Jerry's Swamp and Little Pond

Natural Resource and Habitat Enhancement Study

Thompson,Connecticut

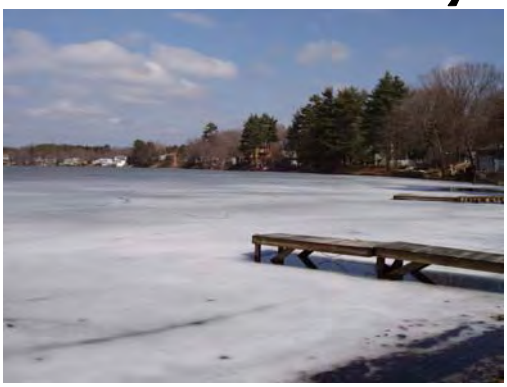
Eastern Connecticut Environmental Review Team Report

Eastern Connecticut
Resource Conservation and Development Area, Inc.

Jerry's Swamp and Little Pond Natural Resource and Habitat Enhancement Study Thompson, Connecticut

Jerry's Swamp

Little Pond



Environmental Review Team Report

Prepared by the
Eastern Connecticut Environemntal Review Team
of the
Eastern Connecticut Resource Conservation and Developme nt Area, Inc.

For the
Conservation Commissiona and
Inland Wetlands Commission
Thompson, Connecticut

February 2008

Report #613

Little Pond and Jerry's Swamp Field Review

March 2007

Jerry's Swamp—Phragmites

August 2007

Jerry's Swamp—Purple Loosestrife

March 2007

August 2007

Acknowledgments

This report is an outgrowth of a request from the Thompson Conservation Commission and the Thompson Inland Wetlands Commission to the Eastern Connecticut Conservation District (ECCD) and the Eastern Connecticut Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The Eastern Connecticut Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Tuesday, March 27, 2007.

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**Report expected, but not yet received.*

I would also like to thank Carolyn Werge, conservation officer, Judy Rondeau, wetland agent, Ron Tillen and Howard Peck, wetland commission members, Norma O'Leary, conservation commission member, Peter Nalewajk and Paul Hoenig, Little Pond Association and Fred Dodd, Doris T. Shaw Wildlife Sanctuary, and Charles Lee, DEP, Lakes Management Unit for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with maps. During the field review Team members were given additional information. Some Team members conducted a map review only. Following the review, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the town. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in the review of these important town resources.

If you require additional information please contact:

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Table of Contents

Introduction

Introduction

The Thompson Conservation Commission and the Inland Wetlands Commission have requested Environmental Review Team (ERT) assistance in reviewing Jerry's Swamp and Long Pond for habitat enhancement and concerns with Little Pond.

The entire area of Jerry's Swamp and Long Pond is considered to be of local and state significance. It is where the Five Mile River originates. Jerry's Swamp is a vast and diverse wetland that is extremely shallow in many portions and the town thinks that it may benefit from deepening portions of open water areas provided that it would not adversely affect the ecosystem. This would allow passage for canoes and kayaks.

The second focus area encompasses the hydrology of Jerry's Swamp which lies north and downstream from Little Pond. The water level at the pond is readily affected by activities (beavers) in Jerry's Swamp. Many dwellings along Little Pond suffer at various times from unusually high water levels that no longer recede as they did in the past. There have been historical maintenance issues with beaver activities, but currently the high level issues seem to indicate a problem beyond the usual maintenance associated with beaver activities.

Objectives of the ERT Study

The Conservation Commission and Inland Wetland Commission has requested ERT assistance to evaluate the swamp habitat to determine if it would benefit (fisheries and wildlife habitat and recreation) from intervention at this time and they are looking for an evaluation and guidance concerning the water flow from Little Pond through Jerry's Swamp.

During the ERT field review it was noted that there appeared to a stand of *Phragmites australis* (common reed) in Jerry's Swamp. Phragmites is an aggressive invasive plant that can take over a wetland system. The ERT coordinator asked the DEP Wildlife Division, Wetlands Habitat and Mosquito Management (WHAMM) Program to evaluate the area for possible control since the area has many natural and plant communities of local and statewide significance. The appendix contains photos from their field review (which was conducted in mid August 2007) and additional information on control methods. Purple Loosestrife was also found in the same vicinity. Purple Loosestrife (*Lythrum salicaria*) is also an invasive plant that is detrimental to wetland systems. It is hoped that the town and landowner would investigate opportunities that would assist them with funding of control methods. (DEP-WHAMM, Paul Capotosto and Roger Wolfe, (860) 642-7239)

Also contained in the appendix are some additional sources of information on beavers and flooding problems.

The ERT Process

Through the efforts of the Thompson Conservation Commission and the Inland Wetlands Commissions this environmental review and report was prepared for the Town of Thompson.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the town. Team members were able to review maps, plans and supporting documentation provided by the applicant.

The review process consisted of four phases:

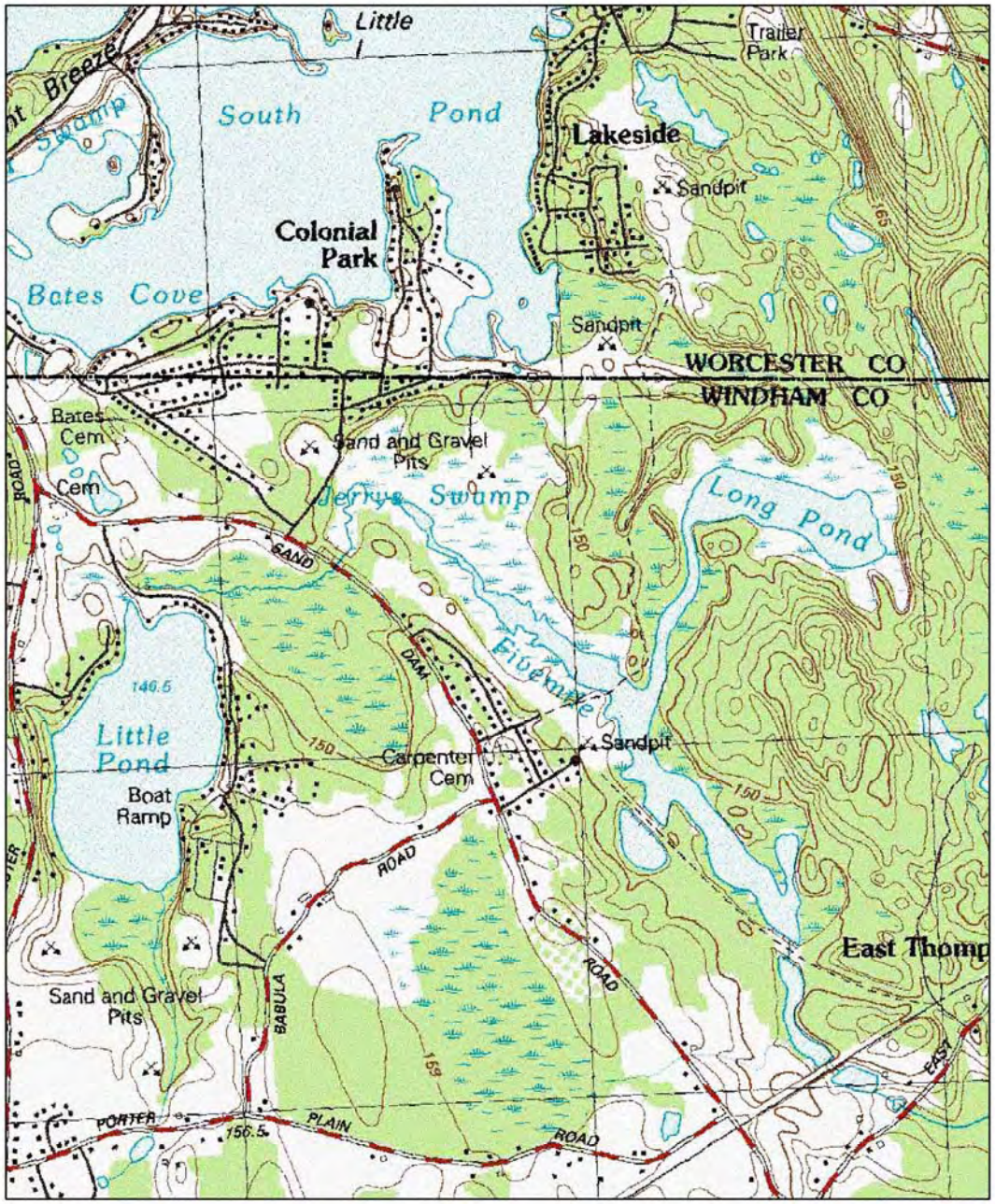
1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted Tuesday, March 27, 2007. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

The DEP Wildlife Division WHAMM program was asked to conduct a field review and evaluation of invasive species control outside of the regular ERT process. There field review was conducted on August 16, 2007 and air photos were taken on September 4, 2007.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

Jerry's Swamp Site Map



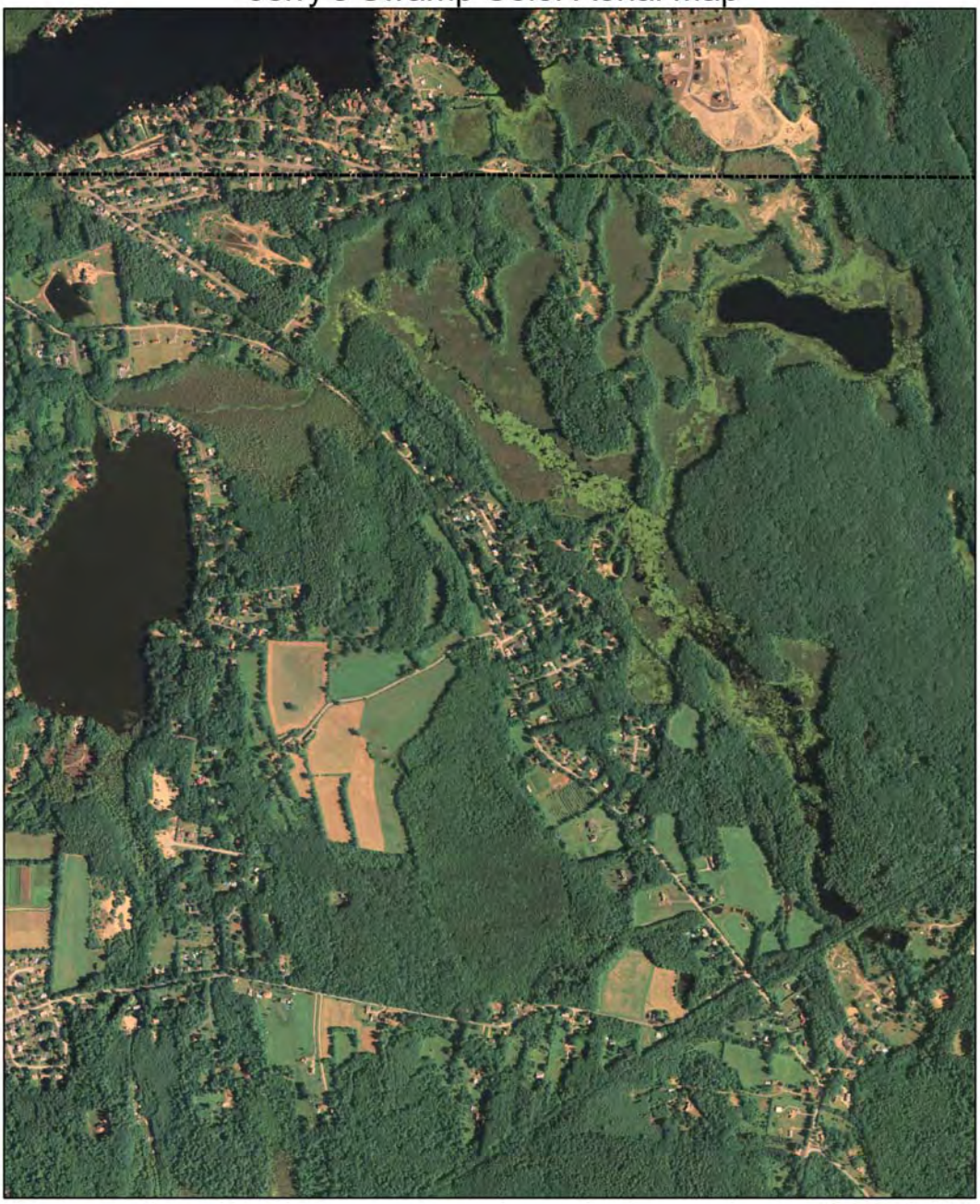
The Connecticut Environmental Review Team

This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team. This map is for educational use only. It contains no authoritative data. January 2008.

Thompson, CT

0 0.1 0.2 0.4 0.6 Miles

Jerry's Swamp Color Aerial Map



The Connecticut Environmental Review Team

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January 2008.

Thompson, CT

0 0.050.1 0.2 0.3 Miles

N
W E
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Fred Dodd Parcel
Five Mile River plus
Town Boundaries
Parcels
NDDB05
Water
This map is for general planning purposes only.
0
1
2 Miles

Topography and Geology

Jerry's Swamp along with Long Pong and Little Pond form the headwaters of Five Mile River. These wetland features occupy a long topographic lowland that is immediately east of a major ancient plate boundary that is referred to by geologists as the Lake Char Fault (see Rodgers, 1985). The west-facing eastern slopes of the watershed are underlain by one billion year old rocks belonging to the Avalon Terrane that welded onto North America about 390 million years ago. The lowland is filled with sand and gravel that was deposited by glacial melt-water streams a little more than 16,200 years ago.

Topography

Lake Chaubunagungamaug[1] (nomenclature from USGS Oxford Quadrangle topographic map, 1969) and the Five Mile River occupy a north-northwest/south-southeast trending lowland (Fig. 1)[2]. Lake Chaubunagungamaug drains to the northwest and Five Mile River drains to the south. The valley topography is hummocky with round-topped hills surrounded by irregular ridges and depressions (Fig. 2). Such topography is typical of areas underlain by sand and gravel that was deposited against melting blocks of glacial ice. Numerous gravel excavation operations in the area attest to the composition of the near surface material.

The surface-water divide between the Five Mile River drainage basin to the south and the Lake Chaubunagungamaug basin to the north trends roughly east-west along the Connecticut/ Massachusetts border. Little Pond (el. 478' MSL) and Long Pond (el. 478') are within the Five Mile River drainage. Jerry's Swamp has an elevation reported at 477'. Lake Chaubunagungamaug has a reported elevation of 479'.

Geology

Bedrock Geology

Bedrock geology is seemingly of lesser importance for this discussion. Rocks were not exposed in the immediate vicinity of the ERT field excursion, but they were seen in exposures on the east side of the southern part of Jerry's Swamp (Fig. 3). Those outcrops were likely gneiss of the Quinebaug Formation. The Quinebaug Formation is part of the Putnam/Nashoba Terrane that had welded onto North America prior to 390 million years ago. The hills immediately to the east are composed of the Plainfield Formation, schist, gneiss and quartzite, which are part of the Avalon Terrane. Avalon welded onto North America about 390 million years ago. The boundary between the two formations is the concealed Lake Char Fault, which is inactive today. Avalon Terrane was underthrust below North American Terrane along the Lake Char Fault. The lowland topography described above is a reflection

[1] Lake Chargoggagoggmanchauggagoggchaubunagungamaugg, also known as Webster Lake.
[2] Note elevations shown on map that accompanies this report are in meters. The 1969 edition of the USCGS Oxford Quadrangle topographic map shows elevations in feet. Little Pond elevation of 478'=146.5m.

of the trend of the Lake Char fault, enhanced by the greater resistance to erosion of Avalon rocks. Also, rocks of the Quinebaug Formation may be more fractured than Avalon rocks.

Surficial Geology

The surficial deposits are Pleistocene in age and date to the end of the last Ice Age glaciation. Local deposits of organic matter and alluvium are found in the lakes, swamps and rivers of the area. Glacial till is found on the highlands on both sides of the valley and covering two low hills within the valley. Till is a poorly sorted glacial soil, composed of mud, sand and pebbles, cobbles or even boulders. Till may be deposited in two ways. It is deposited beneath the glacier forming a bed over which the glacier moves. Till may also be deposited when the ice melts, leaving all the debris it was carrying on the ground surface much the way road sand is left by the side of the road when sand laden snow, plowed to the side of the road during the storm, melts. Most of the till is ten feet or less in thickness, but one low hill southeast of Little Pond is reported as thick till (>15') by Stone et al (2005).

