

Management Issue #1 - Riparian Corridor Protection

Background

Riparian corridor lands, those lands adjacent to rivers and streams, are the first line of defense for a river system. Protection of these areas is the most important action that can take place to ensure the long-term quality of river and watershed resources. The enclosed brochure, "The Importance of Streamside Buffers", along with the document "Riparian Buffer Zones: Functions and Recommended Widths" provides important background on why riparian areas are important and the levels of riparian corridor protection needed to protect important river and stream values.

Extensive research was done looking at other riparian corridor protection efforts including:

- The Massachusetts River Protection Act, established in 1996, which requires a 200 foot resource protection area along all perennial streams in the state (except for 14 highly urbanized communities where the area is reduced to 25 feet)
- The Farmington River Protection Zoning Overlay District, adopted in 1992, establishes a 100 foot setback area along the Wild & Scenic Farmington River in four communities in Connecticut
- The new CT River Gateway Standards which establish a 50 foot no activity zone and a 100 foot no structure area along waterbodies in the Gateway Zone. The Town of Lyme in June 2005 adopted these standards for their Gateway area that includes Hamburg Cove.

See "Model River Protection Zoning Overlay Area – Summary of Components" which is based on a compilation of these and other efforts.

An analysis of the parcels in that would intersect the proposed overlay area show:

- In East Haddam only 3.7% of all the parcels in town would intersect the proposed overlay area, with 49% of the actual proposed overlay area already classified as wetlands and 100% of the area already considered within the Inland Wetlands Commission upland review area.
- In Lyme only 9.8% of all the parcels in town would intersect the proposed overlay area, with 60% of the overlay area already classified as wetlands and 100% of the area already considered within the Inland Wetlands Commission upland review area.
- In Salem only 13.4% of all parcels in town would intersect the proposed overlay area, with 50% of the overlay area already classified as wetlands

and 89% of the area already considered within the Inland Wetland Commissions Upland Review Area.

A summary analysis for each town and the watershed follows the *Model River Protection Overlay Area – Summary of Components*.

Recommendation

Each community adopts a River Protection Overlay Zone for all perennial streams and rivers in the Eightmile River Watershed that provides a 50 foot setback on small headwater streams, and a 100 foot setback on larger streams. The proposed Overlay zone is flexible, respecting pre-existing uses and providing for uses within the overlay area consistent with protection of riparian corridor function.

Action

1. Adopt the River Protection Zoning Overlay Area.

Riparian Buffer Zones: Functions and Recommended Widths



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For the

Eightmile River Wild and Scenic Study Committee

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1. Functions of Riparian Buffers

Riparian buffers are vital elements of watersheds, primarily due to their protection of surface and ground water quality from impacts related to human land use. These vegetated buffers are complex ecosystems that provide food and habitat for unique plant and animal species, and are essential to the mitigation and control of nonpoint source pollution. In fact, the removal of streamside vegetation, primarily for development purposes, has resulted in degraded water resources and diminished value for human consumption, recreation, and industrial use.¹

In the Eightmile River watershed, maintenance of riparian buffers in their natural condition has been identified as one of the most effective means of protecting multiple outstanding resource values (ORVs), including water quality, hydrology, unique species and natural communities, and watershed ecosystem function.

Sedimentation increases turbidity and contributes to rapid siltation of waterbodies, negatively impacting water quality. Increased sediment loads also narrow channel widths and provide substrate for colonization of invasive aquatic plant species. Intact riparian buffers ameliorate these negative impacts by stabilizing streambanks. Roots of riparian vegetation deflect wave action and hold bank soil together. The buffer vegetation also decreases erosional impacts during flood events and prevents undercutting of streambanks.

Excess nitrogen and phosphorous from fertilizers and animal waste, as well as other pollutants originating from pesticides and herbicides, often bond to soil particles. The nutrient-loaded sediment contained in surface runoff then flows to the nearest waterbody and is deposited. This process is the primary cause of accelerated eutrophication of lakes and rivers². Streamside forests function as filters, transformers, and sinks for harmful nutrients and pollutants³. Buffer plants slow sediment-laden runoff and depending upon their width and vegetational complexity, may deposit or absorb 50 to 100% of sediments as well as the nutrients and pollutants attached to them⁴. When surface water runoff is filtered by the riparian buffer approximately 80 to 85% of phosphorous is captured⁵. Nitrogen and other pollutants can be transformed by chemical and biological soil activity into less harmful substances. In addition, riparian plants act as sinks, absorbing and storing excess water, nutrients, and pollutants that would otherwise flow into the river, reducing water quality.

One of the most important functions of riparian buffers is enhanced infiltration of surface runoff⁶. Riparian vegetation in the buffer surrounding a waterbody increases surface roughness and slows overland flows. Water is more easily absorbed and allows for groundwater recharge. These slower flows also regulate the volume of water entering rivers and streams, thereby minimizing flood events and scouring of the streambed.

¹ Welsch 1991

² Jontos 2004

³ Welsch 1991

⁴ Connecticut River Joint Commission 2005

⁵ Connecticut River Joint Commission 2005

⁶ Dillaha et al. 1989

Many plant and animal species depend on the distinctive habitat of riparian buffers, which include elements of both terrestrial and aquatic ecosystems. Forested buffers improve habitat quality by providing shade that cools water temperatures, thereby elevating the dissolved oxygen content that is necessary for many species of fish and aquatic insects. Woody debris from shrubs and trees within the vegetated buffer provides food and cover for a multitude of aquatic species. If large enough, buffers also provide corridors essential for terrestrial wildlife movement.

Vegetated buffers may serve as screens along waterways, protecting the privacy of riverfront landowners and blocking views of any unsightly development. Hiking and camping opportunities are also facilitated by forested buffers, which if large enough, allow outdoor enthusiasts to enjoy the proximity of the water. The diversity of plant species provides visual interest and increases aesthetic appeal.

