Encroachment

What is Encroachment?

Encroachment is a term used to describe the advancement of structures, roads, railroads, improved paths, utilities, and other development, into natural areas including floodplains, river corridors, wetlands, lakes and ponds, and the buffers around these areas. The term encroachment also encompasses the placement of fill, the removal of vegetation, or an alteration of topography into such natural areas. These encroachments cause impacts to the functions and values of those natural areas, such as a decline in water quality, loss of habitat (both aquatic and terrestrial), disruption of equilibrium (or naturally stable) conditions, loss of flood attenuation, or reduction of ecological processes.

Constructed encroachments within river corridors and floodplains are vulnerable to flood damages. Placing structures in flood prone areas results in a loss of flood storage in flood plains and wetlands and heightens risks to public safety. Moreover, protection of these encroachments often result in the use of river channelization practices -- including bank armoring, berming, dredging, floodwalls, and channel straightening -- to protect these investments. The removal of vegetation to improve viewscapes or access, and the removal of woody debris from rivers to facilitate human use can increase resource degradation and the property's susceptibility to flood damages, causing higher risks to public safety. As described in the channel erosion stressor chapter, such practices result in greater channel instability, excessive erosion, and nutrient loading by concentrating flows and increasing stream velocities and power.

Encroachment increases impervious cover adjacent to lakes, rivers and wetlands, thereby increasing the rate and volume of runoff, loading of sediment and other pollutants, and temperature of the receiving water. The cumulative loss of wetlands that provide water quality protection to adjacent surface waters can result in ongoing reduction in water quality. The extent of encroachment, the cumulative effects of impervious cover, and the degree to which natural infiltration has been compromised can also contribute to the instability of the stream channel.

Encroachment in lake shorelands usually is comprised of residential development and associated vegetation removal; it can also include roads, parks and beaches and urban areas. Recent development patterns on lakeshores have seen replacement of small "camps" with larger houses suitable for year-round use. This new development generally is accompanied by substantial lot clearing, lakeshore bank armoring (seawalls and rip-rap), and an overall increase in lawn coverage and impervious surface. Research in Vermont and nationally has shown this land conversion and development results in degraded shallow water habitat and increased phosphorus and sediment runoff. Encroachments into the lake itself include docks, retaining walls, bridges, fill and dredging. The table below documents the effects of encroachment upon surface waters.

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Impacts from Encroachment	
Rivers and Floodplains	
Changes in Hydrology	**Changes in Geomorphology**
*increase in magnitude and frequency of severe floods	*stream disequilibrium: channel widening, downcutting
*increased frequency of erosive bankfull floods	*increased streambank erosion
*increase in annual volume of surface runoff	*elimination of pool\riffle structure
*more rapid stream velocities	*stream channelization
*decrease in dry weather baseflow on stream	*stream crossings form fish barriers
Changes in Water Quality	**Changes in Aquatic & Terrestrial Habitat**
*massive pulse of uncontrolled sediment during construction stage	*shift from external to internal stream energy production
*increased washoff of pollutants	*reduction in diversity of aquatic insects
*nutrient enrichment leads to benthic algal growth	*reduction in diversity of aquatic and terrestrial species
*bacterial contamination during dry and wet weather	*destruction of wetlands, buffers, and springs
*increased organic carbon loads	
*higher toxic levels, trace metals, and hydrocarbons	
*increased water temperatures	
Lakes and Ponds	
Changes in In-Lake Habitat	**Changes in Terrestrial Habitat**
*decreased submersed woody habitat	*decrease in natural woody vegetation along shore
*decreased rocky habitat/increased embeddedness	*decrease in habitat for species dependent on riparian areas
*decreased leafy debris	* loss of connectivity between aquatic and terrestrial habitat
*decreased shading/ insect fall	
*increased fine sediment (muck and sand)	
Changes in Water Quality	**Changes in Physical Function**
*increase in local nutrient availability	* increased adjacent erosion when one shoreline is armored or altered
*increase in attached algae growth	* increased risk of mass failure
*increase in temperature	
*increase in phosphorus loading to the lake	
*decrease in water clarity	
Wetlands	
Loss of the Functions and Values that Wetlands Provide:	
*Water Storage for Flood Water and Storm Runoff	*Rare, Threatened, and Endangered Species Habitat
*Surface and Ground Water Protection	*Education and Research in Natural Sciences
*Fish Habitat	*Recreational Value and Economic Benefits
*Wildlife Habitat	*Open Space and Aesthetics
*Exemplary Wetland Natural Communities	*Erosion Control through Binding and Stabilizing the Soil

