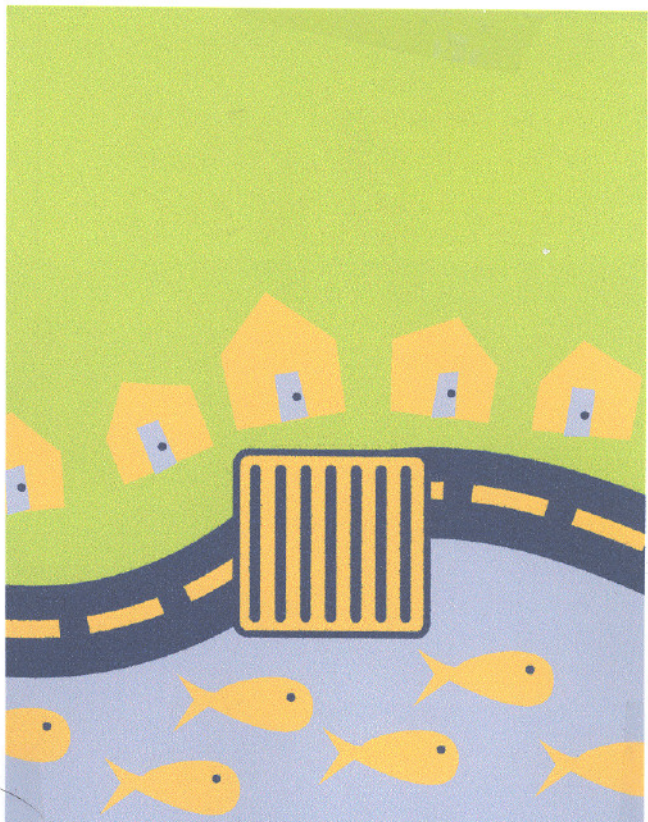
SOLUTION TO STORMWATER POLLUTION!

A homeowner's guide to healthy habits for clean water



EPA United States Environmental Protection Agency

Appendix C: Public Education and Outreach Materials



JOIN THE EXETER CLEAN WATER CAMPAIGN!

10 THINGS YOU CAN DO

1 **COMPOST YARD WASTE**
The Transfer Station accepts leaves and grass clippings and the town provides a one-time leaf collection at curbside in the fall. See "What's New" at town website: www.exeternh.org.

2 **USE FERTILIZERS SPARINGLY** and avoid pesticides.

3 **DIRECT DOWNSPOUTS AWAY** from paved surfaces.

4 **CHECK AUTOMOBILES FOR LEAKS** and fix them as soon as possible.

5 **RECYCLE MOTOR OIL**
Transfer station accepts motor oil. For hours, see "General Info." at town website: www.exeternh.org.

6 **TAKE YOUR CAR TO A CAR WASHING FACILITY** or wash it on a grassy or gravel surface.

7 **PICK UP AFTER YOUR PET**

8 **REPORT ILLEGAL DUMPING**
Bulk pick-up at curb is offered each spring & fall. See "What's New" at town website: www.exeternh.org.

9 **TAKE UNWANTED HOUSEHOLD CHEMICALS** to the Household Hazardous Waste Collection, First Saturday in October.

10 **DO NOT LITTER...** and *never* pour or dump anything down the storm drain.

EXETER CLEAN WATER CAMPAIGN SPONSORED BY:

THE TOWN OF EXETER – DEPARTMENT OF PUBLIC WORKS

PHONE: 603-778-0591

STATIC CLING ART

COASTER

CURB ART

KIDS STICKER

HELP PREVENT STORMWATER POLLUTION!

Storm drains direct rainfall and snowmelt away from businesses, homes and roadways to prevent flooding.

Water entering drains empties directly into our local waterways.

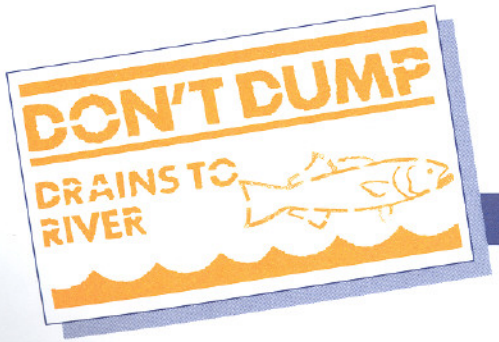
Unfortunately, the water that empties into our waterways is not the same water that fell to the ground. As the water moves toward the drains, it picks up litter, pet waste, fertilizer, pesticides, oil, grease, and other contaminants.

Look for this marker located next to storm drains in the downtown area.

WWW.EXETERNH.ORG

MEET SAM STENCILFISH!