2. Recommended buffer widths

The width of a buffer depends greatly on what resource you are trying to protect. Scientific studies have shown that efficient buffer widths range from 10 feet for bank stabilization and stream shading, to over 300 feet for wildlife habitat. Furthermore, the necessary width for an individual site may be less or more than the average recommendations, depending on soil type, slope, land use and other factors. The ranges cited below come from four literature reviews by The U.S. Army Corps of Engineers New England Division, the University of Georgia's Institute of Ecology, the U.S. Army Engineer Research and Development Center, and researchers from the UK Forestry Commission.⁷ Results from studies done in New England fall within the ranges cited below, and no evidence was found in the literature to suggest that buffers should be, on average, either wider or narrower.

a. Erosion control

Erodibility of soil type is a key factor when assessing adequate buffer widths. Widths for effective sediment removal vary from only a few feet in relatively well drained flat areas to as much as several hundred feet in steeper areas with more impermeable soils. In order to prevent most erosion, vegetated buffers of 30 feet to 98 feet have been shown to be effective.

b. Water quality

Nutrients - Nitrogen and phosphorous can be retained in buffers that range from 16 to 164 feet. The wider buffers will be able to provide longer-term storage. Nitrogen is more effectively removed than phosphorous. In 1995, a study conducted in Maine found that the effectiveness of buffers at removing phosphorous is variable but in most cases, a 49-foot natural, undisturbed buffer was effective at removing a majority of the nutrient from surface runoff. However, the U.S. Army Corps of Engineers concluded in their 1991 study that there was insufficient evidence

⁷ U.S. Army Corps of Engineers 1991, Wenger 1999, Fischer and Fischenich 2000, Broadmeadow and Nisbet 2004, respectively.

to determine a necessary buffer width for phosphorous retention. It is important, therefore, to combine buffer zones with strategies to reduce phosphorous at its source.

Pesticides – Buffer widths for pesticide removal range from 49 feet to 328 feet. Pesticides that are applied manually require less of a buffer area than aerially-sprayed pesticides.

Biocontaminants – Buffer widths for biocontaminants, such as fecal coliform, were not reviewed in this study. The University of Georgia found that, in general, buffers should be 30 ft. or greater. However, buffers may not be able to adequately filter biocontaminants and it is also important to reduce these pollutants at the source.

c. Aquatic habitat

Wildlife – The minimum width of riparian buffers to protect aquatic wildlife, including trout and invertebrates, range from 33 feet to 164 feet.

Litter and debris input – Recommendations for buffer widths to provide an adequate amount of debris for stream habitat range from 10 feet to 328 feet, although most fall within 50 feet to 100 feet.

Stream temperature. Adequate shading can be provided by a 30-foot buffer, but buffers may need to be up to 230 feet to completely control stream temperature. The amount of shade required is related to the size of the channel. The type of vegetation in the buffer regulates the amount of sunlight reaching the stream channel. Generally, a buffer that maintains 50% of direct sunlight and the rest in dapple shade is considered preferable⁸

d. Terrestrial habitat

The Eightmile River watershed contains a large number of roadless, undeveloped forest blocks and is more than 80% forested in total. Furthermore, the riparian corridor within 300 ft. of the river and its tributaries has remained mostly intact, supporting a high level of biodiversity as well as protecting water quality. The Eightmile River is host to a number of important species, including native brook trout, freshwater mussels, blue back herring, bobcats, great horned owls and cerulean warblers.

The habitat requirements for birds, mammals, reptiles, amphibians and fish vary widely, and the necessary buffer width to protect each species varies widely as well. While trout and salmon can benefit greatly from the shading, habitat, food, and water quality protection that a 150-foot buffer provides, mammals such as the red fox and the bobcat require riparian corridors of approximately 330 feet. Furthermore, birds such as the cerulean warbler, which requires large areas of forest, may need a buffer that is much greater than 330 ft.⁹ For this reason, we do not believe that it is feasible to capture all of the habitat needs of all species with a uniform buffer. More careful targeting of potential riparian habitat, work with landowners to create conservation

⁸ Broadmeadow and Nisbet 2004

⁹ Chase et al. 1995

easements, as well as the creation of protected areas by the town will aid in more specific approaches to habitat preservation for these species.

For a more detailed look at the range of recommended buffer widths, see Appendix 1.

3. Factors influencing buffer width

There are many factors that influence the effectiveness buffers. These include slope, rainfall, the rate at which water can be absorbed into the soil, type of vegetation in the buffer, the amount of impervious surfaces, and other characteristics specific to the site.

a. Slope

As slope increases, the speed at which water flows over and through the buffer increases. Therefore, the steeper the land within the buffer, the wider it needs to be to have time to slow the flow of water and absorb the pollutants and sediments within it. Many researchers suggest that especially steep slopes serve little value as a buffer, and recommend excluding areas of steep slope when calculating buffer width. The definition of “steep” varies from over 10% to over 40% slope¹⁰.

b. Soil type

The type of soil affects how quickly water can be absorbed. Soils that are high in clay are less permeable and may have greater runoff. On the other hand, soils that are largely made up of sand may drain water so rapidly into the groundwater that roots are not able to effectively trap pollutants. Furthermore, soils that are moister and more acidic have a better capacity to take up nitrogen from the soil and release it to the atmosphere (through denitrification).

c. Vegetation mix

Structurally diverse riparian buffers, i.e. those that contain a mix of trees, shrubs and grasses, are much more effective at capturing a wide range of pollutants than a riparian buffer that is solely trees or grass. Removal efficiencies range from 61% of the nitrate, 72% of the total phosphorous and 44% of the orthophosphates from grass buffers to 92% of the nitrate 93% of the total phosphorous and 85% of the orthophosphates from combined grass and woody buffers.¹¹

¹⁰ Wenger 1999

¹¹ Jontos 2004

Table 1: Estimated reduction of nutrient loads from implementation of riparian buffers¹²

Buffer Type	Nitrogen	Phosphorus	Sediment
Forested	48-74%	36-70%	70-90%
Vegetated Filter Strips	4-70%	24-85%	53-97%
Forested and Vegetated Filter Strips	75-95%	73-79%	92-96%

Source: Delaware Department of Natural Resources and Environmental Control

Generally, the grass filter strip works best for sediment removal, while the forested buffer is better for nitrate removal from subsurface flows¹³. Grasses have a shallower and denser root mat that is more effective in slowing runoff and trapping sediments from the surface flow. Trees have a deeper root system that can trap and uptake nutrients from the groundwater, stabilize banks, and regulate the flow of water to the stream.

Forests provide certain functions that grasses cannot. Trees shade the river and provide an input of leaf litter and branches that are necessary for many aquatic species. In addition, a forested buffer provides important habitat for terrestrial wildlife. Native plants species are preferred to ornamentals or exotics due to the habitat advantage they provide for wildlife. Old trees are especially valuable for providing inputs of coarse woody debris.

The most effective riparian buffers should include a mix of trees, shrubs and herbaceous plants native to the region and appropriate to the environment in which they are to be planted. When planting buffers, it is best to use adjacent reference riparian buffers as the basis for selecting floral composition¹⁴.