Modified from: *Metropolitan Washington Council of Governments. Watershed Restoration Sourcebook. Washington D.C.: Anacostia Restoration Team, 1992.*

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How important is Encroachment?

Based on the Watershed Management Division's evaluation, encroachment is a highly ranked stressor.

Empirical data from Vermont's Stream Geomorphic Assessment program indicate that 30 % of the assessed stream-miles have encroachment within their river corridor (active portion of the floodplain that allows for the re-establishment and maintenance of "equilibrium" or naturally stable slope and stream channel dimensions). Of those streams that have encroachments, roads and development (structures, parking lots, and fill) contribute 65% and 26% respectively to the overall extent of encroachment.

Perhaps of greatest concern along rivers are the traditional channelization practices that are used to protect existing encroachments. They can be expensive to maintain, do not address the underlying causes of channel instability, increase erosion hazards to adjacent properties, and cause impacts to aquatic and riparian habitat. More importantly, channelization practices are counter-productive in trying to restore and maintain a stream's access to its floodplain and its ability to achieve stream equilibrium over time. The State Hazard Mitigation Plan reports that, "channelization, in combination with widespread flood plain encroachment, has contributed significantly to the disconnection of as much as 75% of Vermont's streams from their flood plains."

Additionally, the National Flood Insurance Program (NFIP) had been seen as a way to control new encroachments from being located in floodplain areas. However, NFIP minimum requirements are designed to minimize the risk to new investments in flood hazard areas, but do very little to ensure that new investments do not increase the flood risk to existing investments. Another shortcoming of the NFIP is that only 20% of the river miles in Vermont have NFIP delineated floodplains. The remaining 80% of stream miles have virtually no floodplain protections, which facilitates new at-risk encroachments that further degrade the resource. In addition, Vermont experiences catastrophic flood damages to both public and private investments along rivers and streams that do not have an NFIP FHA designation.

Historical surveys indicate a loss of 35% (121,000 acres) of Vermont's wetlands through encroachment and conversion prior to the 1980s. Wetland encroachments continue at reduced rate and with minimized impacts through the regulation of wetlands based on their function and value. Wetland and buffer zone encroachment continues at a more accelerated pace in communities that have existing infrastructure located in or adjacent to wetlands. These encroachments affect not only the physical, chemical and biological integrety of the wetland resource but can also have determintal impacts on associated surface waters such as streams, rivers, lakes and ponds.

Based on a recent statistically-based survey, 71% of Vermont lakes (excluding Lake Champlain) exhibit moderate levels of lakeshore disturbance, and a further 11% exhibit high levels of shoreline disturbance (National Lakes Assessment ref.). More detailed information available from a subset of intensively studies lakes in Vermont suggests that shoreland development in Vermont results in a signficant loss of in-lake physical habitat features such as fallen trees and branches, leaf litter and cobble substrate. Encroachments upon buffers and waters by homes, driveways, lawns, walls and other infrastructure comprises the majority of this documented disturbance. Following the clearing and conversion of native vegetation to lawn, the ensuing increase in erosion frequently prompts the construction of retaining walls along lake shorelines. These structures present barriers to the natural movement of animal life to and from the lake, and are part of the overall impact of developed shores on in-lake habitat. Additionally, homes, retaining walls and other development can exacerbate flooding hazards and damages from floods when natural shoreline vegetation and in-lake physical habitat features are lost. Nationally, "poor shoreline condition" was found to be the most significant threat to lake biology (see EPA study here).