Not all the debris carried by glacial ice is left in place when the ice melts. Substantial amounts are eroded by glacial melt-water that collects into streams. The streams deposit sand and gravel (but not the mud) along the stream's bed and banks. The sand and gravel deposits of the region were formed in this way. The hummocky topography indicates that when the streams were depositing the sediment large chunks of left-over ice were still present in the valley. The sand and gravel were deposited upon and against glacial-ice remnants. When the ice finally melted, large depressions, called kettles, were created that became the lakes and swamps of the area. Little Pond is in a kettle and Long Pond is a partially filled kettle. Jerry's Swamp is an area where gravel was deposited on top of a long, narrow chunk of ice.

Stone et al show that the temporary location of the southern terminus of the ice front sometime about 16,200+/- years ago passed through the area (see Fig. 4).

Ground-water

It is interesting to consider a north-south topographic profile (Fig. 5) starting at Lake Chaubunagungamaug and ending south of the Airline trail (see Fig. 1 for location). Lake Chaubunagungamaug has an elevation of 479' which may be controlled by a mill dam at its outlet in Webster. Jerry's Swamp has an elevation of 477' and has an outlet stream that drops to 470' elevation where it passes below the Airline trail. These elevations reflect the elevation of the ground-water table and indicate a southward gradient in head. Although there is a surface water divide just south of Lake Chaubunagungamaug, the southward regional head-gradient and the porous and highly transmissive nature of the sand and gravel aquifer suggest that water in the lower parts of the aquifer may travel southward below the surface-water divide. If this is the case, water from Lake Chaubunagungamaug may surface

through subaqueous springs in not only Jerry's Swamp, but also in Little Pond and Long Pond.

Lake and Swamp Levels

The elevation of Jerry's Swamp exerts a control on the elevation of Little Pond and Long Pond. The elevation of Jerry's Swamp today is controlled by flow through a 3-4-foot culvert beneath an abandoned rail-bed (Fig. 6). That culvert could easily be blocked resulting in a back up into the swamp and rising water levels in the swamp. The level of Little Pond is controlled by flow through a ditch recently excavated through an abandoned rail-bed (fig. 7) and a culvert under Sand Dam Road. A water level drop of about 1 feet exists on opposite ends of the ditch. The upstream end presumably is the same elevation as Little Pond. The flow width in ditch is about 3 feet and the flow depth is about 6". Blocking the ditch or the culvert would cause water levels in Little Pond to increase. Apparently beaver activities have caused blockages to both outlets discussed above. Preventing beaver activity or constructing outlets that beavers would not affect would lead to more stable lake and swamp water levels.

If there is hydrologic connection between Lake Chaubunagungamaug and Little Pond, water level in the higher lake could affect water level in Little Pond. A trained hydrologist should evaluate this possibility if the issue continues to be of importance. In addition to affecting water levels, Lake Chaubunagungamaug's water may be importing additional nutrients into Little Pond.

References

Rodgers, John, 1985, Bedrock Geological Map of Connecticut. State Geological and Natural History Survey of Connecticut, Nat'l. Resource Atlas Series

Stone, J.R., London, E.H., and Thompson, W.B., 1992, Surficial Materials map of Connecticut. U.S. Geol. Surv. and State Geol. And Nat. Hist. Surv of Connecticut.

Stone, J.R., Schafer, J.P., London, E.H., DiGiacomo-Cohen, M.L., Lewis, R.S., and Thompson, W.B., 2005, Quaternary Geologic Map of Connecticut and Long Island Sound Basin (1:125,000). U.S. Geol. Surv. Sci. Invest. Map # 2784.

Figure 1. Topographic map showing line of topographic profile (Fig 5).

Figure 2. Local ridge composed of sand and gravel that helps define hummocky topography. This material was deposited by a glacial melt-water stream that was flowing in a crevasse or possibly a tunnel in the ice at the end of the last ice age.

Figure 3. Bedrock exposures on east side of Jerry's Swamp.

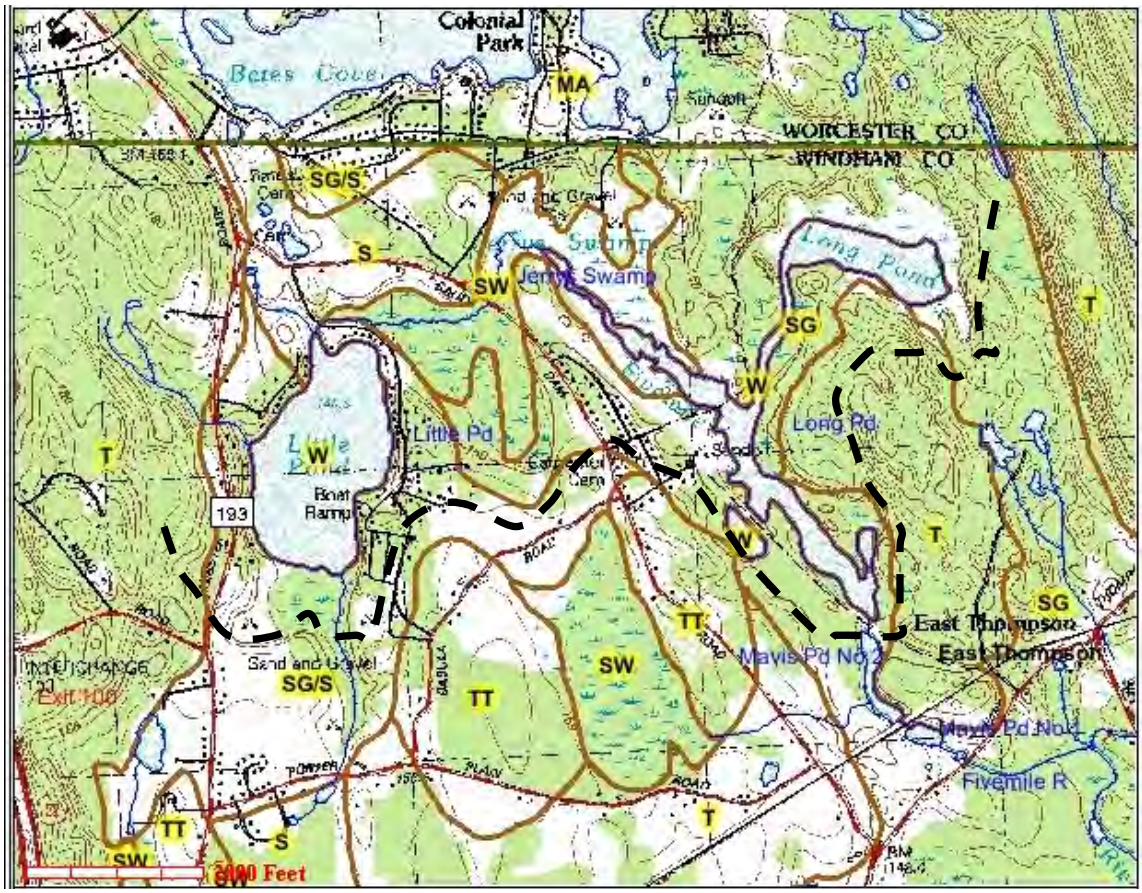


Figure 4. Surficial materials in the area surrounding Little Pond (from Stone and others, 1992). Dashed line marks position of a temporary still-stand in the melt-back of the glacier some time between 16,500 and 16,000 years ago (Stone and others, 2005).

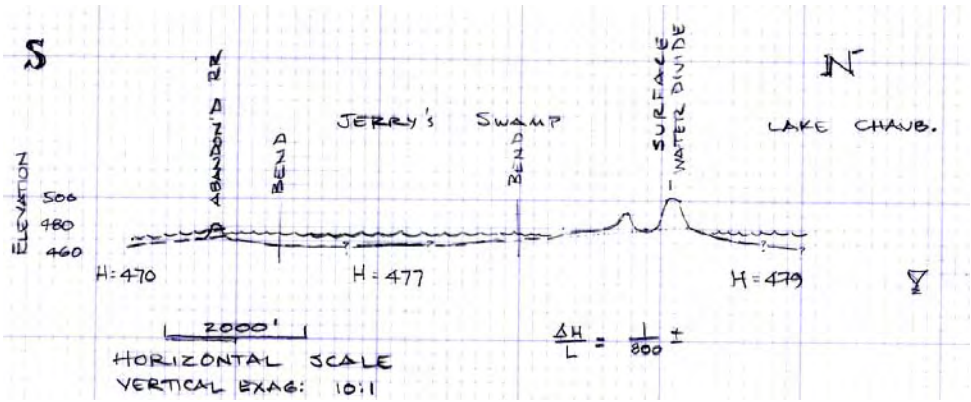


Figure 5. Topographic profile as indicated in Fig. 1. Note decrease in water-table elevation from north to south. A hydraulic gradient of 1:6-800 may drive groundwater southerly in deeper parts of the shallow aquifer. Thus water originating in Lake Chaubunagungamaug could be issuing from subaqueous springs in Little Pond or Jerry's Swamp.

Figure 6. Out-flow of Jerry's Swamp is through 3-4' concrete pipe that passes beneath abandoned rail-bed.

Figure 7. Intake of Jerry's Swamp. Water flow through a short swampy water-course brings water from Little Pond to Jerry's Swamp. Photograph on left looks upstream toward Little Pond. Photograph on right looks downstream into Jerry's Swamp.

Conservation District Review

The Eastern Connecticut Conservation District (ECCD) evaluated the conditions at Little Pond and Jerry's Swamp with regard to habitat enhancement and ECCD's comments are as follows:

Little Pond

Little Pond is typical of many ponds in the region, in that seasonal homes were constructed along the shoreline over the past several decades. Overtime, may of these homes have become year-round residences. This type of development creates many problems with regard to the water quality and habitat. One of the primary problems is that septic systems could be outdated, inadequate, and/or too close to the lake. The second most common problem is pollutants carried from the developed properties into the pond by stormwater runoff. ECCD recommends that the Town consider actions which can be taken to a) reduce the current negative impacts, and b) reduce or prevent future negative impacts. Some actions to consider are:

1. Inspection of current septic systems to determine condition, adequacy for the residence, and appropriateness of location in relation to the pond
2. Improvement/relocation of septic systems which are not functioning properly, inadequate for the residence, or located too close to the pond
3. Educate residents concerning pollutants they can control, such as lawn pesticides, household cleaners and other chemicals, pet waste, driveway runoff, etc.
4. Limit use of the items listed in #3 above.
5. Provide residents with information on how to discourage geese
6. Encourage residents to plant and maintain riparian buffers
7. Limitations and conditions for future development around the pond

Aerial view of boat launch.

During the field tour, the review team visited the boat ramp at Little Pond. In addition to the list above, the District recommends that improvements be made at the boat ramp to prevent sediment and other contaminants from running off the boat ramp into the pond.

Launch and turn around area.

Series of "Choke Points"

The ERT Team proceeded downstream and inspected the locations where flow is restricted, beginning with the outfall of Little Pond, and ending approximately three miles downstream at a hiking trail crossing. Below are ECCD's observations at each of the four choke points.

Outfall of Little Pond

The outfall of Little Pond is a culvert pipe approximately 3 to 4 feet in diameter. At the time of the ERT inspection, this culvert was essentially clear. During the meeting, concern was expressed by local residents that the water level in Little Pond has risen to abnormally high levels in recent years after major storm events. It was reported that there has been beaver activity in the area and the beaver have made attempts to block this culvert. In addition to beaver, flotsam could get hung up at the culvert, and this could also contribute to reduction of flow through the culvert. If the outfall of Little Pond becomes even partially blocked, high water levels on Little Pond can result. ECCD recommends the following:

1. Frequent, regular inspections and clearing of debris and/or beaver cuttings at the Little Pond outfall
2. Control the beaver population
3. Reconstruction of the outfall to increase the capacity in order to accommodate high flows

Sand Dam Road

Sand Dam Road is situated on top of a berm that appears to have been built to cross this swampy area. To allow the flow to move downstream, there is channel approximately five feet wide through the berm, and a bridge has been constructed for Sand Dam Road to cross the channel. This choke point is similar to the outfall of Little Pond and the same recommendations apply. In addition, if the Town wishes to determine whether or not this choke point could impact the water level in Little Pond, the District recommends an evaluation be made that would take into consideration the precise elevation of Sand Dam Road in relation to the Little Pond outfall culvert, the capacity of the channel at Sand Dam Road, and the water-holding capacity of the swamp and stream channel located between the outfall of Little Pond and Sand Dam Road. In other words, determine if it is possible for Sand Dam Road to cause water to back up into Little Pond.

Hiking Trail – Crossing #1

View (looking upstream) of the footbridge and Sand Dam Road

Approximately 100 feet downstream from Sand Dam Road, there is an old railroad bed that has been converted to a hiking trail. Similar to Sand Dam Road, an elevated berm was constructed across the wet area to support the railroad. The tracks have been removed and the elevated berm is now a hiking trail. There is a wide channel cut through the earthen berm and a footbridge spans over the channel to accommodate hikers. It was explained to the ERT that a culvert pipe was the former method for conveying water through the berm, but this was recently converted to the open "V" shaped channel the ERT observed. This new channel appears to have ample capacity and more capacity than the channel at Sand Dam Road, so the choke point in this area will be Sand Dam Road, until the water is so high that it flows over Sand Dam Road.

Since the channel has already been reconstructed to accommodate high flows, our only recommendations are numbers 1 and 2, above, which are regular maintenance to keep the channel open, and controlling the beaver population.

Hiking Trail – Crossing #2

Culvert pipe at the second trail crossing

Approximately one mile south (downstream) along the hiking trail, the trail again crosses the watercourse. At this location the water is conveyed through the earthen berm by way of a culvert pipe which is approximately 3 feet in diameter. Local residents informed the ERT that high flows of water exceed the capacity of this pipe. There is a proposal to install an additional structure to convey more water; however, there are no definite plans at this time. The District recommendations here are similar to those for the Sand Dam Road choke point, which is to say that if the Town wishes to determine whether or not this choke point could impact the water level in Little Pond, the District recommends an appropriate evaluation be made. The District also again recommends regular maintenance to keep the culvert pipe open, and controlling the beaver population.

Our overall impression of Jerry's Swamp is that it is a fully functioning wetland and human activity has caused only minor to moderate degradation. The District considers this swamp to be a valuable natural resource and the District encourages the Town to limit human disturbance in the swamp's watershed which could pollute the swamp or alter the hydrology.

Wetland Review

The ERT team examined the hydrologically connected Little Pond, Jerry's Swamp, and the Five Mile River system as was viewable from road crossings, rail bed trails and other general access points.

The Team was asked to comment on the combined problems of lake elevation rising, and the organic massing in the connecting waterway between Long Pond and Five Mile River.

Wetland-wise this system comprises an extensive acreage of high quality wetlands, with frequent interspersion of upland islands and a water quality that outwardly is excellent. There is a tremendous amount of shallow open water, very much diversity in emergent and scrub shrub vegetation and shady shoreline which, in all, makes the system a water regime most towns would be envious of. The functions of this lake, wetland and river system including nutrient recycling and flood storage have been described in the fisheries section of the is report. But other issues, specifically related to land use, may be affecting the water quality within the drainage.

Beaver Problems

The team found that the water level of Little Pond had been corrected when the damming impacts of the local beaver population were controlled. Two locations were specified as problematic.

The first was the outflow of the lake that passes under Jezierski Lane. Here the outflow pipe was recently cleared of debris providing a free flow of water out of the lake and under the road into Jerry's Swamp.

The screen/rack is free of debris on the Lake side of the road.

The second problem is the much larger culvert that, when blocked, results in much larger consequences. This 48 inch sectional concrete culvert conducts the main flow of the Five Mile River under the former rail bed as it moves downstream. Beavers, having stopped that

flow, have caused upstream flooding. This problem too had been rectified for the time being at the date of the Team meeting.

This large culvert carries the main flow of the Five Mile River under the rail trailbed. A look through the culvert, as this photo does, shows the flow rate before the spring melt. As can be seen, the upstream side is clear, which allowed for full flow at the time of the visit.

Historically the lake level had been reasonably maintained by the annual trapping of nuisance beaver. With the cessation of beaver control +/-four years ago, the two problems came to be noticed. There seemed to be an understandable desire for nature to take its course to keep the area natural and thus eliminate beaver trapping. But, as with so much of the Connecticut landscape, the local landscape has been very much altered through the years. The rail bed being the most dominant remnant of this alteration. Today beaver control is just part of the means necessary to keep the area as natural as possible within the constraints of historic landscape changes while still maintaining the quality and value of the abutting lands.