"LOOK FOR ME NEAR YOUR HOUSE!"



Keep an eye out for this stencil in your neighborhood. When you see it, you'll remember to keep the storm drains clean!

COLOR SAM STENCILFISH IN!

STORM DRAIN STENCILS – GET INVOLVED!

Many communities around the United States are using a painted message to inform the public that storm drains are directly connected to waterways. The New Hampshire Estuaries Project has provided a grant to stencil storm drains in Exeter. The Exeter Department of Public Works and UNH Sea grant will coordinate stenciling projects in Exeter. We are looking for volunteers, schools, and groups that would like to participate.

For more information about how to participate in a storm drain stenciling project in Exeter or the Seacoast, contact UNH Sea Grant Extension at 603-749-1565.

STORMWATER RUNOFF

Storm drains are located throughout Exeter. Storm drains are designed to direct water away from homes, businesses, and roadways as quickly as possible to prevent flooding. When it rains, the water that runs along the curbs on streets "disappears" down storm drains.

HAVE YOU EVER WONDERED WHERE THE WATER GOES?

Water entering a storm drain is not the same water that fell from the sky. As storm water travels across streets, driveways and yards, it picks up contaminants such as oil, antifreeze, gasoline, litter, pet waste, pesticides, fertilizers and yard waste. Any substance that goes into a storm drain goes directly to local rivers, streams, or wetlands. This is called "nonpoint source pollution" or "polluted runoff." Today, nonpoint source pollution is the nation's largest source of water quality problems.

PREVENTING POLLUTANTS FROM ENTERING OUR WATERS CAN START IN YOUR OWN BACKYARD.

The next time there is a heavy rainstorm watch where the water goes in your yard. In some areas you can follow the path of water to the nearest storm drain. In other areas, the water will flow to a culvert or low area where the water runs off your property into a stream or wetland.

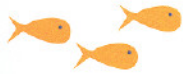
You can help prevent runoff and nonpoint source pollution. When water has the opportunity to soak into the ground, the soil, sand, and plants capture pollutants before they flow to the surface waters and ground waters.

HELP PROTECT WATER QUALITY BY:

- Fix oil and other engine leaks in your car.
- Never pour oil or other toxic chemicals into storm drains or onto the ground.
- Used oil can be taken to the Transfer Station and other chemicals can be taken to the Household Hazardous Waste Collection. Call DPW at 778-0591, ext 157 or visit exeternh.org for more details.
- For gardening or landscaping, test your soil before applying fertilizer to avoid applying more than you need. If you must fertilize, apply a slow release nitrogen fertilizer.
- Compost yard waste or take them to the Transfer Station for composting.
- Properly dispose of pet waste.
- Wash your car on grass or gravel instead of the driveway or street. Or better yet, take it to a car wash where the water gets treated and recycled. This will help keep soap, scum, and oily grit away from the storm drains and the waterways.

HELP CONTROL RUNOFF BY:

- Planting trees, shrubs, and ground cover.
- Redirecting downspouts from paved areas to vegetated or gravel areas.
- Use materials for walkways and patios that allow water to infiltrate the soil, such as bricks or stones.



"RUNOFF RETURNS" SPONSORED BY:

THE EXETER DEPARTMENT OF PUBLIC WORKS

UNH SEA GRANT

NEW HAMPSHIRE ESTUARIES PROJECT

FOR MORE INFORMATION CONTACT 603-778-0591.

This project is supported through a grant from the New Hampshire Estuaries Project.

DO YOU REALIZE?

- That pouring, blowing, or sweeping debris into the streets could lead to the polluting of Exeter's rivers?
- Storm drains are designed to collect rainwater from streets, parking lots and rooftops as quickly as possible to prevent flooding. Storm drains discharge runoff directly to waterways without treatment.
- The improper disposal of detergents, oil, chemicals and debris into the storm drains impacts the water quality of our rivers and it is illegal.

MATERIALS REQUEST

FILL OUT POSTCARD, ADD POSTAGE AND MAIL.
THANK YOU FOR YOUR SUPPORT.