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Global climate models predict an increase in temperature of 4°F in Vermont by the year 2100 and an increase in precipitation by as much as 30% during the winter months. Therefore, the degree of encroachment, the river channelization/lakeshore stabilization practices used to protect those encroachments, and subsequent loss of floodplain function in both rivers and lakes could make Vermont particularly vulnerable to climate change-related increases in flood frequency and magnitude.

What objectives are achieved by managing Encroachment?

The current extent of encroachment -- from transportation infrastructure, homes, businesses, utilities, and industries -- and the degree to which productive agricultural land is in close proximity to waterways are significant. Floodplains, river corridors, wetlands, lake shorelands, and buffer areas continue to experience development pressures. However, the economic viability of these businesses and the health and safety of our communities depend upon the quality of these resources and the long-term stability of our rivers and health of our lakes and wetlands. Working with communities and landowners to limit encroachment helps to meet several surface water goals and objectives, including:

Objective A. ***Minimize Anthropogenic Nutrient and Organic Pollution***

Wetlands can provide one of the best natural means of removing nutrients and organic matter from runoff prior to it reaching surface waters. This is achieved through the retention of flood waters, the uptake of nutrients by wetland vegetation, and settlement of particle-bound phosphorus in wetland pools. Limiting encroachment to protect wetlands is critical to minimizing the impacts from nutrient and sediment pollution.

Minimizing encroachment and allowing a river access to its floodplain, river corridor, wetlands, and buffer areas provides room for floodwater storage and conveyance. When floodwaters slow down and spread out, flood peaks are reduced, sediment, nutrients and other pollutants settle out, and ice jamming is reduced. These areas are also vital for ground water recharge and thus maintenance of base flow in streams. The natural vegetation in these areas helps to slow down and filter floodwaters, while also trapping and filtering out pollutants from overland flow coming from adjacent uplands.

Along lakeshores, a buffer of native vegetation is critical to filtering pollutants out of runoff from upland development. On many Vermont lakes, the shoreland is the most intensively developed part of the watershed, and is in effect "suburbanized." Such development often results in poor near-shore conditions relative to nutrient enrichment such as mucky bottom, attached algae and nuisance plant growth. Additionally, buffers on the small tributary streams that feed most Vermont lakes help alleviate nutrient and sediment inputs from the watershed as a whole.

Objective B. ***Protect and Restore Aquatic and Riparian Habitat***

River corridors, floodplains, wetlands, lake shorelands, and buffer areas provide important habitat for fish, wildlife, and some rare, threatened, and endangered species. These areas are also important for species migration, providing travel corridors between habitat features, and dispersal routes for fish, birds, and other wildlife. Minimizing encroachment reduces the likelihood of habitat fragmentation and loss of habitat function. The life histories of reptiles and amphibians necessitate regular movement between land and water. Fish that require shallow areas for spawning move into nearshore littoral areas during the spring season. Waterfowl, including ducks and loons, prefer to nest among vegetation on the shoreline, while still maintaining close proximity to water for feeding and predator avoidance. For these species,

maintaining healthy connectivity between different habitats is vital. Encroachments that pose a physical barrier between aquatic and riparian habitats (i.e. retaining walls) greatly impede access required by these species.

Minimizing encroachment also supports native plant growth and deters non-native invasive species. Maintaining native vegetative cover provides shade to moderate water temperatures, and supplies coarse woody habitat and other organic inputs for in-stream and in-lake habitat. Vegetation directly on the shoreline acts to intercept and filter out fine sediment before it reaches the stream or lake, helping to keep the stream bottom clean and preventing sedimentation of shallow lake waters. This in turn supports aquatic insects, a principle food source for fish and birds. On lakes, shoreland development resulting in removal of native vegetation is linked with a measurable degradation of shallow water habitat elements such as loss of woody habitat, overhanging vegetation and increasing fine sediments. Slowing phosphorus enrichment of lakes maintains a lake in its natural trophic state, which would be more ecologically stable. Overall, minimizing encroachment allows these areas to continue serving as important infiltration resources, supporting groundwater aquifer recharge and the maintenance of adequate base flow, crucial in supporting the biological integrity of streams during drier months.