Table 2: Plant type vs. removal efficiency

Function	Grass	Shrubs	Trees
Sediment trapping	High	Medium	Low
Filtration of Sediment born Nutrients, Microbe and Pesticides	High	Low	Low
Soluble forms of Nutrients and Pesticides	Medium	Low	Medium
Flood Conveyance	High	Low	Low
Reduce Stream Bank Erosion	Medium	High	High

Source: Jontos 2004 (modified after Fisher and Fischenich 2000)

¹² (Palace, 1998; Lowrance et al., 1995; Franti, T.G., (1997); Parsons et al. (1994); Gilliam et al. (1997); Osmond et al., (2000)

¹³ Triangle J. Council of Governments 1999

¹⁴ Jontos 2004

4. Buffer types

a. Variable Width

Several models have been created to consider individual site factors in determining buffer width. These range from the complex to the relatively simple. The more complex models take into account multiple factors, such as slope, erodibility and infiltration rates¹⁵. Examples of such models include:

Brown et al. (1987):

$$\text{Buffer width} = (\text{average slope/erodibility factor})^{1/2}$$

Cook College Department of Environmental Resources:

$$\text{Buffer width} = 2.5 (\text{time of travel of overland flow}) * (\text{slope})^{0.5}$$

More simple models only take into account slope. A common formula is to set a fixed buffer width and apply 2 feet per percent slope. Many of these models recommend *not* including impervious surfaces or areas of steep slope in the buffer width (**Figure 1**). Cook College recommends excluding anything greater than 15% slope, while Wenger (1999) recommends excluding all slopes over 25%.

b. Fixed Width

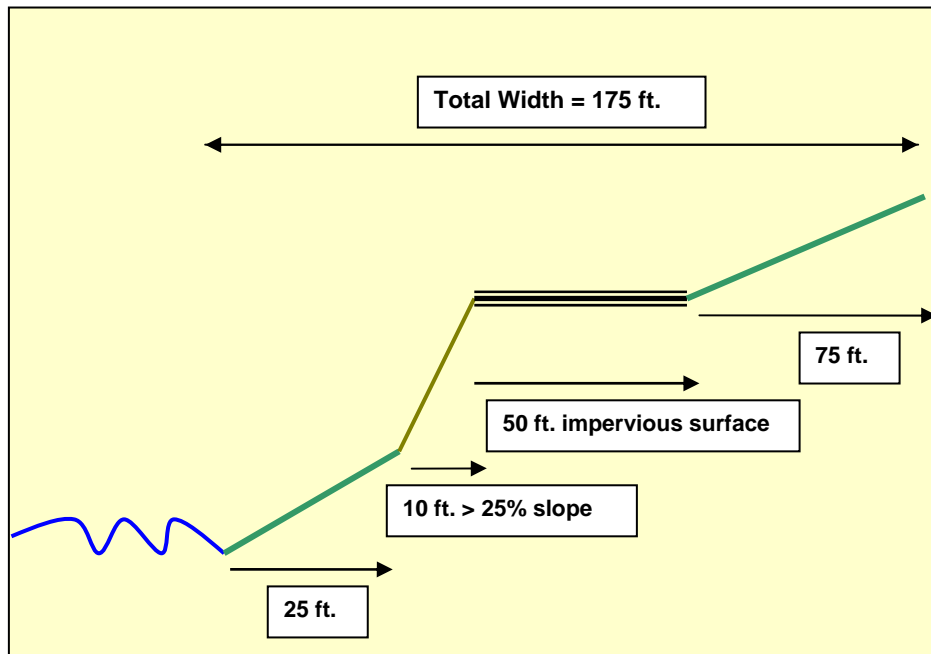
A fixed buffer width is the easiest to administer. However, care must be taken to select the appropriate width for the resources you are targeting. Studies unanimously support the conclusion that buffer efficiency at filtering out pollutants increases with width. However, this does not increase infinitely, and the goal is to find the most efficient width. For example, a study in the Mid-Atlantic¹⁶ found that 90% of sediments were removed by a 62 ft. riparian buffer, but only 94% were removed by more than doubling the buffer width to 164 ft

If a fixed buffer width is chosen, it should be on the conservative side to provide leeway for slope and soil type. Data for the Eightmile River watershed show that significant areas of the land bordering the river have slopes that are above 15%. Therefore, we believe it is necessary to make a fixed buffer width wider than the average minimum recommendation of 100 ft.

¹⁵ Described in the US Army Corps of Engineers (1991) literature review.

¹⁶ Peterjohn and Corell 1994.

Fig.1: Variable buffer width adjusted from 100 feet to 175 feet to account for effects of slope and impervious surface.



c. Three Zone

The Three Zone system was originally developed as part of an initiative to protect the Chesapeake Bay. The combination of vegetation types (trees, grass and shrubs) helps maximize the efficiency and diversity of benefits that the buffer provides (Figure 2).

Zone 1

Minimum Width: 15 ft.

Composition: Native trees and shrubs

Function: Bank stabilization, habitat, shade, flood prevention

Management: None allowed except bank stabilization and removal of problem vegetation.

Zone 2

Minimum Width: 60 ft.

Composition: Native trees and shrubs.

Function: Removal of nutrient, sediments and pollutants from surface and groundwater, habitat

Management: Some removal of trees to maintain vigorous growth.