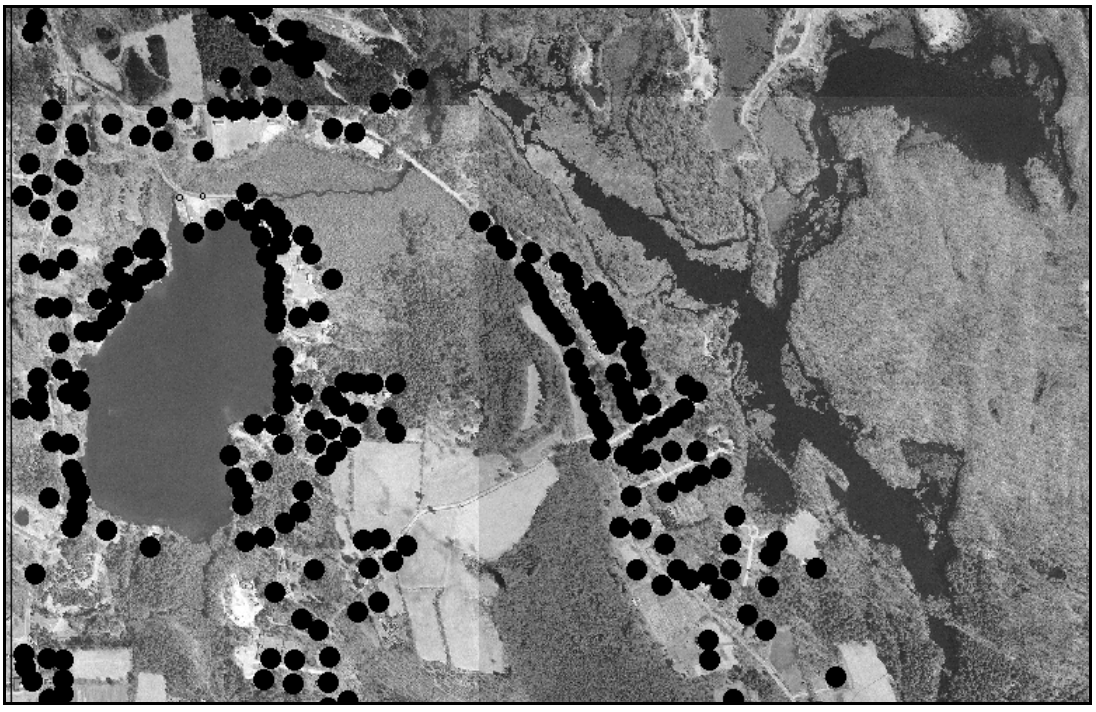
The two photographs above depict the northeast shore of Little Pond over a span of seven decades. On the left is the photograph from April 1934. On the right is the photograph from spring, 2004. In the earlier photo a mound or dike-like feature clearly stands out along the northeast shore. It may be interpreted as a way that was used to keeping floodwaters *in the lake* instead of losing the water to overland flow to the north east and into Jerry's swamp. It appears that the mound no longer exists in the 2004 photos, leaving the house lots to do the work (?). *This is CT State Library photograph number 00940*.

Massing Organics

The situation of massing organics in the outflow stream from Long Pond to the Five Mile River was brought up to the Team. During the phases of growth in the ecosystem, some organic materials accumulate large masses underwater. Since the massed organics are below water, the oxygen needed for decomposition is limited. Sometimes these partially decomposed masses of organic material break off and work their way to the surface. Once the organics rise to the surface they are exposed to oxygen and begin further decomposition. Phases of growth, partial decomposition, mass breakoffs and floatations are natural in some systems. It would take more investigation than the Team is able to provide to assess whether the organics in the passageway between Long Pond and the Five Mile River are a natural stage in the growth and organic decomposition of the in the wetland system or are the result of outside influences.

Land Use Change/Impervious Surfaces/ Water Quality in the Watershed

This April 1934 aerial photograph (above) depicts a two square mile area (1,280 acres). Much of the land at that time was dedicated to agricultural fields. Within these bounds were located 27± roofed structures and three main roadways.



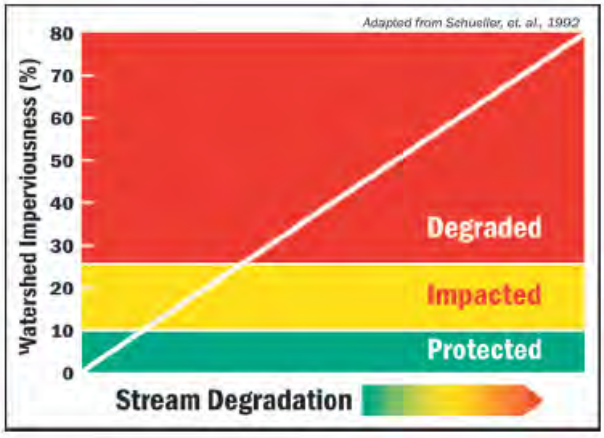
Seventy years later the April 2004 aerial photograph (above) depicts, in the same two square mile area, about 248 roofed structures, or nearly a ten fold increase. Approximately

two thirds of these structures, with the accompanying impervious surfaces and fertilized and pesticided lawns, are within 300 feet of wetlands or watercourses.

The tenfold structure increase/increased development seen in the past seven decades introduced vast amounts of impervious surfaces into the watershed. Typically, runoff from impervious surfaces is channeled into roadways, then directed by the curbs and gullies/ditches downhill to pass into storm drains. The storm drains in turn outlet into, or just upslope of, wetlands. Minimizing impervious surface is one way to decrease this runoff, and thus decrease the impacts to the wetland/lacustrine systems.

A rule of thumb for any given drainage is that the water quality decreases as impervious surface in the watershed increases. (Impervious surfaces are generally thought of as roads, driveways, roof tops, sidewalks, etc.) The numbers/ranges seen in the graphic which follows are often referred to when reviewing the long term health of the watershed.

Generally speaking the water quality of the stream is considered to be well protected when the imperviousness in the watershed is 0-10 percent of the total land cover. The studies show that from that 10 percent to about 26 percent imperviousness, the water quality is compromised. After ~26 per cent definite degradation is taking place. As with many studies, the numbers are not absolute for every scenario, but the concept is sound. Impervious surfaces then become a critical predictor of future water quality.



This graphic is taken from NEMO Fact Sheet Number 3 entitled: Impacts of Development on Waterways. *The fact sheet and this graphic are available on line at:* http://nemo.uconn.edu/tools/publications/fact_sheets/nemo_fact_sheet_3_s.pdf *.The NEMO URL:* http://nemo.uconn.edu/tools/publications.htm *may be visited for many other Facts Sheets on Nonpoint pollution information for municipal officials.*

Finally, it may be worthwhile at this time to investigate the septic systems abutting the lake. Tests for failing septic systems and information about septic system care and BMP's (Best Management Practices) can be obtained from the local health department. With house lots in such close proximity to the shore of Little Pond, understanding the lake's potential nutrient loading from lawn fertilizers and pesticides in combination with imperfect septic system function may answer future water quality questions.

Fisheries Resources

Little Pond

Little Pond, also known as Schoolhouse Pond, is a natural lake, 65 acres in size with a 477-acre watershed (Jacobs and O'Donnell 2002). It is a fairly shallow pond with a maximum water depth of 14 feet. The shoreline of the lake is heavily developed with residences around its entire length (Jacobs and O'Donnell 2002). It is fed by surface runoff, groundwater inputs and a small wetland stream from the south. Water transparency in the pond can be fairly turbid, (less than 3 feet) due to algal blooms. Little Pond has not been sampled by the DEP Lake and Pond electrofishing survey. The fish community is expected to be mainly comprised of largemouth bass, chain pickerel, yellow perch, sunfish species and brown bullhead. It is annually stocked by the DEP Inland Fisheries Division with over 500 adult brown and rainbow trout.

Jerry's Swamp/Long Pond

The fish community in this area is most likely fairly similar to that of Little Pond with the exception that water temperatures would be too warm to support trout species. This geographical area, which represents the headwaters of the Five Mile River basin, is a very valuable wetland ecosystem providing a diversity of emergent, floating and submergent wetland vegetation and shallow, open water habitats for a variety of fish and wildlife. One of the more important functions of this wetland area is water storage. Wetlands serve to store floodwaters during high precipitation periods and conversely function to augment base streamflows of the Five Mile River during dry periods. This wetland area also is useful in nutrient cycling by enhancing the decomposition of organic matter; incorporating nutrients back into the food chain and also serves to filter out sediments and particles suspended in runoff water thereby reducing downstream sediment loading in the Five Mile River.

Comments/Recommendations

Flooding Issues

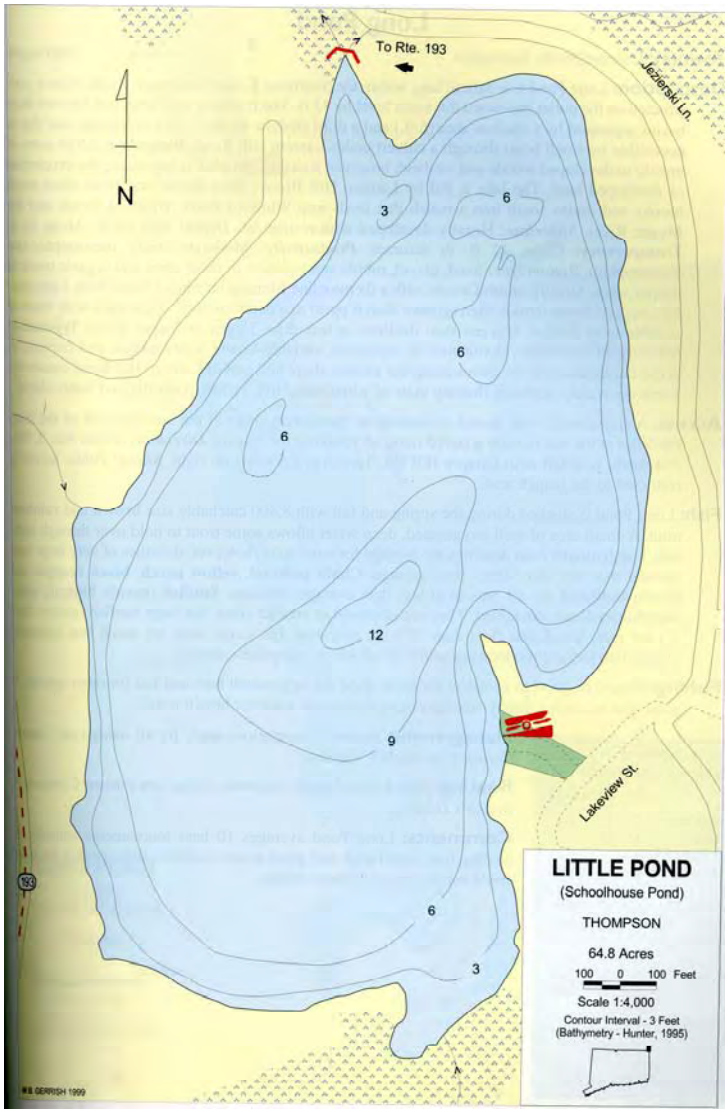
One of the issues of concern by Little Pond residents is that lake water surface elevations have been higher than normal in recent years. It appears that culverts conveying the outlet of Little Pond underneath Jerzierski Lane and Sand Dam Road are undersized and may contribute to flooding issues especially when these small openings are plugged-up by beavers. Another contributing factor may be that Sand Dam Road and the adjacent abandoned railroad line act as a berm and hydraulic control thereby affecting storage and movement of water from Little Pond and its adjacent large wetland complex to the northeast into Jerry's Swamp. The Town of Thompson may want to investigate replacing culverts with new culverts with increased hydraulic capacity.

Dredging

From a fisheries resource perspective, there are no viable reasons to dredge existing diverse wetland habitats in Jerry's Swamp and Long Pond. Deepening and increasing the amount of open water habitats while facilitating canoe and kayak passage through marshy sections will not serve to significantly enhance fish habitats. A dredging project involves a whole host of complex environmental issues that would need to be sufficiently addressed before receiving regulatory approval. Dredging activities come under the regulatory purview of the CTDEP Inland Water Resources Division and the U.S Army Corps of Engineers. Contact Mr. Bob Gilmore at 860-424-3019 regarding specific CTDEP permit requirements.

Literature Cited

Jacobs, R. P. and E.B. O'Donnell. 2002. A Fisheries Guide to Lakes and Ponds of Connecticut. Connecticut Department of Environmental Protection. DEP Bulletin 35. 354 pp.



Page 186

Little Pond

Town(s): Thompson

Description: Little Pond is a natural lake within the Thames River Drainage Basin. ***Watershed:*** 477 acres of mostly agricultural land with some residential development and undeveloped wetland, The pond is fed by surface runoff, a small wetland stream from the south, and bottom springs. It is the headwater of the Fivemile River, which eventually flows into the Quinebaug River, ***Shoreline:*** Heavily developed with residences around its entire length. ***Depth:*** Max 14 ft., Mean 7.1 ft. ***Transparency:*** Turbid; reduced to 3 ft. by an algal bloom. ***Productivity:*** Moderate (early mesotrophic-mesotrophic). ***Bottom type:*** Not available. ***Stratification:*** Does not occur due to limited depth. ***Vegetation:*** Sparse; the sandy, rocky bottom supports small numbers of pondweeds. Some floating mats of white water-lily and yellow pond-lily are present.

Access: A state-owned boat launch is located on the eastern shore. Facilities at the site include a gravel boat ramp

suitable for small boats and parking for 6 cars.

Directions: Exit 100 off 1-395, east on Wilsonville Rd., left (north) on Rte. 193, right (east) on Sand Dam Rd., first right on Jezierski Lane, launch is 0.7 miles on right. ***Shore:*** Limited to the boat launch area.

Fish: Not sampled during the lake and pond electrofishing survey. Little Pond is stocked each spring with 800 catchable size **brown** and **rainbow trout.** Trout are unable to holdover due to the pond's limited depth.

Fishing: Should be fair for trout in the spring. Fishing is also reportedly fair for largemouth bass, chain pickerel and yellow perch.

Management: Statewide regulations apply for all species (see current *Connecticut Anglers' Guide).* **Boating:** No special regulations (see current *Connecticut Boater's Guide).*

The Natural Diversity Data Base

The Natural Diversity Data Base maps and files regarding the project area have been reviewed. According to our information there are several state listed species and a significant natural habitat that occur in the vicinity of this project site. Attached is a list of state-listed species that occur in this area of Thompson.

Scientific Name	**Common Name**	**State Protection Status**
Animals		
Enneacanthus obesus	Banded Sunfish	SC
Erynnis pesrius persius	Persius Duskywing	E
Natural Communities		
Acidic Atlantic white cedar basin swamp		
Poor Fen		
Plants		
Aster nemoralis	Bog Aster	E
Eriophorum vaginatum var. spissum	Hare's Tail	T
Gaylussacia dumosa var. bigeloviana	Dwarf Huckleberry	T
Hydrocotyle umbellate	Water Pennywort	E
Rosa nitida	Shining Rose	SC

E=Endangered T=Threatened SC=Special Concern

"Endangered Species" means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "endangered species" pursuant to the federal Endangered Species Act.

"Threatened Species" means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the sate and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the federal Endangered Species Act, except for such species determined to be endangered by the Commissioner in accordance with section 4 of this act.

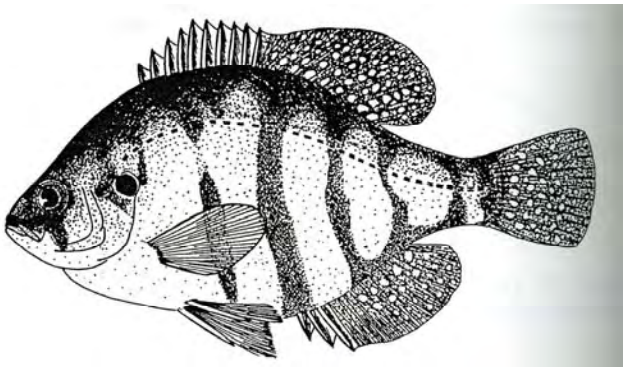
"Species of Special Concern" means any native plant species or any native nonharvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state.

Photos and further information about the listed plant species may be found on the Connecticut Botanical Society's website – www.ct-botanical-society.org.

Atlantic White Cedar Swamps: ~Basin Swamp - forested and/or shrub swamps with stagnant or slow moving water; in topographically defined basins; on decomposed peats and mucks. Includes acidic Atlantic white cedar basin swamps and Atlantic white cedar (Chamaecyperis thyoides) seasonally flooded forests. Community examples: Atlantic white cedar / Highbush blueberry (Vaccinium corymbosum) community Atlantic white cedar / Rosebay rhododendron (Rhododendron maximum) community. Examples - Rhododendron Sanctuary Natural Area Preserve, Pachaug State Forest, Voluntown.