Objective C. ***Minimize Flood and Fluvial Erosion Hazards***

A prudent and cost-effective public safety measure is to limit encroachment in floodprone areas. Keeping out of harm's way lessens the exposure to flooding, reduces damage to property and infrastructure, and minimizes the cost and misery associated with those damages. Most importantly, limiting encroachment reduces the need to subsequently channelize and armor stream channels to protect that development and infrastructure. This promotes reestablishment and maintenance of a physically stable condition over time. Providing for dynamic "equilibrium" attenuates the impacts of flooding, thereby reducing the risk of future damages to public and private investments.

Minimizing encroachments in lake shorelands, especially on the immediate shoreline, would reduce the perceived need by lakeshore property owners for winter drawdowns, which some dam owners conduct to protect shoreline structures from ice damage. Removing or avoiding construction of shoreline structures would allow a lake's water level to be managed with natural annual fluctuations. Additionally, as we find with riparian floodplain areas, a lakeshore floodplain with limited encroachment is essential for the protection of public safety, reduction in flood damages to property and infrastructure, and subsequently, the minimization of cost and hardship that comes with such damages. A functioning lakeshore floodplain provides many of the same functions that we see on river floodplains: storage of sediment, nutrients, and other pollutants, the reduction of damage from ice run-up and wave activity, and the reduction of flood peaks. These functions are minimized or reduced in lakes that have their natural riparian buffers fragmented by retaining walls, boathouses, and other such encroachments. Simply put, the disruption of natural lakeshore vegetation and buffer areas significantly reduces a lake's resilience to extreme flood and weather events.

What are the causes and sources of Encroachment?

The causes of encroachments are manifold, and include:

- Transportation infrastructure (roads, highways, railroads, bridges and culverts) within river corridors and floodplains, wetlands, buffers, and lake shorelines.

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Locating transportation infrastructure, including the fill associated with roads and crossings, in riparian and shoreland areas has caused significant impacts. Many of Vermont's roads, highways, and railroads encroach on these resources due to Vermont's mountainous landscape, requiring rivers and transportation infrastructure to share narrow valleys. This is exemplified in the adjacent photograph of Long Pond, in Eden, Vermont. As a result of road encroachment, there are tens of thousands of stream crossings, particularly culverts, which are commonly undersized; their openings are not wide enough to span the channel. This practice leads to systemic habitat impacts and channel instability (see the Channel Erosion Stressor Chapter). The 1999 report to the Vermont General Assembly on flood control policies found that, "By far the largest single source of flood loss, both in terms of monetary loss and in terms of its effect on people, is loss to transportation infrastructure and utility services." At this time, ANR has begun working with VTrans to identify areas where infrastructure maintenance practices need to be changed to better accommodate both transportation infrastructure and river corridors. However, ANR will need to continue to work with VTrans and communities in systematically working to minimize impacts from existing and future encroachments and identifying more appropriate sizing for existing stream crossing structures.

- Structures, including camps, residential homes, commercial and industrial buildings, and utilities.

Land use decisions typically occur at the local level and are based on local standards. Proposed encroachments are routinely permitted, even in areas prone to flood damages and even if those developments exacerbate the vulnerability of flooding at adjacent properties. Encroachments into river corridors and riverine or lakeshore floodplains often result in landowners seeking to protect those properties using structural measures and other channelization or hardening practices. Structures located in wetlands often have ongoing drainage issues that result in landowners seeking to further alter the hydrology of an area. For wildlife dependent on wetlands, streams and lakes, ongoing impacts that are a result of these

encroachment-related practices are difficult to quantify.