Zone 3

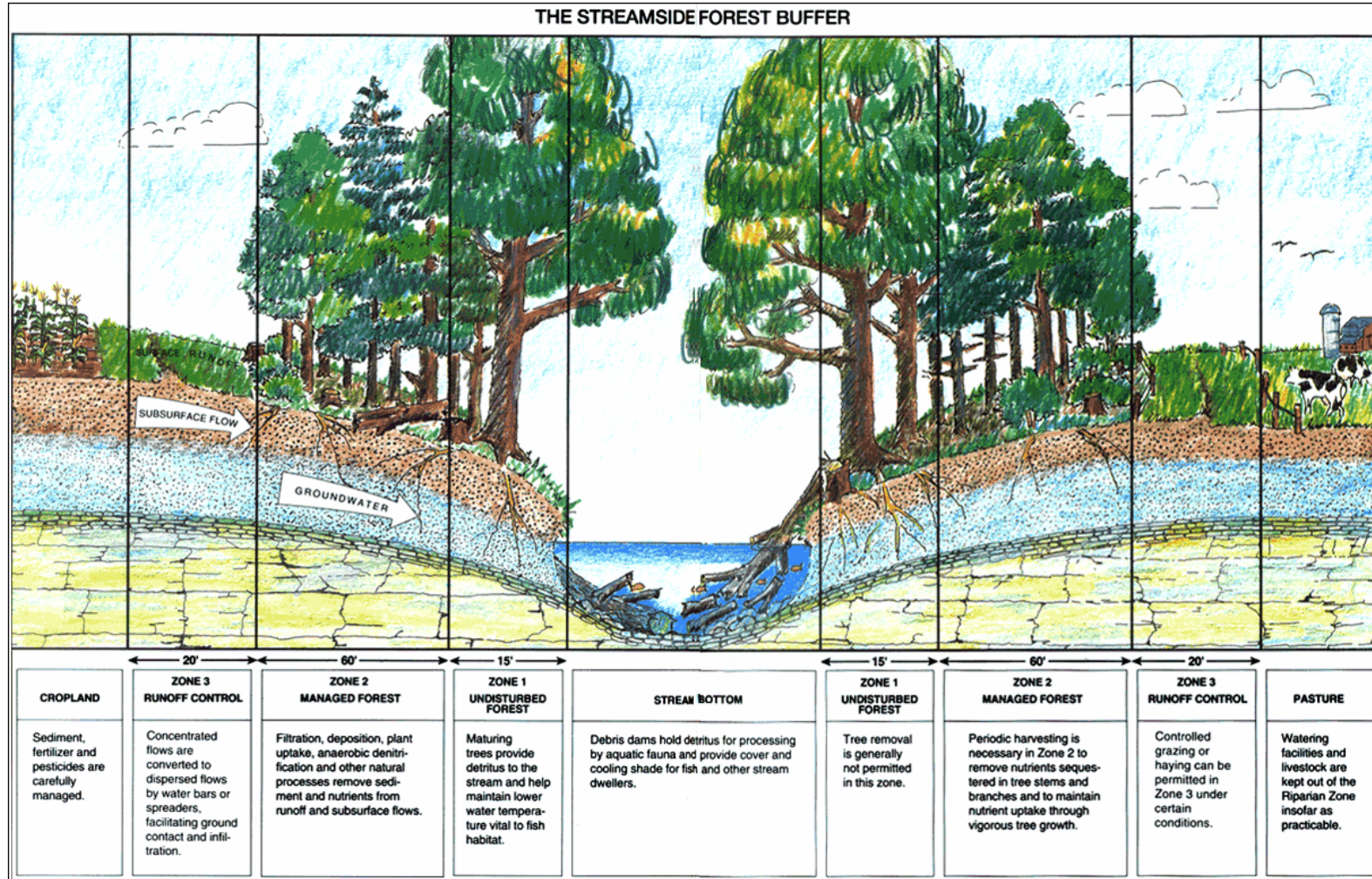
Minimum Width: 30 ft.

Composition: Grasses and herbaceous plants

Function: Slow surface runoff, trap sediments and pesticides

Management: Mowing

Fig. 2: Three-Zone System



Source: Welsch 1991. Riparian Forest Buffers: Function and Design For Protection and Enhancement of Water Resources.

5. What order streams to protect

Buffers are most effective when they are contiguous. Guidelines for buffer widths recommend that long, continuous buffer strips should often be a higher priority than fragmented strips of greater width.¹⁷ Small gaps in vegetation along the bank can channelize runoff into the river and effectively negate the effect of surrounding buffers. For this reason, landowners who currently have lawns that run to the edge of the river should be encouraged to replant trees and shrubs along the bank. In addition, footpaths cleared for river access should be winding, rather than straight, and as narrow as possible to minimize sedimentation.

Failure to extend protection to the smaller headwater streams in the river basin also ignores important sources of sedimentation and pollution. To preserve water quality in the Eightmile River, it is essential to protect all of its tributaries. In fact, smaller order streams often account for the greatest miles of watercourse in a basin. Buffering low order streams (1st, 2nd and 3rd) has greater positive influence on water quality than wider buffers on portions of larger order streams already carrying polluted water. While it may be politically infeasible to set wide buffer zones around intermittent and ephemeral streams, this omission is not justified by the science. A University of Georgia study of riparian buffers warns, “Governments that do not apply buffers to certain classes of streams should be aware that such exemptions reduce benefits substantially.”¹⁸ A review of buffers by the U.S. Army also notes that “even the best buffer strips along larger rivers and streams cannot significantly improve water that has been degraded by improper buffer practices higher in the watershed”.¹⁹

Smaller headwater streams have the greatest area of land-water interaction, and have the greatest potential to accept and transport sediment. Ephemeral streams, which only exist during periods of high rain, can serve as important sources of sediment and pollutants to the river. It is important that they are maintained in a vegetated condition in order to help trap and slow the flow of pollutants. Furthermore, removing riparian vegetation from the banks of small, heavily shaded streams will have a much greater impact on stream temperature and aquatic habitat throughout the watershed than removing vegetation from larger rivers, where only a fraction of the water is shaded. Rather than ignoring these streams completely, a compromise would be to create a smaller setback. Clinnick et al (1985) advocate a minimum of a 20 m wide buffer for ephemeral streams, and where that is not possible, at least leaving the banks vegetated²⁰.

¹⁷ Fisher and Fishenich 2000

¹⁸ Wenger 1999

¹⁹ Fisher and Fishenich 2000

²⁰ Wenger 1999

Appendix 1–Summary of Effective Buffer Widths from Literature Review

Author	Effective Width of Buffer (in feet)							
	Aquatic Wildlife	Terrestrial Wildlife	Stream Temperature	Litter/Debris input	Nutrient Retention	Sediment Control	Bank Stabilization	Pesticide Retention
Wenger 1999		220-574 ft.	33 – 98 ft.	50 ft.	50 – 100 ft.	82 – 328 ft.	–	> 49 ft.
Army Corps 1991	98 ft.	30 – 656 ft.	33 – 66 ft.	66-102 ft.	52 – 164 ft.	33 – 148 ft.	49 – 98 ft.	49 – 328 ft.
Fisher and Fischenich 2000	> 98 ft.	98-1,640 ft.	–	10 – 33 ft.	16.4-98 ft.	30-200 ft.	30 -66 ft.	–
Broadmeadow and Nisbet 2004	33 –164 ft.	–	49 – 230 ft.	82 – 328 ft.	16.4-98 ft.	49 – 213 ft.	–	–

Appendix 2 - General Recommended Widths of Buffer Zones

Source: Jontos 2004 (modified after Fisher and Fischenich 2000)

Function	Description	Recommended Width
Water Quality Protection	Buffers, especially dense grassy or herbaceous buffers on gradual slopes, intercept overland runoff, trap sediments, remove pollutants, and promote ground water recharge. For low to moderate slopes, most filtering occurs within the first 10 m, but greater widths are necessary for steeper slopes, buffers comprised of mainly shrubs and trees, where soils have low permeability, or where NPS loads are particularly high.	5 to 30 m
Stream Stabilization	Buffers, particularly diverse stands of shrubs and trees, provide food and shelter for a wide variety of riparian and aquatic wildlife	10 to 20 m
Riparian Habitat	Riparian vegetation moderates soil moisture conditions in stream banks, and roots provide tensile strength to the soil matrix, enhancing bank stability. Good erosion control may only require that the width of the bank be protected, unless there is active bank erosion, which will require a wider buffer. Excessive bank erosion may require additional bioengineering techniques.	30 to 500 m +
Flood Attenuation	Riparian buffers promote floodplain storage due to backwater effects, they intercept overland flow and increase travel time, resulting in reduced flood peaks.	20 to 150 m
Detrital Input	Leaves, twigs and branches that fall from riparian forest canopies into the stream are an important source of nutrients and habitat.	3 to 10 m