Poor Fen - peatlands dominated by ericaceous shrubs. Includes Highbush blueberry (Vaccinium corymbosum) seasonally flooded shrublands, Leatherleaf saturated dwarf shrublands and Black huckleberry (Gaylussacia baccata) saturated dwarf shrublands. Community examples: Highbush blueberry - Cinnamon fern (Osmunda cinnamomea) community Leatherleaf - Black spruce (Picea mariana) community Leatherleaf - White beak sedge community Leatherleaf - Marsh St. John's wort (Triadenum virginicum) community. Example Pachaug State Forest, Voluntown

Banded sunfish *(Enneacanthus obesus)* have been documented in the vicinity. The banded sunfish is currently classified as a Species of Special Concern pursuant to Connecticut General Statutes (CGS) Chapter 495. This classification was recommended by the Endangered Species Advisory Committee for Fish, based in part on the findings of Jann (2001). Much of our information on banded sunfish emanates from a University of Connecticut Masters Thesis by Jann (2001). Other sources of information on banded sunfish in Connecticut include Whitworth et al. (1968) and Whitworth (1996). Banded sunfish distribution in Connecticut has been correlated with muddy, leaf debris substrates, underground springs seeps, high water clarity (i.e. low turbidity) and abundant levels of aquatic plants (Jann 2001).



Enneacanthus obesus, from Whitworth et al. 9 1968, page 104

Persius duskywing (*Erynnis persius persius*) is a species of butterfly. Their habitat is listed as open areas including

mountain grasslands, marshes, sand plains, seeps, and streamsides. The caterpillar hosts are Lupine (*Lupinus*), golden banner (*Thermopsis*), *Lotus*, and other legumes.

The Wildlife Division recommends that a lepidopterist familiar with the habitat requirements of Persius duskywing conduct surveys. A report summarizing the results of such surveys should include habitat descriptions, invertebrate species list and a statement/resume giving the lepidopterists' qualifications. The DEP does not maintain a list of lepidopterists in the state. A DEP permit may be required by the lepidopterist to conduct survey work; you should ask if your lepidopterist has one. The results of these investigations can be forwarded to the Wildlife Division and, after evaluation, recommendations for additional surveys, if any, will be made.

The Wildlife Division has not made an on-site inspection of the project area nor been provided with details or a timetable of the work to be done. Again, please be advised that should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the DEP Wildlife Division should be requested. Consultation with the Wildlife Division should not be substituted for site-specific surveys that may be required for environmental assessments.

The Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications to DEP for the site.

References

Jann, D.B. 2001. Distribution, habitat, and population characteristics of banded sunfish in Connecticut. Masters Thesis. University of Connecticut, Storrs, Connecticut. 58 pgs.

Whitworth, W.R. 1996. Freshwater fishes of Connecticut. Connecticut Geologic and Natural History Survey Bulletin No. 114. Hartford, CT. 243p.

Whitworth, W.R., P.L. Berrien, and W.I. Keller. 1968. Freshwater fishes of Connecticut. State Geol. and Nat. Hist. Survey of Connecticut. Bull No. 101. Hartford, Connecticut. 134 pp.

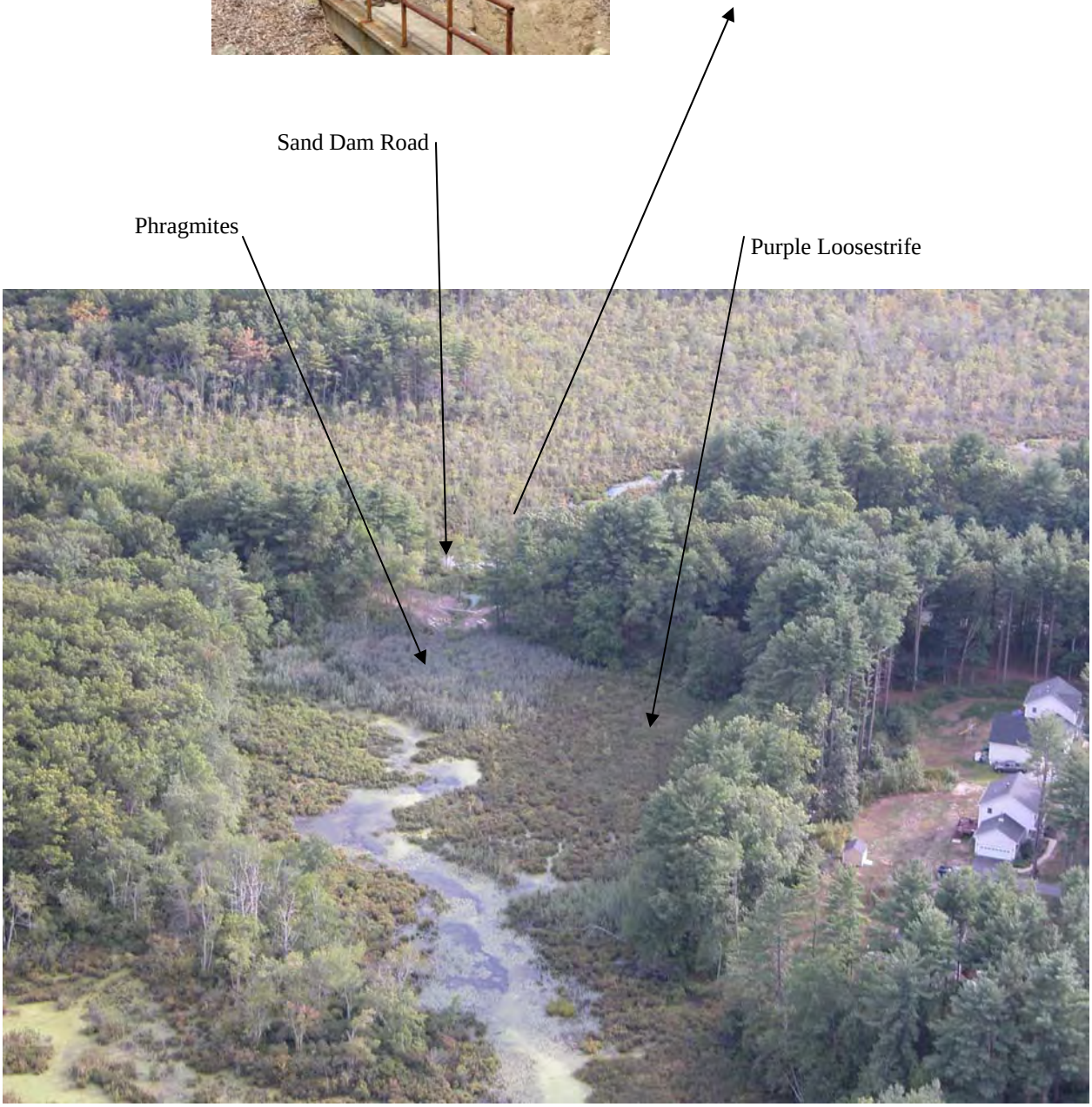
A Watershed Perspective

This section will be added as soon as it is received.

Appendix

DEP WHAMM Field Review

Paul Capotosto and Roger Wolfe of the DEP Wildlife Division, Wetlands Habitat and Mosquito Management (WHAMM) Program conducting a field review in August 2007 for potential Phragmites and Purple Loosestrife control in Jerry's Swamp.



State of Connecticut
Department of Environmental Protection, Wildlife Division
Wetland Habitat and Mosquito Management (WHAMM) Program

Controlling *Phragmites australis* in Connecticut's Fresh and Salt-water Marshes

By Paul Capotosto and Roger Wolfe

Introduction

Phragmites australis (Phragmites) is an aggressive invasive plant species that has taken over thousands of acres of marsh in Connecticut. The State of Connecticut, Department of Environmental Protection's Wildlife Division, Wetlands Habitat and Mosquito Management (WHAMM) Program has been doing Phragmites control since 1997. Over sixty-six sites have been under the WHAMM Program's control.

Phragmites will grow up to twenty feet tall.

Ecology of Phragmites

Phragmites is a tall, perennial grass that grows in brackish, tidal fresh water and non-tidal freshwater wetlands. Native Phragmites may have been present as a minor component of Connecticut tidal marshes as early as 3000 years ago, in the last 30-50 years Mono-typical Phragmites has begun spreading at rates as high as 1-3% per year in areas like the lower Connecticut River. It is estimated that approximately 10% of Connecticut's tidal wetlands are dominated by Phragmites. It is now confirmed that the new, pestiferous type that has been introduced, possibly on ballast stone from ships is genetically different from the native plant stock and most commonly found in Europe. Scientists, environmental managers, and conservationists are increasingly concerned about the potential threat that the spread of Phragmites poses to tidal wetlands throughout Connecticut. Phragmites is intolerant of soil salinities greater than 18 parts per thousand, and is not typically found in salt marshes, unless the salinity regime has been altered through impounding, diking, or some other means of restricting tidal flow. Phragmites is most abundant in brackish and tidal fresh marshes. Other factors that may contribute to the spread of Phragmites include disturbances such as excavation, sedimentation, and increasing nutrient concentrations.

Phragmites forms dense colonies or clones, mainly spreading through thick underground rhizomes. New shoots form at the nodes along the rhizomes. In nutrient rich areas such as tidal marshes, this simple and rapid method of spread allows Phragmites to out compete the native plant species for both nutrients and light. In addition to the threat imposed on native plant and animal species, the density of the Phragmites stems, and the slow rate of decomposition in the winter after the stems die provide an ample supply of combustible material that creates a serious fire hazard, particularly in suburban areas.

Thick stands of Phragmites form nearly impenetrable barriers to the movement of animals and large birds such as ducks, shorebirds, and wading birds. These thick monotypic stands result in a degradation of habitat

by raising the marsh elevation and by filling in the open water areas. This habitat loss starts the decline in the diversity of bird species utilizing a marsh. The Seaside sparrow, Salt marsh Sharp-tailed sparrow (both Connecticut species of special concern), as well as the Willet and Marsh wren are less abundant in Phragmites marshes. In part, this is because they are highly adapted to nesting in native plant-dominated salt and brackish marshes. Although a few bird and animal species such as rail, American bittern, Red-winged blackbird, deer and muskrat may inhabit Phragmites marshes, most other animals and birds avoid these areas because they cannot penetrate the thick stands.

The shade from these large stands also hinders the growth of native plants. Studies have shown that plant diversity is greatly reduced after forming dense monocultures of Phragmites, and that it appears to be detrimental to the overall ecological functioning of tidal wetlands.

Control Methods

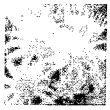
The objective of Phragmites control is not to completely eradicate the species, because in certain circumstances it may contribute to overall habitat diversity of tidal wetlands, but rather to reduce the extent of monotypic stands that have invaded brackish and tidal-fresh water wetlands. There are two methods commonly used to control the spread of Phragmites:

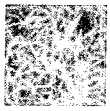
1) **Restoring Salt Water Tidal Flows**: The Connecticut Department of Environmental Protection's Office of Long Island Sound Programs, Tidal Wetland Restoration Program uses this method for restoring degraded tidal wetlands. Since Phragmites is intolerant of salinities greater than 18 ppt, reintroduction of salt water results in a gradual replacement of Phragmites by native vegetation. However, this generally takes between ten to twenty years. Planting of native vegetation is usually not necessary because of abundant natural seed sources. Since 1980, this restoration technique has been applied to approximately 1500 acres in Connecticut.
2) **Three-year Herbicide Application and Mowing**: Glyphosate, Habitat and Renovate are aquatic herbicides used to control dense stands of Phragmites in brackish tidal marshes of Connecticut. An aquatic surfactant (sticking agent) is typically mixed with the herbicide prior to its application. Spraying occurs during the mid summer months until the first frost. A month after the spraying, mowing can begin and is done with low ground pressure equipment. This ground spraying and mowing is done for three successive years. About eighty percent of the Phragmites will be eliminated after the first year. Since 1997, the WHAMM Program has controlled 1,497 acres.

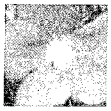
DEP WHAMM Program's lgp ARGO with tower and tank with high-pressure sprayer.

DEP WHAMM Program's Posi-Track ASV MD2810 Low Ground Pressure Mower.

Invasive Plant Atlas of New England







Phragmites australis
(Common reed)

COMMON NAME

Common reed

FULL SCIENTIFIC NAME

Phragmites australis (Cav.) Trin. ex Steud.

FAMILY NAME COMMON

Grass family

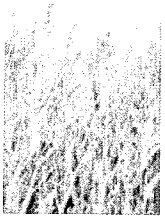
FAMILY SCIENTIFIC NAME

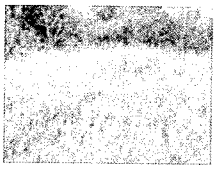
Poaceae

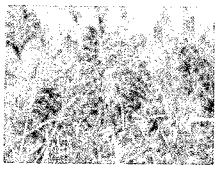
IMAGES


Size comparison

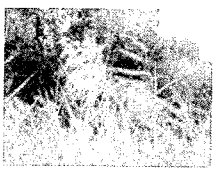

Incursion


Habit

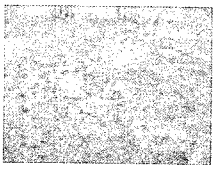

Incursion


Close-up of inflorescence


Hairs at Leaf-stem Junction


Inflorescence


Incursion


Rhizomes

Variation

NOMENCLATURE/SYNONYMS

Synonyms: *Phragmites communis* Trin.
Phragmites phragmites (L.) Karst.

DESCRIPTION

Botanical Glossary

Phragmites australis is a stout grass that measures 2-4 m (6.5-13 ft.) in height. It is most often seen in large colonies. The stems and leaves are smooth and glabrous. The gray-green leaves are acuminate in shape, 25-50 cm (10-20 in.) long and 2-3 cm (0.75-1 in.) wide. Long white hairs are present at the leaf-sheath junction. The light brown to purple inflorescence is 20-40 cm (7.5-15 in.) long. The spiklets have 3-7 flowers and appear between July and September. The flowers are surrounded by silky white hairs. The first glume is narrowly elliptic and blunt, while the second is linear and nearly twice as long as the first. The lemmas are narrow, 8-12 mm (0.3-0.5 in.) wide. The rachilla hairs are white and as long as the lemmas. However, they are not visible until after the flowers bloom. The seeds are brown, light weight, and about 8 mm (0.3 in.) long. In the fall the plant turns brown, and the inflorescences persist throughout the winter. Page References Crow & Hellquist 261, Gleason & Cronquist 781, Holmgren 732, Magee & Ahles 153. See reference section below for full citations.

SIMILAR SPECIES

Phragmites australis (Cav.) Trin. Ex Steud (Native Phragmites) Recent research has indicated that there are native populations of *Phragmites australis* in the United States. In 2004 the native populations were described as a subspecies, *Phragmites australis* subsp. *americanus* (Article by Saltonstall, Peterson, & Soreng). The native and non-native plants are very difficult to differentiate. invasivespecies.net has a webpage that illustrates the morphological differences between them. It has been shown that most of the New England populations are non-native.

REPRODUCTIVE/DISPERSAL MECHANISMS

Phragmites australis reproduces by means of wind-dispersed seeds and by long rhizomes.

DISTRIBUTION

Phragmites australis is found on every continent in the world except for Antarctica. It is found in every state in the United States except Alaska and Hawaii. It occurs in all of the New England states.

HISTORY OF INTRODUCTION IN NEW ENGLAND

Phragmites australis is native to some parts of the United States, and probably came to New England via natural immigration. It is known to have been in New England for at least 4000 years. Unfortunately, some non-native strains of this plant have also made their way here, and it is suspected that these strains are the ones that have exhibited invasive tendencies.

HABITATS IN NEW ENGLAND

,Coastal Beach or Dune,Coastal Grassland,Edge,Lake or Pond,Open Disturbed Area,River or Stream,Roadside,Salt Marsh,Vacant Lot,Wet Meadow

Phragmites australis can grow in a variety of habitats. It is most often found in wet or marshy areas. This plant grows best in fresh water, but also can be found in brackish, acid or alkaline wetlands. It is also found at the interface between wetlands and uplands.

THREATS

Though some populations of *Phragmites australis* may be native to parts of New England, it becomes problematic when it forms huge monocultures that spread for acres, excluding native species. This often happens when it grows in polluted areas that other plants do not tolerate as well. It can form large, thick walls at the interface of upland and wetland habitats. In New England it is clear that this plant has spread beyond its original range, and is now encroaching into wetlands that contain rare native species.

MANAGEMENT LINKS

The Nature Conservancy

Massachusetts Audubon Society

Plant Conservation Alliance
Fact sheet with management information

The Connecticut Invasive Plant Working Group
Invasive Plant Management Guide

DOCUMENTATION NEEDS

Documentation required: A photograph of the habit, flowers or fruit.
Best time for documentation: Summer, fall.