- ☐ Stormwater Logo Sign
- ☐ Bookmarks
- ☐ Kid's Stickers
- ☐ Flyers
- ☐ Paper Coasters

BUSINESS

CONTACT NAME

ADDRESS

PHONE

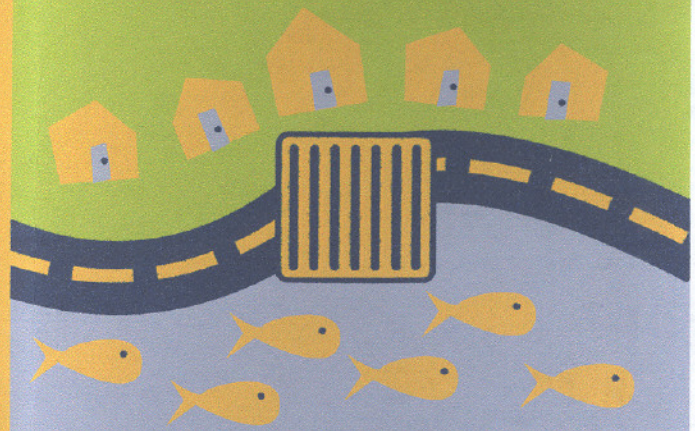
POSTCARD PERFORATES OFF

EXETER CLEAN WATER CAMPAIGN
SPONSORED BY:

THE TOWN OF EXETER –
DEPARTMENT OF PUBLIC WORKS

10 FRONT STREET
EXETER, NH 03833

PHONE: 603-778-0591
FAX: 603-772-1355
E-MAIL: PDUFFY@EXETERNH.ORG



JOIN THE EXETER CLEAN WATER CAMPAIGN!

LOCAL BUSINESSES CAN HELP KEEP EXETER'S WATER CLEAN.

STORMWATER RUNOFF IMPACTS WATER QUALITY

Local businesses can be a part of the Exeter Clean Water Campaign. The Town of Exeter wants to partner with local businesses to help educate the community and to participate in an effort to improve our local water quality.

EXETER IMPACTED BY NEW CLEAN WATER REGULATIONS

The Stormwater Phase II Rule requires certain communities with storm drainage systems to obtain a National Pollutant Discharge Elimination System (NPDES) permit and develop a stormwater management program designed to prevent harmful pollutants from being washed by stormwater runoff into local waterways.

Stormwater (rain and snow melt) flows into the municipal storm drainage system (catch basins) and is discharged to our rivers and streams without treatment.

Common pollutants include oil & grease, pesticides, sediment and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. These pollutants can impair the waterways thereby discouraging recreational uses, contaminating drinking water sources, and interfering with the habitat for fish and wildlife

EXETER'S STORMWATER MANAGEMENT PROGRAM

The U.S. Environmental Protection Agency (EPA) is the permit authority for New Hampshire. EPA requires Stormwater Management Programs to include the following Six Minimum Control Measures:

1) Public Education
2) Public Participation
3) Illicit Discharge Detection and Elimination
4) Construction Site Runoff Control
5) Post Construction Runoff Control
6) Pollution Prevention/Good Housekeeping for Municipal Operations

WHAT DOWNTOWN BUSINESSES CAN DO TO HELP PREVENT STORMWATER POLLUTION:

- DISPOSE OF BUSINESS SWEEPINGS IN THE TRASH
- DISPOSE MOP WATER TO SANITARY SEWER
- AVOID TOXIC MATERIALS SUCH AS CLEANERS TO THE EXTENT POSSIBLE
- MAKE SURE ALL TRASH IS BAGGED AND TIED AND DUMPSTERS ARE CLOSED
- DO NOT LOCATE DUMPSTERS NEXT TO CATCH BASINS OR WATERWAYS
- INSTALL & PROPERLY MAINTAIN GREASE TRAPS & INCEPTORS
- RECYCLE WASTE COOKING OIL – NEVER POUR DOWN DRAINS OR DUMP OUTSIDE
- DO NOT CLEAN EQUIPMENT OUTDOORS – DETERGENTS, CHEMICALS AND GREASE IMPACT OUR WATER QUALITY

PUBLIC EDUCATION AND PARTICIPATION

We believe that education is the most important element in the Stormwater Program. Many people simply do not realize that the water that flows into catch basins goes directly to the river or other waterways without treatment. Once people realize that their individual actions impact their local waterways, they will want to keep their streets litter free, properly dispose of pet waste, be careful when applying fertilizer and pesticides, and make sure their automobiles are not leaking oil or other fluids.

PARTNERING FOR WATER QUALITY

Exeter's downtown is high visibility and the perfect place to educate the public about stormwater runoff. The town will provide signs (shown here)

for businesses that support the stormwater program. We will also provide educational materials such as bookmarks, placemats, hard stock paper coasters, children's stickers, and flyers if businesses are interested. To receive these items, please fill out attached postcard and mail it back to us.

If you have any questions, please contact Phyllis Duffy at 603-778-0591, or via e-mail at pduffy@exeternh.org.

PLEASE APPLY STAMP

EXETER CLEAN WATER CAMPAIGN
C/O THE TOWN OF EXETER –
DEPARTMENT OF PUBLIC WORKS
10 FRONT STREET
EXETER, NH 03833