Appendix 3

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Appendix 4 - Web Resources

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Model River Protection Zoning Overlay Area - Summary of Components

Draft

Purpose of River Protection Overlay Area

The purpose of the River Protection Overlay Area is to protect and enhance the functions and values of the riparian corridor, including:

- Maintaining high water quality
- Maintaining natural flows and hydrology
- Conserving ecological functions
- Supporting habitat and species diversity and abundance
- Maintaining flood storage
- Protecting valuable aquatic species and habitats
- Conserving natural scenic and topographic features

River Protection Overlay Area Definition

The proposed overlay area includes all perennial rivers or streams in the Eightmile River Watershed and the area landward and horizontal from the stream edge, 50 feet on first order headwater streams and 100 feet on all larger streams. A stream edge is defined as the ordinary high water mark typically identified by vegetation or soil types that are distinct from the upland area. The proposed overlay area does not apply to wetlands, vernal pools, Hamburg Cove or Lake Hayward.

Significant Activities

Where a proposed activity involves work within the overlay area the Planning & Zoning Commission shall presume that such activity is significant to the purposes of the overlay area as stated above. This presumption is rebuttable by an applicant upon clear and convincing evidence that the location of the proposed activity within the overlay area does not undermine the purpose of the overlay area.

Standards

No activity which will result in the alteration of land or vegetation within the overlay area shall be permitted by the Planning and Zoning Commission unless:

- there is no reasonably available alternative with less adverse impact on the purposes of the overlay area as stated above; **and**
- the project as proposed will have insignificant impact on those purposes.

The following exceptions may be allowed:

- a) construction and maintenance of unpaved footpaths not more than 4' in width to provide non-motorized access to, or across, the waterbody;
- b) construction and maintenance of water dependent structures and uses such as docks;
- c) construction of new utility lines where the proposed route is the best environmental alternative;

- d) septic system maintenance (other than tank pumping which does not require a permit) and, if a system has failed, repair/replacement meeting state/local standards where the maximum feasible overlay area is maintained;
- e) construction of accessory structures/uses associated with lawfully existing single family houses where the Planning & Zoning Commission finds that alternatives outside the overlay area are not available; the size and impacts of the proposed structure/use have been minimized; and the structure/use is located as far from the resource as possible; The commission still reserves the right to deny a permit if the activity would have a significant impact to the purpose of the overlay area.
- f) new activities in an overlay area that is already altered such that the required buffer cannot be provided without removal of pre-existing structures and/or pavement, provided that the proposed alteration will not increase adverse impacts on that specific portion of the overlay area and that there is no technically demonstrated feasible construction alternative;
- g) where a lot is located entirely within the overlay area, the Commission may permit activities within the overlay area when the applicant has demonstrated that the proposed work has been designed to minimize impacts to the overlay area. As mitigation, the Commission may require the applicant to plant or maintain a naturally vegetated buffer of the maximum feasible width given the size, topography, and configuration of the lot.

Activities Not Needing a Permit

- a) planting of native vegetation or habitat management techniques designed to enhance the riparian corridor values protected by the regulation;
- b) Fish & wildlife conservation activities;
- c) Continuation, but not expansion of pre-existing farming practices;
- d) Maintenance of existing structures, utilities, stormwater management structures and paved areas;
- e) Fire prevention and emergency operations;
- f) Survey and boundary posting;
- g) Pruning for a filtered view of the watercourse and removal of dead and diseased and nonnative vegetation consistent with Planning & Zoning Commission standards - if removal of trees 4" diameter or greater at breast height is to occur there must be a plan by a qualified forester approved by the commission or its agent. In all cases the overlay area must be maintained containing a natural buffer of native herbaceous plants, shrubs and trees.

**Analysis of Parcels Intersecting Proposed River Protection Overlay Area
50 feet on First Order Headwater Streams and 100 feet on all Larger Streams**

Note: This summary page includes only parcels in the Eightmile River Watershed that are on perennial streams. Protected open space parcels and parcels abutting Lake Hayward are not included.

- 209 Parcels Intersect the Proposed River Protection Overlay Area – 3.7% of all parcels in town
- 737 Total Acres in the Proposed River Protection Overlay Area – 2% of the total town area
- 49% of all Acres in the Proposed River Protection Overlay Area are Already Regulated Wetlands (359 acres)
- 100 % of all Acres in the Proposed River Protection Overlay Area are Already Within the Inland Wetlands Commission's 100 foot Upland Review Area.
- There is No Creation of Non-buildable Lots

East Haddam Summary - Analysis of Parcels Affected by 50 foot Riparian Setback on 1st Order Streams, 100 foot Setback on All Other Streams

Analysis is on Perennial Streams in the Eightmile Watershed and Does Not Include Parcels That Are Already Protected Open Space or Parcels abutting Lake Hayward

June 15, 2005 DRAFT

	# of Parcels	Total Acres of Parcels	Acres in Setback	Setback as Percent of Total Parcel	Acres of Wetlands in Setback	Percent of Wetlands in Setback
East Haddam Totals						
East Haddam 1st Order (50 ft setback)	60	1397	91	7%	31	34%
East Haddam 2nd Order (100 ft setback)	120	5116	541	11%	253	47%
East Haddam 3rd Order (100 ft setback)	21	338	85	25%	59	69%
East Haddam 4th Order (100 foot setback)	8	100	20	20%	16	80%
Total	209	6951	737	11%	359	49%

of Parcels With No Wetlands in Setback

East Haddam 1st Order (50 ft setback)	14	244	8.5	3%	0	0%
East Haddam 2nd Order (100 ft setback)	22	386	26	7%	0	0%
East Haddam 3rd Order (100 ft setback)	2	2	0.3	15%	0	0%
East Haddam 4th Order (100 foot setback)	0	0	0	0%	0	0%
Total	38	632	35	6%	0	0%

of Parcels With >50% Wetlands in Setback

East Haddam 1st Order (50 ft setback)	20	278	26	9%	20	77%
East Haddam 2nd Order (100 ft setback)	62	2532	217	9%	144	66%
East Haddam 3rd Order (100 ft setback)	9	218	61	28%	51	84%
East Haddam 4th Order (100 foot setback)	8	100	20	20%	16	80%
Total	99	3128	324	10%	231	71%