ADDITIONAL INFORMATION

Adirondack Park Invasive Plant Program
Identification, fact sheet, management and distribution information

Integrated Taxonomic Information System
Taxonomic information

The PLANTS database
General information and map

The Nature Conservancy
Extensive description, images, and control information

Invasiveplants.net
Differences between native and non-native *Phragmites australis*

USDA Forest Service Fire Effects Information System
Extensive information including a description and ecology of the species

Virginia Native Plant Society
General information including control

Ohio Perennial and Biennial Weed Guide
Photographs and description

National Invasive Species Information Center
Links to more information

Virginia Tech Weed Identification Guide
Description and photographs

REFERENCES

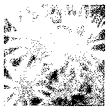
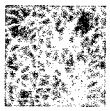
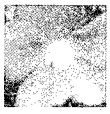
Britton, N.L. and A. Brown. 1970. An Illustrated Flora of the Northeastern United States vol. 2. Dover Publications Inc., New York. Crow, G.E. and C.B. Hellquist. 2000. Aquatic and Wetland Plants of Northeastern North America. Vol 2. University of Wisconsin Press, Madison. Gleason, H.A. and A.C. Cronquist. 1991. Manual of Vascular Plants of the Northeastern United States and Adjacent Canada. 2nd ed. New York Botanical Garden, Bronx, New York. Graneli, W. 1989. Influence of standing litter on shoot production in reed, *Phragmites australis* (Cav.) Trin. Ex Steudel. Aquatic Botany 35: 99-109. Hara, T., J. van der Toorn and J.H. Mook. 1993. Growth dynamics and size structure of shoots of *Phragmites australis*, a clonal plant. Journal of Ecology 81: 47-60. Holm, L.G., D.L. Plunckett, J.V. Pancho and J.P. Herberger. 1997. World's worst weeds. University of Hawaii Press, Honolulu. Holmgren, N.H. 1998. Illustrated Companion to Gleason and Cronquist's Manual. New York Botanical Garden, Bronx, New York. Magee, D.W and H.E. Ahles. 1999. Flora of the Northeast. University of Massachusetts Press, Amherst. Marks, M., B. Lapin, and J. Randall. 1994. *Phragmites australis* (*P. communis*): threats, management, and monitoring. Natural Areas Journal 14: 285-294. Orson, R.A. 1999. A paleoecological assessment of *Phragmites australis* in New England tidal marshes: changes in plant community structure during the last few millennia. Biological Invasions 1: 149-158. Ostendorp, W. 1989. "Die-back" of reeds in Europe - a critical review of literature. Aquatic Botany 35: 5-26. Saltonstall, K. 2002. Cryptic invasion by a non-native genotype of *Phragmites australis* into North America. Proceedings of the National Academy of Sciences, USA. 99(4): 2445-2449. Thompson, D.J. and J.M. Shay, J.M. 1985. The effects of fire on *Phragmites australis* in the Delta Marsh, Manitoba. Canadian Journal of Botany 63: 1964-1969. USDA, NRCS. 2001. The PLANTS Database, Version 3.1. (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Van der Toorn, J. and J.H. Mook. 1982. The influence of environmental factors and management on stands of *Phragmites australis*. I. Effects of burning, frost, and insect damage on shoot density and shoot size. Journal of Applied Ecology 19: 477-499.

DATA RETRIEVAL

Data

MAPS OF PLANT DISTRIBUTION IN NEW ENGLAND

Map

Lythrum salicaria
(Purple loosestrife)

COMMON NAME

Purple loosestrife

FULL SCIENTIFIC NAME

Lythrum salicaria L.

FAMILY NAME COMMON

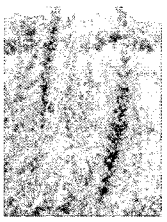
Loosestrife family

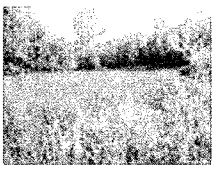
FAMILY SCIENTIFIC NAME

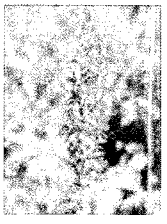
Lythraceae

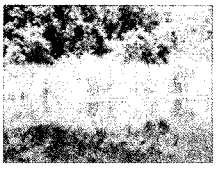
IMAGES

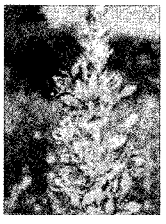

Habit


Inflorescence


Incursion


Inflorescence close-up


Habitat


Inflorescence Close-up

NOMENCLATURE/SYNONYMS

Synonyms: None

DESCRIPTION

Botanical Glossary

Lythrum salicaria is an herbaceous wetland perennial that can grow 0.5-1.5 m (1.5-5 ft.) tall. The leaves are either opposite or in whorls of three. The can be pubescent or glabrous. They are lanceolate to linear in shape and 3-10 cm (1-4 in.) long. The larger leaves can be cordate or clasping at their bases. The flowers are purple, magenta or pink. They are numerous and borne on spikes that are between 10 and 40 cm (4-16 in.) long. The hypanthium is linear and twice as long as the sepals. Each flower has 5-7 petals, and the open flowers measure 7-12 mm (0.3-0.5 in.) in diameter. The relative lengths of styles and stamen in these flowers can vary in three different ways. The flowers are in bloom from July to September. The fruits are capsules, each containing numerous reddish-brown seeds. Page References Bailey 719, Crow & Hellquist 203, Fernald 1048, Gleason & Cronquist 311, Holmgren 292, Magee & Ahles 758, Newcomb 351, Peterson & McKenny 224,288. See reference section below for full citations.

SIMILAR SPECIES

Lythrum alatum Pursch. (winged loosestrife)* Picture of *L. alatum* *Lythrum alatum* is a rare plant that could be confused for *L. salicaria*. *Lythrum alatum* is usually shorter in stature, being around 40-80 cm (1-2.5 ft.) tall. The leaves of *L. alatum* are alternately arranged, except for the very lowest ones on the plant. The flowers of *L. alatum* are solitary in the upper axils while the flowers of *L. salicaria* are numerous and in a spike-like arrangement.

REPRODUCTIVE/DISPERSAL MECHANISMS

Lythrum salicaria reproduces through prolific seed dispersal. The seeds usually fall to the ground after they have ripened. They can be moved longer distances by water or by becoming attached to waterfowl.

DISTRIBUTION

The native distribution of *Lythrum salicaria* is central and southern Europe, Great Britain, and parts of Russia. It has been reported from every state in the United States except for Florida, Arizona, Louisiana, Georgia, Alaska and Hawaii. This plant occurs widely in New England.

HISTORY OF INTRODUCTION IN NEW ENGLAND

The first report of *Lythrum salicaria* in North America was in 1814. Before the year 1900, 14 of 30 populations of this plant were located in estuaries from Massachusetts to New Jersey. The location of these sites would indicate that the plant was introduced somewhere in this area. There are several hypotheses on how this plant was originally introduced. It could have been a part of ship ballast from Europe, or attached to sheep. *Lythrum salicaria* was also planted as a source of nectar for beekeeping, as an ornamental, and for medicinal reasons. By the 1900's there were more inland populations being reported, one of these being in New Hampshire. Since these initial introductions it has spread by being planted in gardens and by waterways.

HABITATS IN NEW ENGLAND

,Coastal Grassland,Herbaceous Wetland,Lake or Pond,River or Stream,Shrub Wetland,Wet Meadow,Yard or Garden

Lythrum salicaria is most often found in situations where the soil is moist. However, it prefers areas with shallow water, and does not grow as prolifically in deep-water situations.

THREATS

Lythrum salicaria has the ability to completely dominate wetlands, forming a vast, monotypic stands. These stands prevent the establishment of native wetland plants. It can also have an effect on native wildlife that may not be able to use the plants as effectively for food or cover. By forming these dense stands, *Lythrum salicaria* can clog waterways, causing problems for both commercial and recreational uses of these areas. *Lythrum salicaria* can produce up to 2.5 million seeds per plant. Thes seeds persist in the seed bank for years, even if the plants themselves are eradicated from an area. This plant can hybridize with a native loosestrife, *L. alatum*, which is considered rare in Connecticut. With repeated hybridizations, it is possible that the gene pool for *L. alatum* could be depleted.

MANAGEMENT LINKS

Illinois Natural History Survey
General description and management guidelines

The Nature Conservancy

Wisconsin Department of Natural Resources

The Connecticut Invasive Plant Working Group
Invasive Plant Management Guide

Plant Conservation Alliance
Fact sheet with management information

DOCUMENTATION NEEDS

Documentation required: A photograph of the plant habit, flowers or fruit.
Best time for documentation: Summer, fall.

ADDITIONAL INFORMATION

Integrated Taxonomic Information System
Taxonomic information

PLANTS Database
General information and map

The Nature Conservancy
Extensive description, biology, photographs and control information

Plant Conservation Alliance
Fact sheet that includes images and control information

Virginia Native Plant Society
General information including control

Ohio Perennial and Biennial Weed Guide
Photographs and description

Wisconsin Department of Natural Resources
Description, biology and control information

National Invasive Species Information Center
Links to more information

Illinois Nature Preserves Commission
General information and control

Adirondack Park Invasive Plant Program
Identification, fact sheet, management and distribution information

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DATA RETRIEVAL

Data

MAPS OF PLANT DISTRIBUTION IN NEW ENGLAND

Map

:: Site Map
:: Contact Us
:: Report a Sighting

Beavers in Connecticut

Their Natural History and Management

Connecticut Department of Environmental Protection
Bureau of Natural Resources
Wildlife Division

http://dep.state.ct.us

About this Document

This document is the PDF version of the original printed publication. Page numbers when viewing on screen do not necessarily correspond to the printed page numbers.

Copies of this publication are available from the Connecticut Department of Environmental Protection Wildlife Division, Sessions Woods Wildlife Management Area, P. O. Box 1550, Burlington CT 06013-1550.

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State of Connecticut
John G. Rowland, *Governor*

Department of Environmental Protection
Arthur J. Rocque, Jr., *Commissioner*
David K. Leff, *Deputy Commissioner*

Bureau of Natural Resources
Edward C. Parker, *Chief*

Wildlife Division
Dale W. May, *Director*

Beavers in Connecticut

Their Natural History and Management

By Judy M. Wilson

Edited by
Kathy Herz

Illustrations by
Paul J. Fusco

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF NATURAL RESOURCES
WILDLIFE DIVISION

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The author acknowledges that this publication has relied heavily on information and concepts presented in the publication *Beavers in Massachusetts: Natural History, Benefits, and Ways to Resolve Conflicts Between People and Beavers*, written by Scott Jackson and Thomas Decker. Appreciation is also extended to the Connecticut Wildlife Division staff, particularly Ann Kilpatrick and Paul Rothbart, who helped review and edit this publication.

DEP Wildlife Division Mission

The mission of the Connecticut Department of Environmental Protection (DEP) Wildlife Division is to maintain sustainable, diverse and healthy populations of wildlife, including endangered and threatened species, on all suitable habitat throughout the state in numbers compatible with existing land use practices and the carrying capacity of the habitat. The Wildlife Division conducts public awareness and technical assistance programs to enhance privately-owned habitat and promote an appreciation for and understanding of the value and use of Connecticut's wildlife. The Division also manages wildlife habitat on state forests and wildlife management areas, regulates hunting seasons and bag limits for all harvested wildlife species within Connecticut and manages public hunting opportunities on state-owned, state-leased and permit-required areas. In addition, the Division conducts, with volunteer assistance, conservation education and hunter safety programs to promote safe and ethical hunting practices.

FOREWORD

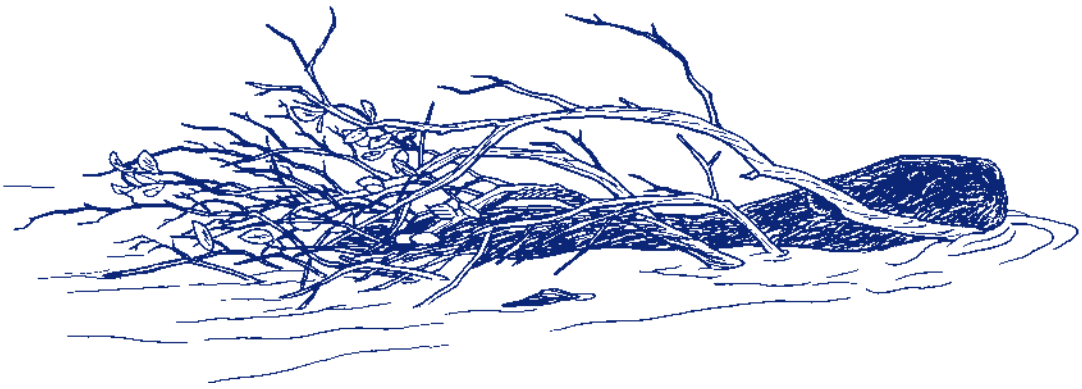
From the Wildlife Division Director
Dale W. May

This booklet is intended to provide property owners, land managers and municipalities with information on the natural history, population dynamics and beneficial aspects of beavers, as well as options for resolving beaver-human conflicts.

There are more beavers in Connecticut today than at any time during the past three centuries. This is due to protective Department regulations regarding trapping and decades of restoration work by wildlife personnel from the DEP. Beavers were extirpated from Connecticut and much of their eastern range by the mid-1800s before being reintroduced to Connecticut near the beginning of the 20th century. For several decades, especially in the 1950s-1970s, biologists and conservation officers routinely livetrapped and relocated nuisance beavers throughout the state to hasten their recovery and expansion into suitable habitat. Needless to say, they were successful. By the 1980s, the trap and transfer activity came to a halt. Beavers were restored in every watershed and we simply ran out of places to put them.

As with many wildlife restoration programs, the beavers and the wildlife agency are the victims of our own success. Along with ecological and aesthetic benefits presented by a thriving beaver population, we now are faced with an ever-increasing rise in beaver complaints. We respond to most of the hundreds of complaints we receive annually by extolling the virtues of beavers and preaching tolerance and appreciation. We do this sincerely and effectively. In addition, we provide technical assistance on options such as fencing and piping. However, we also recognize that beavers do cause serious problems that cannot be solved through tolerance alone. In some cases, such as where public health and safety are jeopardized, beavers may have to be removed completely from the site. In others, landowners employ trapping to maintain beaver populations at a manageable level.

Our goal is to maintain a balance between beaver populations, suitable beaver habitat throughout the state and human land uses. This cannot be accomplished in the absence of some form of population control, such as trapping. We provide landowners with information, technical assistance and options (both lethal and nonlethal) to ensure that beavers are viewed as an asset, rather than a liability. Now that we have successfully restored beavers to the state, we must accept the obligation to manage them responsibly.



Introduction

History of Beavers in North America

The beaver (*Castor canadensis*) has played an important role in the ecological, historical and cultural heritage of North America for thousands of years. By damming streams and brooks, beavers flooded vast areas of forestland, eventually creating systems of marshes and open ponds where mature forests once stood. Through this process, a variety of plant communities were created which provided the necessary habitats for a wide variety of plants, mammals, birds, reptiles and amphibians.

Native Americans relied heavily on beavers for food, medicine, tools and clothing. Beavers also were bartered and exchanged between different Native American groups. They were taken year-round as needed, using snares, dead falls and clubs and by draining their ponds. In a culture where all animals were respected for both their practical and spiritual values, the beaver was honored, especially as a source of guidance on family matters.

For two centuries after the first colonists arrived, beaver pelts were an important medium of exchange in North America, not only between Native Americans and the new settlers, but also between the colonists and Europe. The commercial trade in furbearers, especially beavers, helped drive the early economic and historic development of this country. Beaver pelts were in great demand in Europe, where the fur was made into high quality felt and then fashioned into hats. By the early 1800s, the beaver top hat was the fashion rage in England. This demand for fur allowed North American colonies to pay off large debts to England through beaver trapping. Much of this country was explored and mapped by trappers and "voyagers" who traveled into unsettled territory in search of beaver pelts. Settlers would later use many of the travel routes established by the early fur trappers as they moved west to settle new lands for farming.

By the mid-1800s, much of the East had been cleared of forests and thousands of acres of wetlands were drained for agriculture. As settlers pushed westward, these land use practices continued. There were no laws regulating the harvest of beavers or most other species of wildlife at that time. The loss of habitat and unregulated harvest resulted in the extirpation of beavers from much of their former range in North America. By the mid-1800s, beavers no longer existed in Connecticut and most of the northeastern United States.

Throughout New England, many farms were abandoned in the late 1800s as farmers traveled west in search of more productive land. As the forests grew back, habitat conditions once again became suitable for beavers. At about the same time, the top hat fell out of fashion and people's attitudes regarding the use of natural resources began to shift from one of resource exploitation to conservation. By the turn of the 20th century, all of the northeastern states had developed fish and wildlife agencies, as well as programs and laws to provide for the restoration of many wildlife species. These factors set the stage for the recovery of the beaver.