Larger developments that are poorly planned, or designed without consideration of natural process or public safety, can have cumulative and ongoing impacts to lakes, floodplains, wetlands, and the functions they provide. High concentrations of small parcels crowd many of Vermont's lakes in an effort to accommodate the demand for waterfront property. In Vermont, the density of residences within 100 feet of lake mean water level is roughly twice that of urban areas. Furthermore, camps that were once seasonal in nature, are more frequently being converted to year-round homes, resulting in increases in impervious surface and cleared area close to sensitive riparian areas. This overdevelopment of lakeshore areas compromises the physical, chemical, and biological integrity of lake systems. Wetlands that are crossed multiple times for access to single family lots become islands surrounded by development and lose their connection and function in the larger landscape. A Wisconsin study found that phosphorus loading to the studied lake increased by a factor of four and sediment loading increased by a factor of 20 during the period when a shoreland property is becoming "suburbanized." The ANR works with developers and communities to protect these resources, not just from immediate impacts by reviewing individual projects, but also by working with towns to adopt plans and bylaws that protect these resources on an ongoing basis. Additionally, as part of Act 138, the ANR is required to adopt rules for Flood Hazard Areas in order to regulate activities exempt from municipal regulation. Currently, the ANR is in the process of developing, adopting and implementing statewide rules. The State Floodplain Rule will exceed the National Flood Insurance Program (NFIP) standards and incorporate the regulation of river corridors in order to address the vulnerability that new encroachments bring onto themselves, as well as identify and protect the floodplain functions that mitigate risks to existing developments and water resource values.

- Fills within rivers and streams, wetlands, and lakes.

  While encroachment is not limited to fill, fill activities do represent the most permanent type of loss for rivers, streams, floodplains, wetlands and lakes. Once an area is filled, it no longer functions as an aquatic resource, but instead is an upland area. In addition to the immediate loss, fills can have ongoing impacts to water quality, habitat, and floodplain function depending on the quality of the fill material, and the extent and location of the activity. Fill that is poorly placed and is not stabilized represents an ongoing impact as an erosion hazard. In addition to eliminating habitat, fill can provide barriers to wildlife passage. The introduction of fill into an aquatic system has detrimental water quality effects that include iron-fixing bacteria blooms and the introduction of invasive species. Again, the ANR is currently in the process of developing, adopting and implementing as State Floodplain Rule, which would require a No Adverse Impact (NAI) analysis and certification for development for flood hazard areas outside of the FEMA designated floodway (an area FEMA terms the "flood fringe"). The NAI analysis would require a proposed development to demonstrate that there would be no increase in flood elevations and velocities or decrease in flood storage volume within the mapped Flood Hazard Area.. The State Floodplain Rule will apply an NAI approach to the river corridor by prohibiting new encroachments, including fill, that would exacerbate stream instability and erosion hazards.

- Removal of vegetation.

  Part-and-parcel with encroachments to rivers, lakes, and wetlands, is the removal of riparian, shoreland, and buffer vegetation. Clearing the vegetation from lands adjacent surface waters

compromises many of the functions described above under Objectives A, B and C above. Areas lacking riparian or littoral vegetation lack the capability to filter sediment and nutrient pollutants, no longer provide shade cover, coarse woody debris and other organic material, and no longer have adequate root density and root strength to support the banks or shoreline, which can contribute to sedimentation problems in the surface water. Compared to a naturally vegetated area that has developed in concert with the natural fluctuations of mean water level over time, areas lacking littoral and riparian vegetation experience greater erosion, and subsequently greater property damage, during flood events.

This is particularly important in wetlands. Every function and value that wetlands provide depends in part or in whole on the vegetative component of the system. Persistent emergent or woody vegetation in wetlands along streams provide water quality protection, shading and refuge for fish, wildlife habitat, erosion prevention, and a means of slowing flood water. The removal of trees in a swamp can dramatically alter the hydrology of an area, destroy bird habitat, eliminate important shading for vernal pools, and reduce blow-overs that create micro-topography important for biological diversity. Some wetland natural community types, like bogs and fens, contain vegetative assemblages that are unique and important in the context of Vermont's natural heritage.

Monitoring and assessment activities addressing encroachment

Monitoring and Assessment Programs

Existing monitoring and assessment activities that focus on the causes and effect of encroachment are listed below. Full descriptions of the programs that carry out these activities may be found in the State Monitoring and Assessment Strategy and in Appendix D.