EIGHTMILE RIVER

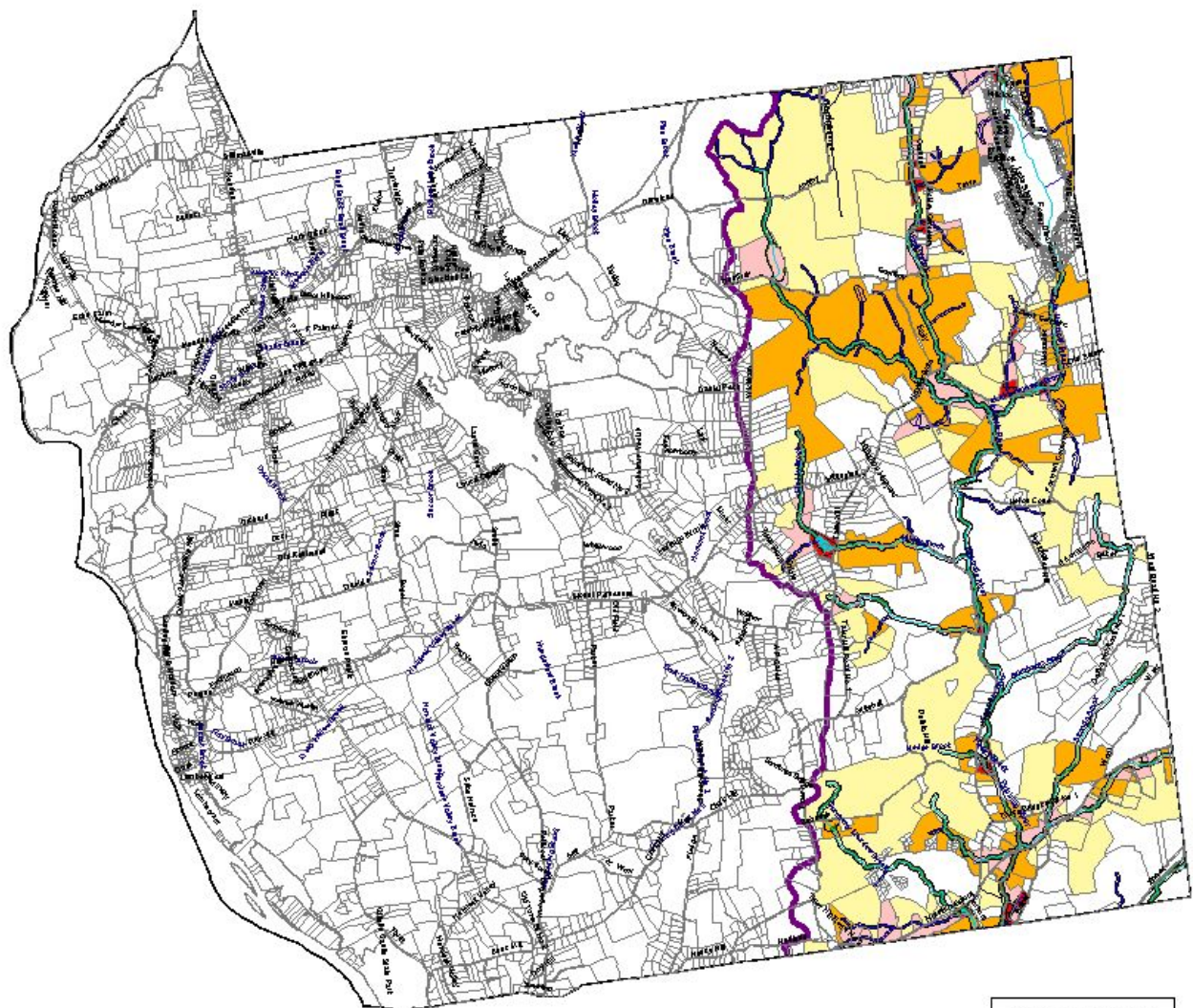
WILD & SCENIC RIVER STUDY

PARCELS THAT INTERSECT PROPOSED RIVER PROTECTION OVERLAY AREA

**100' OVERLAY SETBACK
ON LARGER STREAMS,
50' OVERLAY SETBACK
ON HEADWATER STREAMS**

EAST HADDAM

- Watershed Boundary
- Stream Order
 - Headwater Streams
 - Larger Streams
- Proposed Regulated Area
- Wetlands in Proposed Regulated Area
- Pctls in Reg. Area by Pct of Parcel
 - 0 - 10% 69 Pctls
 - 10% - 25% 59 Pctls
 - 25% - 50% 57 Pctls
 - 50% - 100% 23 Pctls



Created for the Eightmile River
Wild & Scenic Study Commission
by the CT River Coastal
Conservation District

From boundary, hydrology
watershed boundary, roads,
satellite photo (2000), topographic
map: CTDEC

Map for planning purposes.
Not to be used for regulatory

**Analysis of Parcels Intersecting Proposed River Protection Overlay Area
50 feet on First Order Headwater Streams and 100 feet on all Larger Streams**

Note: This summary page includes only parcels in the Eightmile River Watershed that are on perennial streams. Protected open space parcels and parcels abutting Hamburg Cove are not included.

- 171 Parcels Intersect the Proposed River Protection Overlay Area – 9.8% of all parcels in town
- 428 Total Acres in the Proposed River Protection Overlay Area – 2.1% of the total town area
- 60% of all Acres in the Proposed River Protection Overlay Area are Already Regulated Wetlands (256 acres)
- 100 % of all Acres in the Proposed River Protection Overlay Area are Already Within the Inland Wetlands Commission's 100 foot Upland Review Area.
- The proposed River Protection Overlay is similar to Lyme's recently adopted setbacks in the Gateway Zone.
- There are No New Parcels that are not already Regulated by the Upland Review Area
- There is No Reduction in the Number of Buildable Lots
- There is No Creation of Non-buildable Lots

Lyme Summary - Analysis of Parcels Affected by 50 foot Riparian Setback on 1st Order Streams, 100 foot Setback on All Other Streams

Analysis is on Perennial Streams in the Eightmile Watershed and Does Not Include Parcels That Are Already Protected Open Space or Abutting Hamburg Cove