Beavers Return to Connecticut

In Connecticut, historical records indicate that a pair of beavers was released in Union in 1914. Sporadic releases in the late 1920s and early 1930s reestablished isolated populations, mainly in northwestern and northeastern Connecticut. Beavers also began moving into northwestern Connecticut from New York and Massachusetts where restoration efforts also were occurring. By the 1950s, even the small population of beavers present in the state, estimated at 20 colonies, was causing problems for property owners. The Connecticut State Board of Fisheries and Game initiated a livetrap and transfer program to relocate problem beavers into suitable unoccupied habitat. This helped the beaver population to increase dramatically and

expand its range over a larger portion of the state. With the beaver population well established throughout Connecticut, the Board of Fisheries and Game opened the first regulated trapping season in 1961 in response to the growing number of complaints and to manage the beaver population as a renewable natural resource.

The Beaver Population Today

As we enter the 21st century, the beaver population is abundant (estimated at 5,000 to 8,000 individuals), well distributed and continuing to grow across Connecticut. In fact, there are more beavers in the state presently than at any other time in the last 300 years. Beavers exist today in a landscape drastically different than that of pre-colonial times. They now share their habitat with 3.4 million people on 3.2 million acres of land dominated by residential, commercial and industrial development. In addition, it is estimated that Connecticut has lost 25 to 30 percent of its original inland wetlands and watercourses. By compiling complaint data and monitoring the harvest of beavers, biologists are able to draw conclusions about the relative abundance and population trends of beavers in the state.

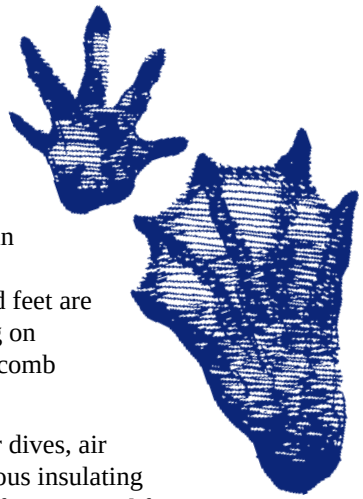
Each year, the Connecticut Department of Environmental Protection (DEP) Wildlife Division responds to hundreds of complaints related to beaver activity. The number of complaints is expected to increase as beaver populations continue to grow and suitable habitat is encroached upon or lost to development. Connecticut citizens and communities must continue to learn how to coexist with beavers. The Wildlife Division is faced with the challenge of maintaining a healthy beaver population on a statewide basis and keeping it in balance with the available habitat. This challenge involves minimizing the problems beavers cause while realizing the ecological, cultural, economic and aesthetic benefits they provide.

Natural History

Distribution and Habitat

Beavers are distributed throughout most of the forested regions of North America, from Alaska to northern Mexico, Nevada and northern Florida. They can be found throughout Connecticut. Beavers inhabit rivers, streams, lakes, ponds, marshes and other wetland sites. These areas must provide adequate food and water depth so that beavers can survive under the ice during winter. Large lakes prone to wave action, fast-moving streams and areas with highly fluctuating water levels are generally unsuitable for beavers.

Description



As North America's largest native rodent, the adult beaver weighs between 30 and 65 pounds. It measures from 24 to 36 inches, not including the tail, which can measure 12 to 18 inches. This heavy-bodied animal has powerful muscles and short legs and, while slow-moving on land, it is well-adapted for life in a semiaquatic environment. On land, beavers typically walk on all four legs, but if carrying mud or sticks, they may hold the materials in their front paws and walk upright. When underwater, thin membranes protect the beaver's eyes and internal valves automatically close within the ears and nose. The lips can seal tightly around the front teeth, preventing water from entering the throat and trachea and enabling the beaver to chew underwater. The large hind feet are webbed and clawed to help propel the animal through the water and provide stable footing on muddy ground. Beavers use their webless front feet to dig, carry materials, hold food and comb their fur.

The beaver's dense underfur is overlain with long, shiny guard hairs. When a beaver dives, air bubbles are trapped beneath the underfur next to the beaver's skin. This provides tremendous insulating qualities that allow the beaver to survive in icy waters. Two specialized claws on the hind foot are used for grooming the fur. The beaver's large, flattened, hairless tail is used as a rudder when swimming, a balance on land and a fat storage area; it also functions in heat regulation. The beaver swims at slow speeds by using its webbed feet and at faster speeds by undulating its body and tail. The tail is also used as a warning device when a beaver slaps it on the water before diving, signaling to other beavers that there is potential danger in the area.

The beaver has a pair of large scent glands, which produce castoreum oil, a pungent, yellowish fluid that is deposited on land to communicate territorial boundaries with other beavers. The beaver also has a pair of glands that produces an oil thought to be used in scent communication and as an aid in helping the fur repel water. Male and female beavers are indistinguishable, except that females have swollen nipples while nursing their kits. Kits are fully furred at birth, with eyes opened and teeth already cut but covered with a thin layer of tissue.

Food Habits

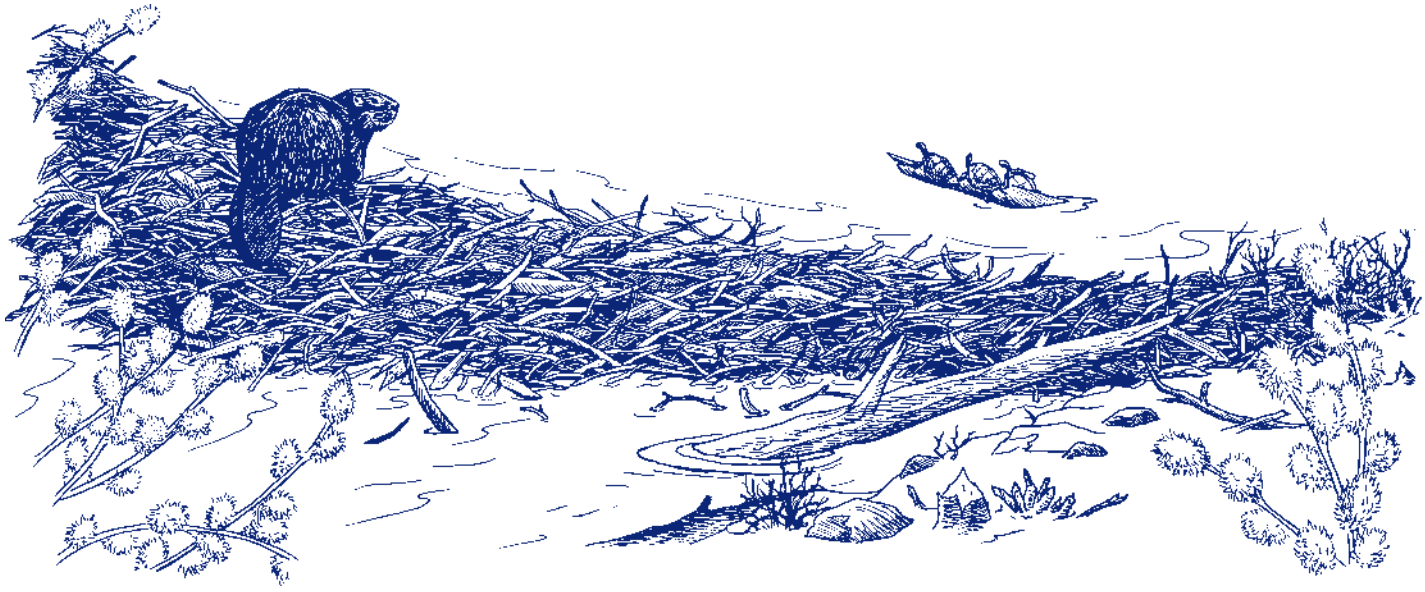
Using their sharp, continuously growing incisors, beavers feed primarily on the outer and inner bark, leaves, twigs, shoots and roots of woody plants. Preferred woody plants include aspen, birch, willow, ash and alder; although beavers will use almost any type of tree species if preferred foods are scarce. A variety of aquatic plants (water lilies, pondweeds, cattails) and other plants (horsetail, evergreen fern), sedges and grasses are consumed by beavers during summer. Branches and logs that have been stripped of leaves and bark for food are often used as construction materials for dams and lodges.

Life Cycle

Beavers are monogamous, having only one mate during the breeding season and often for life. They will readily take a new mate if one of the breeding pair is lost. Breeding occurs in midwinter (January or February). After a gestation period of 100 to 110 days, a single litter of two to six kits is born, usually in May or early June. An established colony of beavers in midwinter is typically comprised of an adult pair, two to four kits and two to four young from the previous year. At two to three weeks of age, the kits begin to eat vegetation; they are weaned at approximately six weeks. The young remain with the adults until their second year, at which time they are forced to leave the parent colony. This usually occurs in spring, before the next litter is born. The two-year-old beavers travel in search of suitable, unoccupied habitat where they can establish their own territory and start a new colony. Most beavers do not breed until their third year.

Dam Building

Unlike most wildlife species, beavers have the ability to modify their surroundings to meet their needs. They do this by damming a stream or brook and flooding an area of trees and shrubs to make an impoundment or “flowage.” By creating an impoundment, the beavers are less vulnerable to predation and they improve their access to food and dam-building materials. The length and height of a dam varies, depending on topography and water flow. In addition to the branches and sticks they cut, beavers also will use mud, leaves, grass, sod, lily pad tubers and even corn stalks as dam-building materials. They push materials, such as mud and stones, onto and into the growing dam by pushing them with their front feet and snout.



Adult beavers do the majority of the dam building with assistance from the juveniles. One or more dams may be built by a colony, depending on such factors as topography of the land, quality of the habitat and the number of colonies in the area. Several dams are often built downstream from the main dam, creating a terrace effect.

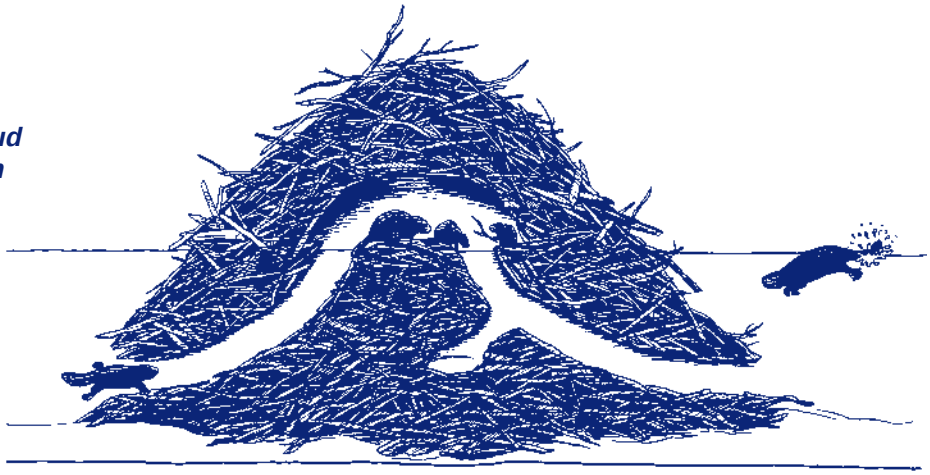
Lodge Building

Beavers typically construct a mound-shaped island of sticks and mud that serves as a year-round lodge. This lodge can vary in size from 20 to 40 feet at the base and rise four to eight feet out of the water. The lodge, which provides protection from the weather and predators, has several underwater entrances leading to one dry chamber used for resting, feeding and grooming. The kits also are born and cared for in the lodge. When beavers first move into an area they may temporarily use a bank den until a dam and suitable lodge can be constructed. Bank dens also may be used as temporary shelters when danger threatens and the beaver is far from the main lodge.

Behavior

Territorial by nature, beavers will not tolerate other beavers within their colony's home range. Beavers are active year-round. They are typically nocturnal, but are sometimes observed during the daytime. Activity is concentrated in the vicinity of the lodge and dam, but beavers may travel several hundred feet from the water in search of food and materials for dam and lodge maintenance. Beavers spend a great deal of time in the lodge during winter when their pond or impoundment is frozen. They rely on a stored pile of sticks and branches, commonly called a food cache, which is anchored to the bottom of the pond adjacent to the lodge. When the pond is iced over, beavers usually restrict their daily travel to retrieving food or checking the dam. If water depths are too shallow, the beavers may be frozen into the lodge and not survive the winter.

Beavers are normally docile animals and generally do not pose a threat to dogs or people swimming in the same area occupied by them. Beavers, like most other species of wildlife, tend to avoid people. However, it is not unusual for an adult with young in a lodge to swim back and forth and slap its tail on the water if someone approaches the lodge or enters the water.



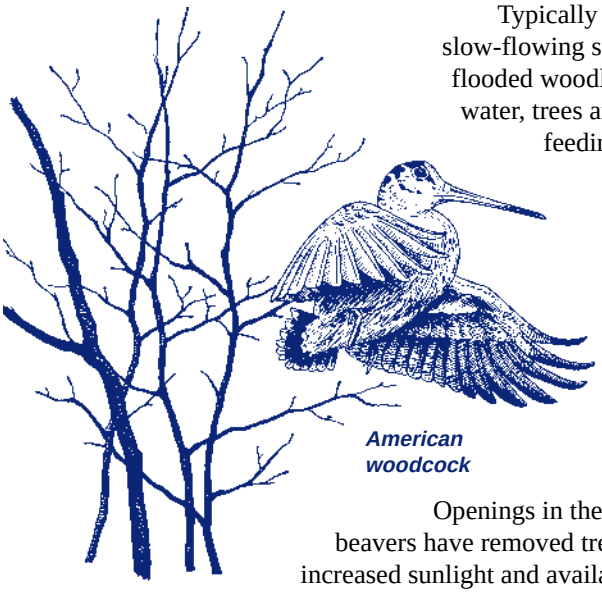
A dome- or teepee-shaped lodge is constructed by beavers out of sticks and mud within the wetland, upstream from the dam. The lodge contains a dry inside chamber which provides cover from the elements and a place to raise young. There are usually several underwater entrances to the lodge.

Benefits of Beavers

Creation of Wildlife Habitat – The Beaver Flowage Cycle

As soon as beavers move into an area, they begin to modify its ecology. As trees are cut and woodlands are flooded, natural succession (the predictable process where one plant community is replaced by another) occurs. Beavers can eventually create an open grassy habitat, called a "beaver meadow," where a forest once stood. At each stage of the beaver flowage cycle, favorable conditions are created for a new assemblage of wildlife.

Tree swallow



American woodcock

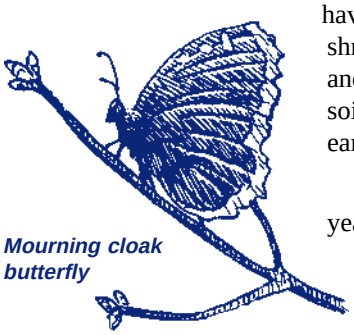
Typically the cycle begins when a beaver dams a slow-flowing stream in a forested area. This newly-flooded woodland, with its interspersion of standing water, trees and shrubs, creates ideal nesting and feeding habitat for waterfowl, including cavity-nesting species like wood ducks and hooded mergansers. As some of the older, larger trees die, they provide prime nesting sites for great blue herons. Woodpeckers excavate holes or cavities in the standing dead and dying trees (snags) and feed on the insects that are attracted to them. Abandoned woodpecker holes make excellent nest sites for other wildlife that cannot excavate their own cavity, such as black-capped chickadees, nuthatches, tree swallows and screech owls. Brown creepers may find their specialized nesting spots under the flaps of peeling bark on many of the snags.

Openings in the forest canopy occur over the water and on the surrounding land where beavers have removed trees and shrubs. Aquatic vegetation takes hold in response to the increased sunlight and available nutrients. Invertebrates, like crayfish, dragonflies, damselflies and fishing spiders, are now much more common. The presence of invertebrates attracts insect-eating wildlife, such as tree swallows, eastern kingbirds and bats.

Although conditions for brook trout may actually improve for the first few years after beavers have dammed a stream, the improvement is usually short-lived. Accumulating silt reduces water levels and covers the gravel substrate upon which fish lay their eggs. The water begins to warm up as the depth is reduced and exposure to sunlight is increased due to the loss of shade trees along the stream. Fish that flourish in warm water, such as bass, perch and sunfish, replace fish that prefer cooler water, like brook trout. Mink and river otter feed on the fish, frogs, salamanders and invertebrates that inhabit the new wetlands created by beavers.

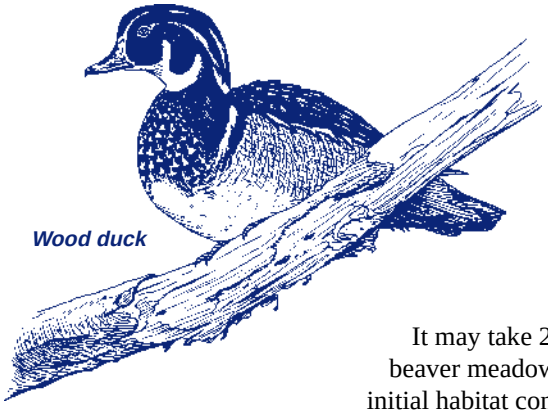
Mink

Over time, the beaver flowage may eventually look more like an open pond, as fewer trees remain standing and aquatic plants, such as cattails, sedges and rushes, become more dominant. The wetland is now highly attractive to muskrats, mallards, Canada geese, black ducks, least bitterns (state threatened) and king rails (state endangered). On the land surrounding the beaver flowage, great changes also have been taking place. As the forest canopy is removed by the beavers' cutting activity, plants, shrubs and vines that prosper in open sunlight begin to dominate the site. White-tailed deer and black bears feed on the various fruiting, succulent plants and grasses growing in the rich soil. The American woodcock, whose long bill is highly adapted for probing the soil for earthworms, often finds abundant worms in the moist soil surrounding a beaver flowage.