- Lake Aquatic Plant Surveys
- Lake Assessments
- Littoral Habitat Study
- Citizen Lake Watershed Surveys
- Lay Monitoring Program
- Stream Geomorphic Assessments
- Bridge and Culvert Assessments
- River Corridor Planning
- Floodplain Mapping
- Wetland Assessments
- VT Fish and Wildlife Department's Natural Heritage Information Project , including inventories of Natural Community Types
- Land Use imagery

Key Monitoring and Assessment Strategies to Address Encroachment

- Continue to conduct long term lake monitoring on a variety of stressors and update lake monitoring strategies as new stressors emerge.

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- Implement the Lake Assessment methodology, which provides quantitative assessment of shoreland and related in-lake conditions and extent of encroachment. Lakes are assessed as part of Rotational Basin Assessments. Determine thresholds in aquatic habitat condition that result in violation of Water Quality Standards.

- Support continued local (town or lake association) use of Citizen Lake and Watershed Surveys to build local support for water quality projects.

- Integrate volunteer monitoring efforts with current departmental needs. Utilize Volunteer Monitoring via the LaRosa Partnerships to achieve WQMS goals. Expand and refine criteria for accepting projects. Create workgroup to guide and prioritize volunteer monitoring efforts. (Focused on LaRosa partnerships). Urge or give preference to proposals that have an implementation plan or address a WSMD-directed project.

- Conduct stream geomorphic and reach habitat assessments and complete river corridor plans in stream and river watersheds to document extent of encroachment, support technical assistance, regulatory, and funding programs, and track progress in mitigating surface water impacts due to encroachment.

- Conduct wetlands monitoring to establish baseline information on biological indicators and criteria.

- Document wetlands projects and associated encroachments to assess ongoing cumulative impacts to wetlands.

- Integrate monitoring and assessment programs, with data and scale-appropriate interpretations made accessible through program-tailored reporting from a web-based data management and map serve system. Make these map-based assessments available to town zoning boards, and Federal and State program staff who provide technical assistance, write permits, or implement remediation.

Technical assistance activities addressing Encroachment

Technical Assistance Programs

Existing programs that provide technical assistance in various aspects of managing encroachment are listed below. Full descriptions of these programs may be found in Appendix D. (the toolbox)

- Lake Shoreland Management Program
  - Website and publications
  - Workshops
  - Site-specific technical assistance
  - Citizen Lake and Watershed Surveys
  - Lake Seminar
- Act 250/248 comments
- Review of town plans and ordinances (VLCT and DEC)
- Shoreland Encroachment Program
- Stream Alteration Program
- River Corridor Management Program (Act 110)
  - Fluvial Erosion Hazards Programs
  - River Corridor Easement Program
- VTANR Roads and Rivers training program
- Floodplain Management Program
- Basin Planning Program
- Wetland Program
- Vermont Transportation Agency Environmental Services
- Better Backroads Program
- Natural Resource Conservation Districts
- Natural Resource Conservation Service
- Low Impact Development Program
- Regional Planning Commissions

Key Technical Assistance Strategies to Address Encroachment

- Develop and maintain the capacity to technically assist landowners, municipalities, land developers, agencies, and organizations to:
  - Conduct River Corridor and Floodplain Planning including development and implementation in order to promote avoidance of development within river corridors and floodplains;
  - Identify and protect wetlands, buffers and associated functions through remote sensing and field observations in order to prevent encroachment into wetlands and their buffers;
  - Identify and protect lake shoreland buffers and associated functions; and
  - Analyze alternatives to promote avoidance and minimization and the design of appropriate setbacks and buffers, based on both a-priori and project-related assessments and planning.
- Develop and maintain the capacity to technically assist municipalities in:

- Conducting River Corridor Planning including development and implementation;
- Developing and implementing Municipal Lake Shoreland Protection Plans

➢ Develop and maintain the capacity to technically assist all municipalities with regulations that protect river corridors, floodplains, wetlands, shorelines and associated buffers.