August 11, 2005 DRAFT

	# of Parcels	Total Acres of Parcels	Acres in Setback	Setback as Percent of Total Parcel	Acres of Wetlands in Setback	Percent of Wetlands in Setback
Lyme Totals						
Lyme 1st Order (50 ft setback)	46	796	32	4%	15	47%
Lyme 2nd Order (100 ft setback)	54	2,038	258	13%	177	69%
Lyme 3rd Order (100 ft setback)	35	266	62	23%	38	61%
Lyme 4th Order (100 ft setback)	14	63	22	35%	6	27%
Lyme 5th Order (100 ft setback)	22	299	54	18%	20	37%
Total	171	3,462	428	12%	256	60%

of Parcels With No Wetlands in Setback

Lyme 1st Order (50 ft setback)	5	173	4	2%	0	0%
Lyme 2nd Order (100 ft setback)	5	127	10	8%	0	0%
Lyme 3rd Order (100 ft setback)	7	12	6	55%	0	0%
Lyme 4th Order (100 ft setback)	7	25	13	50%	0	0%
Lyme 5th Order (100 ft setback)	8	99	8	8%	0	0%
Total	32	436	40	9%	0	0%

of Parcels With >50% Wetlands in Setback

Lyme 1st Order (50 ft setback)	21	366	18	5%	14	78%
Lyme 2nd Order (100 ft setback)	36	1,599	218	14%	166	76%
Lyme 3rd Order (100 ft setback)	21	230	44	19%	36	82%
Lyme 4th Order (100 ft setback)	5	30	8	27%	6	75%
Lyme 5th Order (100 ft setback)	5	119	20	17%	13	65%
Total	88	2,344	308	13%	235	76%

EIGHTMILE RIVER

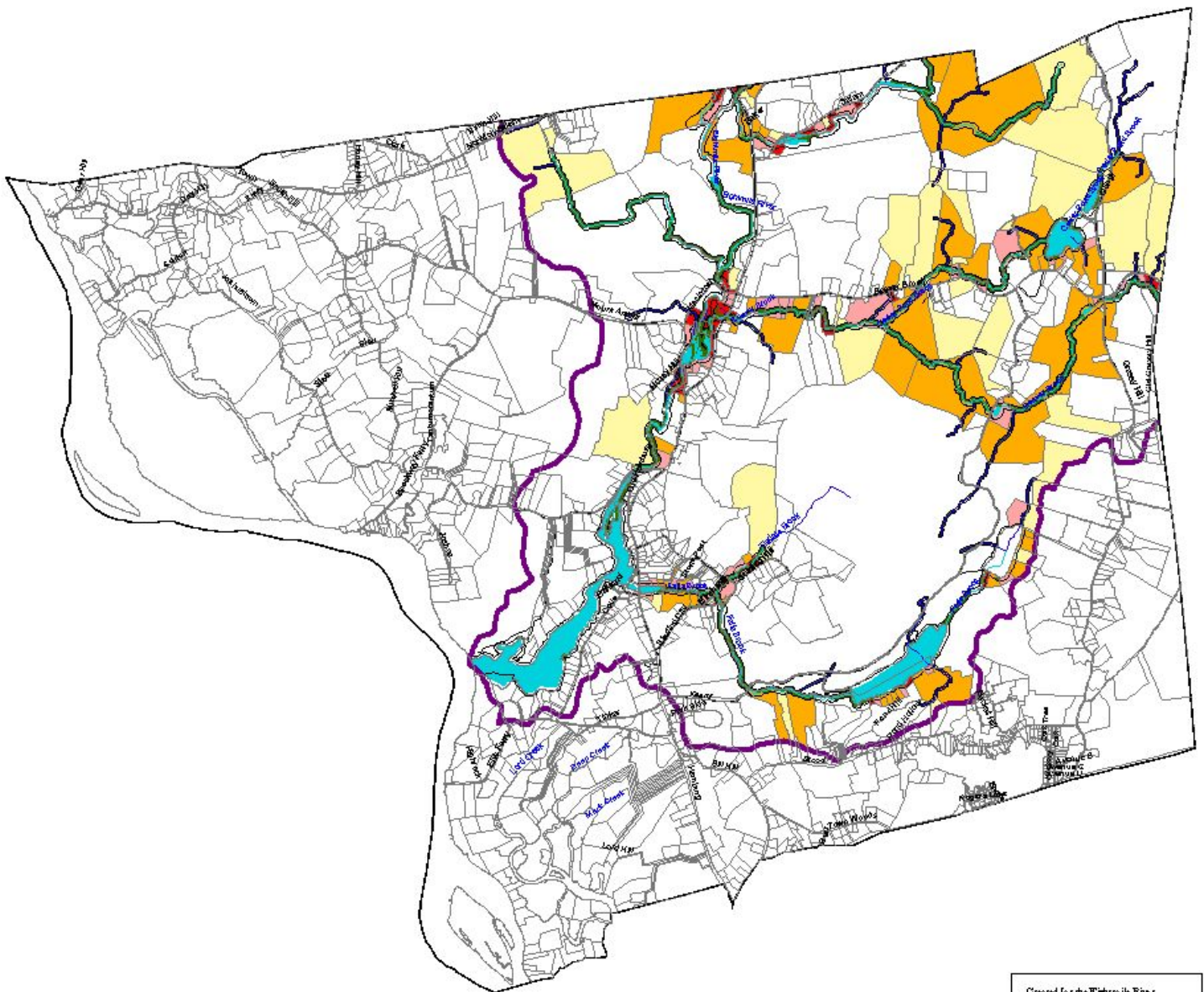
WILD & SCENIC RIVER STUDY

PARCELS THAT INTERSECT PROPOSED RIVER PROTECTION OVERLAY AREA

**100' OVERLAY SETBACK
ON LARGER STREAMS,
50' OVERLAY SETBACK
ON HEADWATER STREAMS**

LYME

- Watershed Boundary
- Stream Order
 - ~ Headwater Streams
 - ~ Larger Streams
- Proposed Regulated Area
- Wetlands in Proposed Regulated Area
- PcIs in Reg. Area by Pct of Parcel
 - 0 - 10% 36 PcIs
 - 10% - 25% 50 PcIs
 - 25% - 50% 45 PcIs
 - 50% - 100% 39 PcIs



0 4 Miles

124000



Created for the Eightmile River
Wild & Scenic Study Committee
by the CT River Coastal
Conservation District

From boundary, hydrology,
uncontaminated boundary, roads,
serial photos (1990), topographic
map: CTDEC

Map for planning purposes.
Not to be used for conveyance.

Ken Geisler: July 29, 2005

**Analysis of Parcels Intersecting Proposed River Protection Overlay Area
50 feet on First Order Headwater Streams and 100 feet on all Larger Streams**

Note: Analysis includes only parcels in the Eightmile River Watershed that are on perennial streams. Protected open space parcels are not included.

- 239 Parcels Intersect the Proposed River Protection Overlay Area – 13.4% of all parcels in town
- There are 636 Total Acres in the Proposed River Protection Overlay Area – 3.3% of the total town area
- 50% of all Acres in the Proposed River Protection Overlay Area are Already Regulated Wetlands (321 acres)
- 89 % of all Acres in the Proposed River Protection Overlay Area are Already Within the Inland Wetlands Commission's 75 foot Upland Review Area.