Mourning cloak butterfly

If beavers remain in an area, they typically exhaust their food supply over a period of years. After the beavers die or move on to find a new territory, the dam eventually breaks and a mud flat or silt bottom is exposed. Depending on site conditions, both grasses and sedges or shrubs and trees may begin to sprout and grow. A meadow containing a mix of grasses, sedges, wildflowers and weeds may persist for years, providing habitat for the American goldfinch, chipping sparrow, field sparrow, monarch butterfly and others.



Wood duck

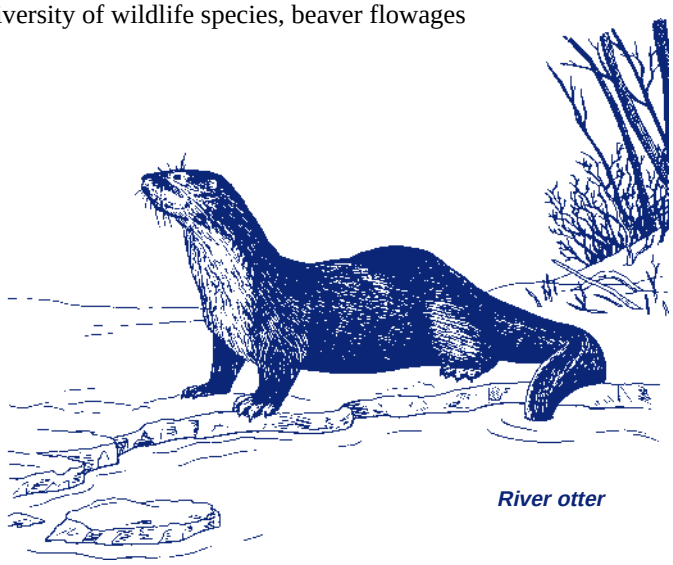
Predators, like the red-tailed hawk, fox and coyote, hunt the abundant populations of mice, voles and shrews that find food and cover in the beaver meadow. Dusky salamanders, two-lined salamanders and pickerel frogs also may be present. The meadow may still contain some standing dead trees, indications of its history under the influence of beavers.

After a period of years, shrubs become established and provide habitat for the yellow warbler, common yellowthroat, blue-winged warbler and chestnut-sided warbler. The change in plant communities is variable. It may take 20 to 50 years before the area resembles a forest again. In some cases, a beaver meadow may persist almost indefinitely. Factors influencing succession include initial habitat conditions, water chemistry, soil type, silt depth, amount of decaying vegetation and the length of time beavers are present.

Wetland Values

In addition to providing vital wetland habitat for a diversity of wildlife species, beaver flowages also provide many other functions and values, including:

Pollution filtration
Sediment removal
Aquatic productivity
Chemical and nutrient absorption
Flood control
Ground water recharge
Aesthetics
Recreation
Nutrient recycling
Water supply
Education and scientific research



River otter

Economic Benefits

As in past history, humans continue to derive economic benefits from beavers. Beaver pelts are sold to fur buyers who in turn sell them to manufacturers, where they are made into high-quality garments, such as coats, hats and gloves. The castor, obtained from the castor glands, is used as a base for perfumes. The meat may be used for personal consumption or is fed to pets.

From 1996-2000, an average of 926 beavers has been harvested annually in Connecticut during the regulated trapping season. The value of pelts fluctuates each year based on a variety of economic factors, including the demand for goods and the level of economic prosperity, especially in Europe and Asia where many of the furs are purchased.

Educational, Recreational and Aesthetic Benefits

Beaver flowages can be pleasing, aesthetic additions to a forested landscape. People value having the opportunity to see beavers and other wetland wildlife. Beaver flowages also offer tremendous recreational benefits for people, by providing places for canoeing, fishing, hunting, trapping, birdwatching and photography. As an educational asset, a beaver flowage can also be used as an outdoor classroom for students to learn about wildlife and wetland ecology. Beavers are an integral part of the Connecticut landscape, helping to promote biodiversity in our ecosystem.

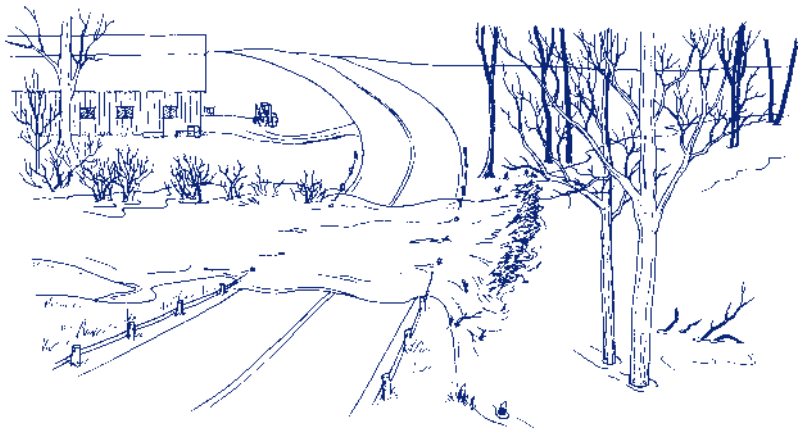
Yellow-rumped warbler

Beaver/Human Conflicts

- *Flooding*
- *Tree cutting*
- *Damage to man-made structures*
- *Impacts on other natural resources*
- *Water quality and public health issues*

While beavers can create and enhance wetland wildlife habitat, their activities often conflict with human needs and desires. The majority of conflicts involve flooding and the killing of trees. Trees are killed by felling or girdling, or by the flooding of their root systems for long periods of time. These trees may fall near or on buildings, cars, roads, driveways, railroads or power-lines. Flooding may affect buildings, roads, man-made dams and ponds, parking lots, driveways, agricultural fields, lawns, wells and septic systems. One of the most common complaints in Connecticut is the plugging of culverts that can cause property flooding and road and driveway damage. Beaver dams also may negatively affect other natural resources by altering wetland ecosystems. For example, dams can serve as barriers to migrating fish and cause inundation and siltation of rare plant and animal habitats.

Beaver damage can be costly and frustrating for landowners and others who use the affected areas. Many Connecticut towns spend thousands of dollars annually to break dams and clear culverts. Nationwide, beavers cause millions of dollars worth of damage each year. People living near beaver flowages often express concerns relating to aesthetics, water quality and health issues, such as giardiasis (see insert on giardiasis) and increased mosquito populations (see insert on mosquitoes). Some people feel that beaver activity "ruins" the aesthetics of an area, expressing that the dead trees and "stagnant" water are unsightly or that the beaver flowage smells. As organic matter builds up in a pond, the natural process of decomposition takes place. In a beaver pond, much of this decomposition occurs where oxygen levels are low or nonexistent. Decomposition under these conditions may create a smell much like rotten eggs. This is natural and there is no cause for alarm. The smell is usually temporary and tends to dissipate as the weather cools or rainfall increases.



Giardiasis

Giardiasis is an intestinal infection caused by an organism (a protozoan), known as giardia, that is shed in the feces of humans, dogs, cats, cattle, birds, deer, mice, beavers and other animals. The infection is contracted when food or water contaminated by feces is ingested. Giardiasis is found worldwide, with a higher incidence in countries with poor sanitary conditions. The infection is usually asymptomatic, but it can cause intestinal pain, diarrhea and weight loss.

Outbreaks in the United States have stemmed from contaminated municipal water supplies, with the blame often falling on aquatic and semi-aquatic animals, such as beavers. However, it has not been clearly established if wildlife species are important reservoir hosts for the organism that causes the illness. In the United States during the last three years, the Centers for Disease Control and Prevention has documented over 50 percent of all giardiasis cases being traced to poor sanitary practices at day care facilities. Human sewage leaks have also been implicated in outbreaks of the infection. Giardiasis can be prevented through proper sanitation and by not drinking untreated surface water. For more information on giardiasis, contact your local public health department.

Preventing and Solving Beaver/Human Conflicts

The Wildlife Division provides technical assistance to individuals experiencing problems associated with beaver activity. The options available depend on the time of year and the nature and severity of the problem. The following section outlines these options.

Land Use Planning/Development Design

Many beaver problems are the direct result of human encroachment on their habitat. Beaver/human conflicts can be expected to increase as land in close proximity to wetlands is developed for residential, commercial and industrial use. Municipal land-use planners and inland wetland commissions should be aware of the potential for beaver activity along wetlands and watercourses. Standard setbacks from wetlands may need to be increased based on site-specific characteristics.

Wetland crossings at roads, highways and driveways should be minimized. If a road must cross a wetland, consideration should be given to proper elevations and structure design. Research in New York has found that culvert size and type are the major factors determining whether beavers will plug a pipe. Standard round culverts may restrict stream flow, alter the stream width and may generate noise that attracts beavers. In general, larger cement box culvert or aluminum pipe arch culverts are preferred over smaller round culverts. Bridges are the least likely structures to be

Mosquitoes

Mosquitoes can exist in almost any natural aquatic environment or artificial container. Examples include salt marshes, swamps, snowmelt pools, shallow depressions or ditches that retain rainwater, tree holes, tire piles, clogged rain gutters and abandoned swimming pools. Connecticut has 48 species of mosquitoes, each with its own unique life cycle. In general terms, some species of mosquitoes lay their eggs on moist substrates (e.g., mud, wet leaves, inside tire casings). The eggs later hatch when the area is flooded by tides, rain water or melting snow. The eggs of other species are laid directly on stagnant water surfaces, hatching within a few days. For all mosquitoes, their development is dependent on water temperature. Mosquito larvae need at least seven to 10 days to fully develop and emerge as adults. Certain species within both of these groups can transmit viruses and other organisms that can cause diseases such as Eastern Equine Encephalitis, West Nile Virus (WNV) and heartworm (which normally affects dogs and cats).

Beavers moving into an area may impact mosquito production, depending on the landscape. River and stream systems that have broad flood plains may contain many shallow depressions that are intermittently flooded as the stream overflows its banks or after heavy rainfalls. Mosquito species that lay their eggs on moist substrates would be expected to reproduce in these flooded depressions. When a wetland is flooded by beaver activity, small, shallow temporary pools are replaced by deeper permanent water. With this change in water depth, mosquito species that lay their eggs on the surface of the water would be expected to lay their eggs in the beaver flowage. This change in mosquito species composition may take several years as the new wetland stabilizes. Heavily vegetated edges and shaded eddies, not experiencing direct sunlight and wind, would most likely provide potential mosquito breeding habitat. It is important to note that the populations of mosquitoes within deeper impounded beaver flowages are part of a more complete food web and are more likely to fall prey to fish, aquatic insects, amphibians, reptiles and birds. There is no evidence that the presence of beavers will increase overall mosquito populations; however, their presence does influence what types of mosquitoes may be present.

For information on Connecticut's mosquito virus testing program and test results, contact the State's Mosquito Management information line at 1-866-WNV-LINE (toll-free in Connecticut). For technical questions on mosquitoes and mosquito control measures, contact the DEP Mosquito Management Program, at (860) 642-7630.

dammed because they generally do not restrict the width of the stream. While some of these structures may be more costly to purchase and install initially, the lower maintenance costs resulting from less frequent plugging may represent a significant advantage economically over the long run. On driveways or roads through woodlands where there is light traffic, a shallow water crossing (ford) can be built from stone that will allow water to pass during flooding. This type of shallow water crossing acts much like an emergency overflow spillway on a dam.

Coexistence/Tolerance

Beavers readily coexist with humans, often successfully surviving in very populated areas. In many circumstances, people experience relatively insignificant beaver damage, such as the cutting of trees around a pond or lake or the flooding of an existing wetland. The beavers are simply doing what is natural and tolerating their activity is part of coexisting with wildlife. Although some landowners may think that the changes that occur when an existing wetland or woodland is flooded by a beaver dam are aesthetically unpleasant, the changes are part of a natural cycle. Wetlands are dynamic systems that should be expected to change over time.

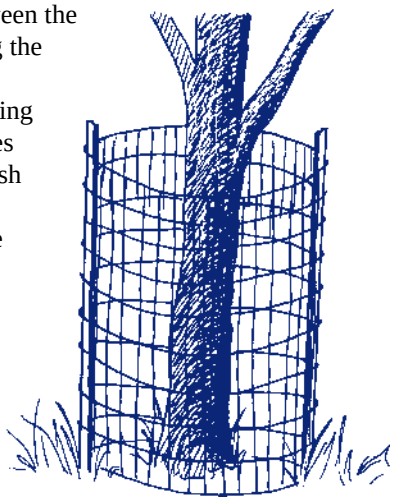
Repellents and Harassment

There are no known or registered repellants that are effective against beavers and harassment usually does not cause beavers to abandon an area. Dam removal may be an effective technique for discouraging young beavers from establishing new territories in undesirable locations (see section on Dam Removal). In rare instances, such as when a young beaver has not established a territory, continual removal of dam materials may persuade it to abandon the site. Where beavers have been well established, dam removal will only be effective if the beavers have moved out of the area or have been trapped.

Breaching (removing a section of a beaver dam) may be used to relieve a flooding condition. If breaching is being done as an interim measure to reduce flooding, it will need to be done on a regular basis, as the beavers will rebuild the dam each night. Breaching also will be necessary prior to installing fencing at a culvert or a water level control device. These activities are regulated under the Inland Wetlands and Watercourses Act (see sections on Exclusion Fencing and Water Level Control Devices and Regulatory Aspects of Beaver Management).

Protecting Trees and Shrubs

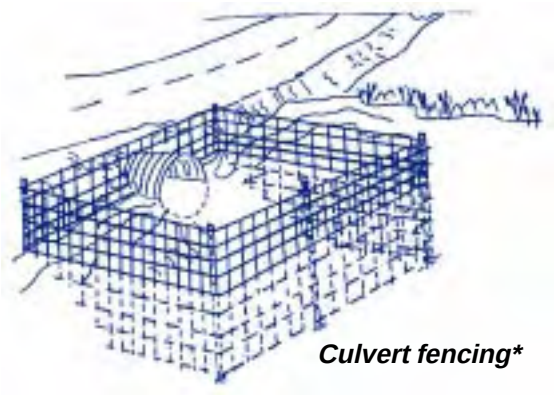
Enclosing the bottom 4 feet with heavy-gauge wire mesh fencing can protect individual trees. Beavers are not adept climbers and the fence will act as a barrier. The mesh size should not exceed 2 inches by 4 inches and the fence should be secured with metal stakes. Leave a 6-inch space between the tree trunks and the fence to allow for tree growth and to prevent beavers from chewing the bark through the mesh. Do not use light-gauge fencing or chicken wire. Beavers are powerful chewers and they may be able to damage the fencing to get at the trees. Fencing can be especially effective for protecting expensive ornamental trees along ponds, lakes or river edges. A larger area of trees can be protected by placing a 4-foot high wire mesh fence (not exceeding 6 inches by 6 inches) around the site. Those who own shoreline along a large lake and are experiencing light beaver damage to surrounding trees have the option of using the standard wire fence described previously or an electric fence to discourage beavers from taking trees. Electric fences should be set about 4 to 8 inches off the ground.



Exclusion Fencing at Culverts

Culverts provide a convenient location for beavers to build a dam. The beavers simply plug the culvert, while the roadway serves as the dam. Hazardous driving conditions can result when the culvert is unable to pass adequate amounts of water during storm events, resulting in a flooded road surface. In addition, standing water adjacent to roads can destabilize roadbeds and create serious settling, cracking and pothole problems. To prevent beavers from directly plugging a culvert, a fence may be installed in front of the culvert as soon as it is evident that a beaver problem exists or is likely to develop. Ideally, the beaver builds its dam against the fence, leaving the culvert to drain water as it was intended. This should alleviate flooding of water over the road and still allow the beavers to create an impoundment.

Before installing exclusion fencing, all debris should be removed from the culvert. Care must be taken to release the water slowly to avoid potential downstream flooding. After the dam is removed, exclusion fencing should be installed immediately as beavers will begin rebuilding the dam overnight. Fencing material should be heavy-gauge woven wire (e.g., concrete reinforcement wire), 5 feet high, with no larger than 6-inch mesh openings. It also should extend back to the culvert walls or cement abutments. The fence should extend out 10 to 20 feet from the culvert, shaped as a half circle and secured to the bottom of the beaver flowage with metal posts. At sites where the topography makes it impossible to assure that the fencing is flush with the wetland bottom, it may be necessary to construct a wire bottom to the exclusion fencing. If the fence cannot be installed for several days, wooden sticks or iron pipes should be driven into the wetland bottom in front of the culvert to prevent the beavers from plugging it.