➢ Develop and maintain the capacity to technically assist agencies and programs with land use authority and responsibility for public infrastructure, in the:

- Development of plans, policies, procedures, and regulation that are consistent with the State surface water goals and objectives; and
- Implementation of strategies to avoid conflicts between human investments, the dynamic equilibrium of streams and important wetland, shoreland buffer, and floodplain functions.

➢ Increase education and training of municipalities and other State Agencies on the impacts associated with encroachment of transportation, bicycle, and pedestrian path infrastructure. This would include the continued ANR Rivers and Roads training program.

➢ Evaluate the effectiveness of Town Road and Bridge Standards implemented by the Vermont Agency of Transportation through funding to towns. Consider improvements needed during bi-annual updates.

➢ Develop lake shoreland restoration projects throughout the state as demonstrations of good management of existing development. Provide technical assistance on lakeshore stabilization and management projects that emphasize the use of native vegetation. Increase the capacity of the WSMD to provide technical assistance on shoreland management, restoration, retrofitting and stabilization.

➢ Develop a working model to improve the relevance and accuracy of the Vermont Significant Wetland Inventory maps by adding information from delineations, project review, and town wetland inventories.

➢ Provide more training on wetland identification to people outside of the agency

Regulatory Programs

Existing programs that regulate encroachment activities are listed below. Full descriptions of these programs may be found in Appendix D. (the toolbox)

- Lake Encroachment Program (Title 29, Chap 11)
- Shoreland Permit Program (Title 10, Chapter 49A).
- Section 401 Water Quality Certifications
- Wetland Permits
- Act 250 / 248 Permits *ANR Procedure on Floodway Determinations in Act 250 Proceedings*
- ANR Riparian Buffer Guidance
- Accepted Agricultural Practices
- Accepted (Forest) Management Practices
- Municipal Zoning

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- Flood Hazard Area Regulation
- ANR State Floodplain Rule for municipally exempt activities

Key Regulatory Strategies to Address Encroachment

- Develop and effectively implement ANR River Corridor and Floodplain Procedures to limit encroachments and future conflicts with river systems, and achieve stream equilibrium conditions.

- Continue to evaluate and include options within stream alteration permits to require an analysis and/or waiver of alternatives that will accomplish protection and restoration of stream equilibrium, river corridors, floodplains, and buffers.

- Develop, adopt and implement State Floodplain Rule for activities that are exempt from municipal regulations. Such rules should address the vulnerability that new encroachments bring onto themselves, as well as identify and protect the floodplain functions that mitigate risks to existing developments and water resource values.

- Ensure that rules and regulations promulgated by other authorities are consistent with those of the Division to meet the goals and objectives of the State Surface Water Management Strategy. With respect to managing the four primary causes of encroachment, this means ensuring that other rules and regulations do not contain inconsistencies with stream equilibrium policy.

- Provide technical and scientific support to legislative efforts to promulgate statewide lakeshore buffer protection or regulation.

- Continue to integrate river corridor and buffer protection in storm water permitting and water quality remediation planning efforts.

- Ensure Act 250/Section 248 permits/CPGs avoid or minimize encroachment into river corridors, floodplains, wetlands and lake buffers.

- Implement the new Vermont Wetland Rules, which will protect more wetlands and their functions and values.

- Ensure Lake Encroachment permits make use of the least intrusive alternative, especially with respect to shoreline stabilization. Promote the use of vegetation and designs that mimic the natural shoreline.

- Assess the extent of violations of the Lake Encroachment statute (i.e. unpermitted fill and walls) and develop an approach to enforcement as needed.

- Ensure the standards for development under the Shoreland Protection Act are met to achieve the objectives for managing Encroachment.

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Funding Programs to address Encroachment

Existing funding programs that support projects to address encroachment are listed below. Full descriptions of these programs may be found in Appendix D.