Salem Summary - Analysis of Parcels Intersecting Proposed River Protection Overlay Area
50 Feet on First Order Headwater Streams, 100 Feet on All Larger Streams

20-Jul-05

Draft

Analysis is on Perennial Streams in the Eightmile River Watershed in Salem and Does Not Include Parcels That Are Already Protected Open Space

Salem Totals	# of Parcels	Total Acres of Parcels	Acres in Setback	Setback as Percent of Total Parcel	Acres of Wetlands in Setback	Percent of Wetlands in Setback
Salem 1st Order (50 ft setback)	124	3,801	209	5%	107	51%
Salem 2nd Order (100 ft setback)	66	1,541	198	13%	97	49%
Salem 3rd Order (100 ft setback)	41	836	133	16%	69	52%
Salem 4th Order (100 ft setback)	8	588	96	16%	48	50%
Total	239	6,766	636	9%	321	50%

**# of Parcels With No Wetlands in
Setback**

Salem 1st Order (50 ft setback)	34	413	34	8%	0	0%
Salem 2nd Order (100 ft setback)	17	255	17	7%	0	0%
Salem 3rd Order (100 ft setback)	5	6	1.2	20%	0	0%
Salem 4th Order (100 ft setback)	0	0	0	0%	0	0%
Total	56	674	52	8%	0	0%

**# of Parcels With >50% Wetlands in
Setback**

Salem 1st Order (50 ft setback)	73	1,967	120	6%	92	77%
Salem 2nd Order (100 ft setback)	26	720	99	14%	72	73%
Salem 3rd Order (100 ft setback)	23	384	72	19%	58	81%
Salem 4th Order (100 ft setback)	3	8	2	25%	1.8	90%
Total	125	3,079	293	10%	223.8	76%

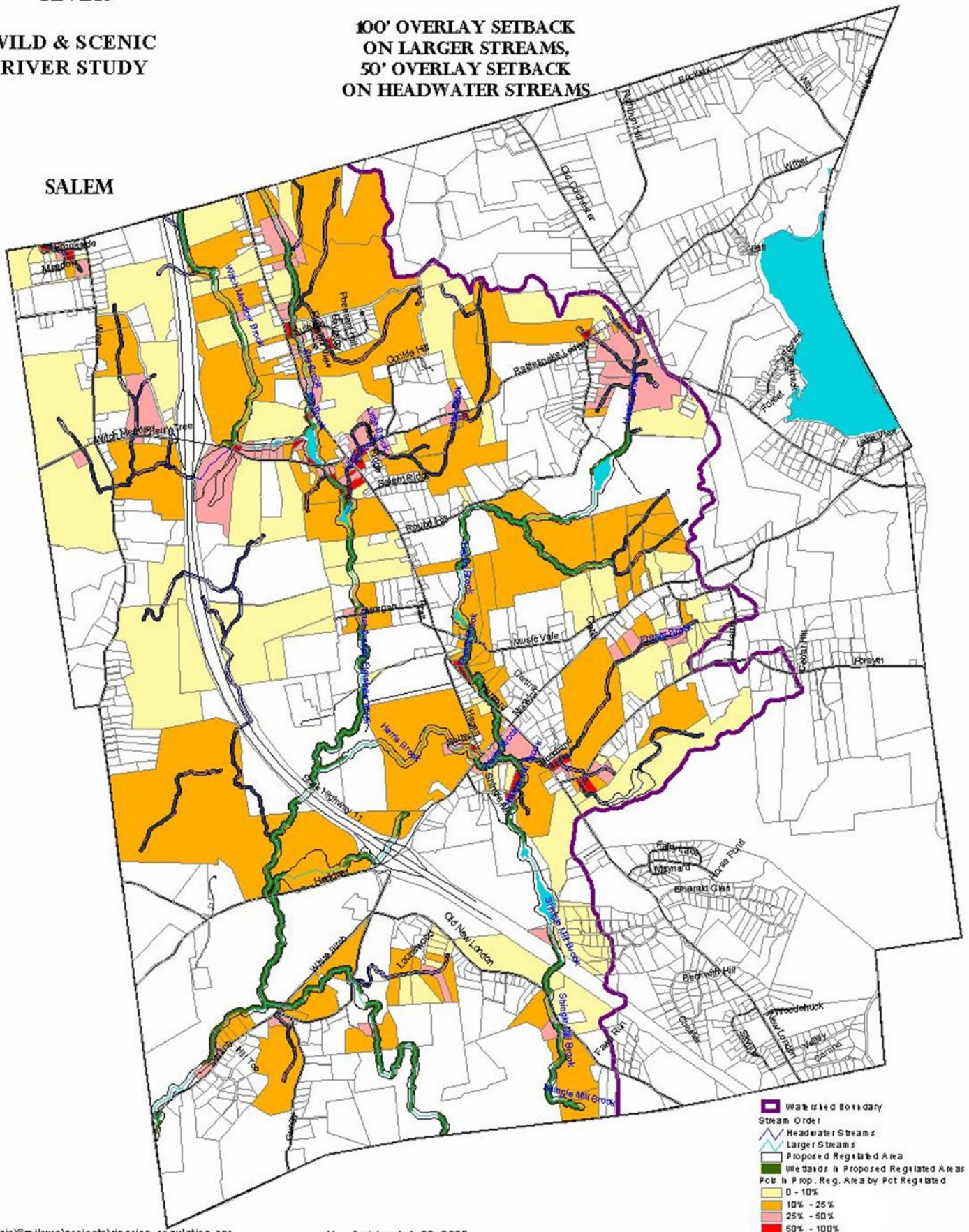
EIGHTMILE RIVER

PARCELS THAT INTERSECT PROPOSED RIVER PROTECTION OVERLAY AREA

WILD & SCENIC RIVER STUDY

**100' OVERLAY SETBACK
ON LARGER STREAMS,
50' OVERLAY SETBACK
ON HEADWATER STREAMS**

SALEM



Eightmile River Watershed Summary - Analysis of Parcels Intersecting Proposed River Protection Overlay Area
50 Feet on First Order Headwater Streams, 100 Feet on All Larger Streams

Analysis Does Not Include Parcels That Are Already Protected Open Space or Abutting Hamburg Cove

August 11, 2005 DRAFT

Stream Order	# of Parcels	Total Acres of Parcels	Acres in Setback	Setback as Percent of Total Parcel	Acres of Wetlands in Setback	Percent of Wetlands in Setback
Total 1st Order	279	7,102	410	6%	197	48%
Total 2nd Order	289	9,544	1,126	12%	598	53%
Total 3rd Order	97	1,440	280	19%	166	59%
Total 4th Order	30	751	138	18%	70	51%
Total 5th Order	22	299	54	18%	20	37%
Total All	717	19,136	2,008	10%	1,051	52%