- Ecosystem Restoration Program
- Flood Hazard Mitigation Grants: PDM, FMA and HMGP grants
- Stronger Communities Grants Program
- ANR Watershed Grants (Conservation License Plate)
- State Land Acquisition Review Committee and process
- CWA Section 319 grants
- Lake Champlain Basin Program Local Implementation Grants
- Connecticut River Mitigation &Enhancement Funds
- Vermont Land Trust
- Vermont Housing and Conservation Board
- CREP
- Better Backroads
- Use Value Appraisal Program
- Agricultural Buffer Program

Key Funding Strategies to Address Encroachment

- Develop meaningful funding incentives for municipalities to adopt plans and bylaws which protect floodplains, river corridors, wetlands, lake and pond shorelands, and buffers. This would include seeking permanent funding to be provided to the Flood Resilient Communities Program. This program was created with the passage of Act 138 but no funding has been provided to date.

- Ensure that state and federal grant programs encourage activities that lead to equilibrium and discourage further encroachment into river corridors, floodplains, lake buffers, and wetlands.

- Explore all alternatives for providing funding from diverse resources to support core programs within the Division.

- Develop and maintain a stable and comprehensive funding program which supports not only the implementation of projects, but the assessment, planning, and design phases necessary to identify projects consistent with the goals and objectives of the State Surface Water Management Strategy.

- Develop and maintain a stable funding program to conserve floodplains, river corridors, lake shorelands, and wetlands.

- Develop a shoreland conservation program for lakes.

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Information and education activities addressing encroachment

Existing programs that inform and educate the general public about the causes and effect of encroachment are listed below. Full descriptions of these programs may be found in Appendix D. (the toolbox)

- Lake Shoreland Management Program
  - Website and publications
  - Lake Score Card
  - Workshops
  - Citizen Lake and Watershed Surveys
  - Lake Seminar
  - Project WET
- River Corridor Management Program
- Flood Resilient Communities Program, including Flood Resilience Sharepoint site
- VT ANR/VTrans River and Road training Program
- Basin Planning Program
- Vermont League of Cities and Towns Municipal Assistance Program
- Natural Resource Conservation Districts
- River and Lake Groups
- Forestry AMP Program

Key Information and Education Strategies to Address Encroachment

- Educate the Division and Agency and other organizations about the impacts of encroachment and the importance of a river corridor and floodplain protection strategy that incorporates buffers. Policies that promote simple setbacks from streams do not accommodate the dynamic nature of fluvial processes. This would include the promulgation of the Flood Resilience Sharepoint site and the Flood Resilient Communities program.

- Create a multi-media educational program, including printed material, photo libraries, videos, power point presentations, field demonstrations, and river flumes, that discusses the impacts and mitigation strategies of encroachment, which may be readily used by Division staff at public forums as opportunities arise.

- Develop an effective outreach approach on the impacts to the lake environment from poor shoreland development practices. Use the Division's scientific data on lake littoral zone impacts from the Littoral Habitat Study and involve lake associations, residents or towns in assessing lakeshore and in-lake conditions to foster greater understanding of the problems and commitment to the solutions. The approach should make use of social marketing techniques and focus on key understandable messages.

- Develop and maintain the State Surface Water Management Strategy as an interactive, web-based site where people can get information about how the State is dealing with stressors such as encroachment and other stressors, but also provide input on the policies and programs developed to address the stressor.

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- Develop I&E tools that address land use in buffers, including the importance of naturally vegetated buffers, and the imperviousness of and water quality impacts from grassed lawns.

- Partner with regional planning commissions, municipalities, and other partners to conduct floodplain buildout analyses, overlaid with river corridors, floodplain maps, and buffers, to develop visuals on the potential impacts to the resource if the municipalities lack stronger zoning. The analysis will also determine the extent of channelization necessary to protect investments, the impacts of the buildout to base flood elevations, and the need for additional stream crossings. This information can be integrated into the Flood Resilient Communities Program or be developed as a result of the Program.

- Continue to work with VTrans on the development of the VTANR/VTrans Roads and River training efforts.

- Increase public awareness of wetlands, their functions and associated regulations that reflects the recently adopted Vermont Wetland Rules.