Culvert fencing*

The use of fencing to alleviate roadside beaver problems has its limitations. Freezing and thawing can damage wire; therefore, maintenance must always be factored in. Existing topography and the feasibility of installing the fence also must be considered.

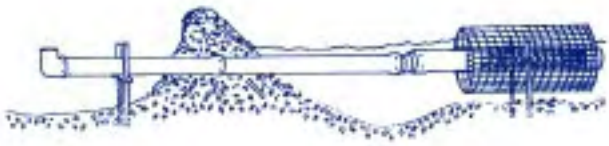
Water Level Control Devices

In some beaver complaint situations that involve flooding, a water level control device (WLCD) may be effective in reducing water levels to a tolerable level. "WLCD" is the general term applied to any type of device installed through a beaver dam to maintain a constant flow of water through the dam. Ideally, WLCDs are used in situations where some reduction in water depth (usually a minimum reduction) would create a tolerable situation for the people involved, yet maintain beavers at the site so that valuable wetland wildlife habitat can be conserved.

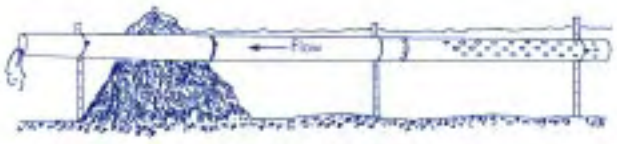
The use of WLCDs in beaver management originated in the late 1920s. Although the concept is generally the same, there are a variety of well-established designs, including "beaver pipes" (perforated plastic or aluminum pipes), "New Hampshire beaver pipes" (3-sided wooden box with a wire bottom), "Clemson Pond Leveler" (perforated pipe surrounded by a wire mesh cylinder and a standpipe outlet), "beaver baffler" (pipe created by multiple layers of fencing), and the Massachusetts design (flexible plastic pipe with a wire box protecting the inlet). Regardless of what the devices are called, the idea is to reduce the sound and sensation of water flow through the device so that the beavers will not plug it.

WLCDs work best where there is one main dam located at the outlet of a waterway. They do not work well when beavers have a number of locations to build a dam, such as in a meandering stream course. A water depth of 3 to 4 feet is needed at the location of pipe installation. Entrances to the lodge must remain underwater and there must be sufficient water depth so the beavers will not be frozen into their lodge during winter. Landowners must still tolerate some

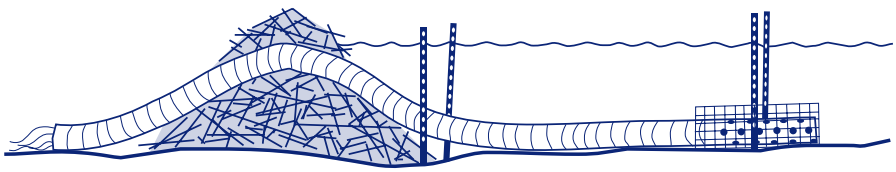
Water Level Control Devices



Clemson beaver pond leveler*



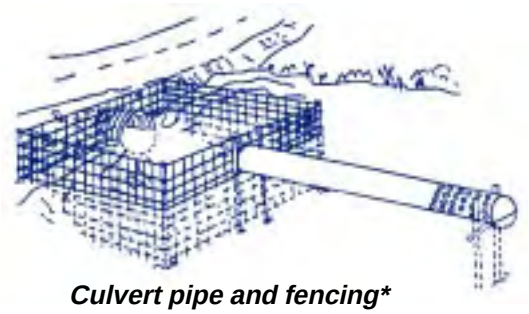
PVC beaver drain pipe*



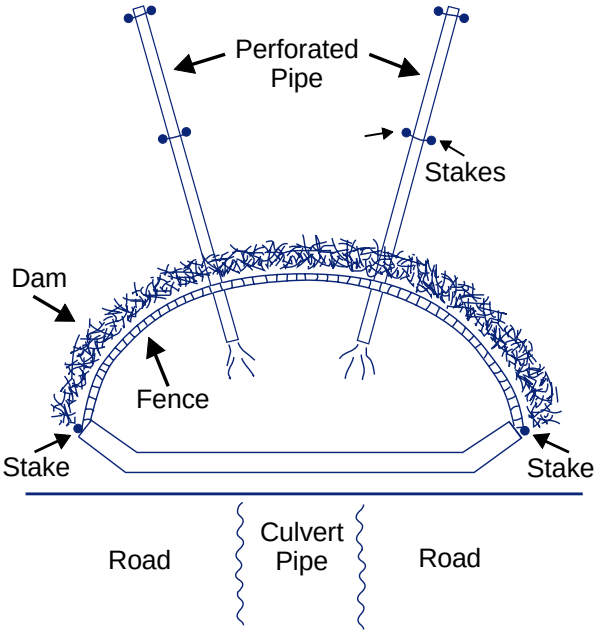
Massachusetts beaver pond leveler*

**Diagram courtesy of New York Department of Environmental Conservation*

Combination Exclusion Fencing and Beaver Pipes



Culvert pipe and fencing*



flooding, especially during storm events. The height at which the outlet end of the pipe is set determines the water level, provided sufficient pipes are used to handle normal runoff. As long as the pipes continue to pass incoming flow, water levels should remain relatively stable (excluding storm events), regardless of the height of the beaver dam. Excess water from heavy rains will flow over the dam.

A combination of pipes and fencing can be used at a roadside culvert where a reduction in water level is desired. After the beaver debris is cleared from the culvert and a woven wire fence is installed as described previously, pipes may be added as shown (see figure on previous page). (Contact the Wildlife Division for a list of licensed commercial Nuisance Wildlife Control Operators who are available to provide assistance in the use of fencing and water level control devices to address beaver flooding problems.)

Exclusion Fencing at Pond Drains and Water Control Structures

Beavers often cause problems in ponds and lakes by plugging outlet pipes or concrete water control structures at man-made dikes or dams. At the first sign of beaver occupation, protective measures should be taken. Fencing the structures with a heavy-gauge, woven-wire mesh will prevent beavers from directly plugging the outlet pipes and make maintenance of these structures more efficient. However, fencing will not control water levels. Landowners must take responsibility to maintain the flow of water through the control structure. Removal of the beavers may be necessary if potential downstream flooding would create a public health or safety problem. Anyone who is concerned that beaver activity at a dam may pose a downstream safety hazard should contact the Dam Safety Section of the DEP Inland Water Resources Division, at (860) 424-3706.

BE ADVISED

- Water level control devices (WLCDs) should only be used at sites where the intention is to maintain a tolerable water level for both beavers and humans.
- While exclusion fencing and WLCDs may remedy a site-specific beaver problem, they do nothing to curb beaver population growth.
- WLCDs require regular monitoring and maintenance.
- The installation of fencing or WLCDs and the removal or breaching of dams are considered regulated activities under the Inland Wetlands and Watercourses Act (Connecticut General Statutes Sections 22a-36 through 22a-45). A town's wetland commission needs to be contacted before any work can be undertaken.
- To obtain instructions and a list of materials required to install a WLCD, contact the Wildlife Division.

Trapping

In situations where the presence of beavers cannot be tolerated or the landowner wishes to control the number of beavers on his/her property, trapping during the regulated winter trapping season is the most effective approach (consult the current Connecticut Hunting and Trapping Guide for season dates). Approximately 70 percent of the beavers harvested annually in Connecticut are taken in direct response to nuisance complaints from the general public. Trapping removes a portion of the beaver population each year. Consequently, population growth is stablized and conflicts with humans are reduced.

Trapping season dates are established so that beavers are harvested at the time of year when the fur is of greatest value. Thus, the populations are managed as a renewable natural resource. Trapping season results are monitored through a mandatory pelt-tagging program. All trappers must obtain written permission from the property owner before trapping on private land and they must follow all trapping laws and regulations, which are among the strictest in the country. (Contact the Wildlife Division for a list of volunteer trappers who are available to provide assistance.) Special authorizations to trap beaver outside of the regulated season may be issued by the Wildlife Division where beaver activity threatens public health and safety or causes damage to agricultural crops (see section on Regulatory Aspects of Beaver Management).

Long-term Population Management

While exclusion fencing and WLCDs may remedy site-specific beaver problems, these techniques will not curb beaver population growth. In Connecticut, there is little natural predation or disease to control beaver populations. Historically, the eastern timber wolf was considered a major predator of beavers. However, wolves were extirpated from Connecticut and neighboring states shortly after the arrival of the colonists and they are not likely to return to the highly developed eastern landscape. Today, bobcats, coyotes, otter and mink may prey on beaver kits and occasionally adults, but natural predation does little to reduce the overall population of beavers. Some beavers are killed by vehicles or they die of natural accidents, injuries or disease, but none of these sources of mortality are significant. Humans remain the primary factor controlling the population growth of beavers.

Carrying Capacity

Beavers are territorial, allowing only one colony or family unit to occupy a given area. If beaver populations were allowed to grow unchecked, complaints would rise dramatically because beavers would be forced to occupy more sites, including those that could cause conflicts with people. Beavers have the ability to exhaust the food supply in an area and make it unsuitable for further occupation.

The ability of an area to support a wildlife population is limited by biological factors, including food, water and cover. The capacity of an area of land to support a healthy population of any one species over time is referred to as its “biological carrying capacity” (BCC). The reproductive potential of most wildlife species can cause their populations to exceed BCC. If this occurs, the habitat quality decreases and the physical condition of the animals can decline.

“Cultural carrying capacity” (CCC) is defined as the maximum number of animals that can coexist with local human populations. This concept is used to define the negative aspects of high deer populations in relation to the current human population, but the concept can easily be applied to beaver populations. Due to the high level of development in relation to Connecticut’s relatively small land base, a population can reach CCC long before it reaches BCC. While Connecticut could biologically provide more habitat for beavers, a higher population would cause a dramatic increase in the number of complaints and have a negative effect on other natural resource values.

Does Trapping Harm Wildlife Populations?

The annual removal of beavers during the regulated winter trapping season is the best long-term solution to maintaining a balance between beaver populations, suitable beaver habitat throughout the state and human land uses. A yearly harvest by regulated trapping helps to ensure that beavers will not become so abundant that there is no suitable habitat left for them to occupy over large areas. Trapping in Connecticut is strictly regulated. It is only allowed for species that are common throughout the state. Most wildlife populations produce more animals than their habitats can

support. When this happens, there may be an increase in natural mortality, an expansion of the population into marginal habitats or both. Trapping can remove a portion of the surplus animals and helps keep populations in balance with BCC and CCC. Restrictions such as seasons and bag limits are used to prevent overtrapping. Trappers' reports help wildlife biologists to monitor harvest and the status of wildlife populations.

Why Not Relocate?

Many people request that the beavers causing problems on their land be live-trapped and relocated. While this was an important technique for reestablishing beaver populations in unoccupied range from the 1950s to the 1970s, relocation is no longer considered a viable option for alleviating beaver problems in Connecticut. In heavily developed states where beaver populations are abundant and widely distributed, it is highly probable that this technique will create new problems. While suitable unoccupied habitats still exist in the state, relocated animals seldom stay in the area where they are released. Beavers that do remain at the relocation site will soon produce offspring that will be forced out of the parent colony at two years of age. These two-year-old beavers must travel in search of new unoccupied habitats where they can establish a territory of their own. From an ecological perspective, it is undesirable to have all potential beaver habitats occupied at once. Rather, a mosaic of wetland habitat types in different stages of succession is desired across the landscape. Most importantly, moving beavers does not reduce the overall beaver population and, thus, does not reduce the number of complaints and damage.

Regulatory Aspects of Beaver Management

Regulated Trapping

Section 26-72 of the Connecticut General Statutes (CGS) gives the Commissioner of the Department of Environmental Protection the authority to regulate the taking of furbearing animals. This includes establishing open and closed seasons, legal methods of take and season harvest limits. The DEP also can authorize trapping outside of the regulated trapping season for specific reasons, such as where public health and safety are jeopardized or natural or agricultural ecosystems are threatened (CGS Section 26-3). Wildlife Division staff can coordinate on-site inspections to verify if out-of-season trapping is warranted. Out-of-season trapping may be done by landowners or lessees of property sustaining agricultural damage (CGC Section 26-72), or by Nuisance Wildlife Control Operators—licensed commercial contractors in the business of nuisance wildlife control (CGS Section 26-47) and volunteers (CGS Section 26-7) who possess the necessary authorization issued by the DEP.

Beaver Trapping Objectives

- Maintain a healthy statewide beaver population at a level compatible with current land use patterns and habitat availability.
- Provide landowners with a cost-efficient option for eliminating or greatly reducing property damage, thus cultivating an attitude of tolerance among landowners. Approximately 70 percent of all beaver trapping is conducted in direct response to landowner complaints.
- Ensure perpetuation of the beaver population by not allowing large areas of habitat to become exhausted simultaneously.
- Provide for the cultural, economic and sustainable use of a renewable resource that will help to control the increase in the beaver population.
- Preserve rare and endangered species, anadromous fish runs and other sensitive natural resources jeopardized by beaver activity at ecologically important sites.

Beaver Dam Removal/Breaching

The breaching or removal of beaver dams and the installation of fencing or WLCDs are generally considered regulated activities under Connecticut's Inland Wetlands and Watercourses Act and should be done with great care under the auspices of the appropriate wetland agency. These activities can pose danger to life and property downstream and have negative environmental consequences, including disruption of wildlife and fisheries habitat, downstream siltation and erosion. Permit determinations are made by the appropriate wetland agency.

Man-made Dams

Many man-made dams, large enough to cause a loss of life or property if they were to breach or fail, come under the jurisdiction of the DEP Dam Safety Section as outlined in the Dam Safety Statutes (CGS sections 22a-401 through 22a-411). Under state statute, the DEP can request the removal of beaver debris or a beaver dam if the debris/dam is constructed on or is obstructing an existing dam or dike regulated by the DEP. Maintaining unobstructed principal and emergency spillways is essential for ensuring that the dam's hydraulic capacity and structural integrity are not compromised. Failure to comply with such a request may result in formal enforcement action being taken in order to remove the beaver debris/dam.

The Inland Wetlands and Watercourses Act

In 1972, the Connecticut State Legislature enacted the Inland Wetlands and Watercourses Act (CGS Sections 22a-36 through 22a-45). With this legislation, the General Assembly recognized that the "inland wetlands and watercourses of the state of Connecticut are an indispensable and irreplaceable but fragile natural resource with which the citizens of the state have been endowed." The purpose of the Act is to provide for the protection, preservation, maintenance and use of inland wetlands and watercourses by minimizing their disturbance and pollution; maintaining and improving water quality; preventing damage from erosion, turbidity or siltation; and preventing loss of fish and other beneficial aquatic organisms, wildlife and vegetation.

Because wetlands and watercourses are of such great biological, cultural, aesthetic and economic importance, most activities in wetlands and watercourses are regulated. A regulated activity is defined as "any operation within or use of a wetland or watercourse involving the removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses." The Act delegates the authority to regulate wetlands and watercourses to each town. All towns have an appointed wetlands agency/commission that is responsible for determining whether an activity proposed within or adjacent to a wetland or watercourse will require a permit. Certain activities in or around wetlands and watercourses also may require review and approval beyond the local wetlands agency (e.g., the DEP has jurisdiction over activities within tidal coastal or navigable waters). For more information, contact your town's wetland commission.

Summary

Beavers are fascinating animals, inspiring wonder when we examine their ecology, adaptations and the role they play as a keystone species in creating a diversity of wetland habitats across the Connecticut landscape. However, beaver activity can also cause property damage and economic loss, jeopardize other rare natural resources and create public health and safety concerns.

Landowners and others sustaining damage need to have flexibility and choice in dealing with beaver problems. A combination of factors, including the individual landowner's attitude, site characteristics, the severity of damage being sustained, off-site impacts and other natural resource values, should be considered when deciding what option or options are best suited to resolve a particular nuisance beaver problem. Successful management of beaver problems will require that all the management options discussed in this booklet be used at various times. The annual trapping of a limited number of beavers will prolong the life of a colony and the associated benefits, while minimizing potential human/beaver conflicts. Protective fencing can be employed if tree cutting is a problem. A WLCD can be installed at a road culvert if site factors are favorable and periodic maintenance is practical. If the presence of beavers is not acceptable, trapping can be conducted during the regulated season.

The Wildlife Division seeks to manage a healthy, well-distributed beaver population in suitable habitat throughout Connecticut, while minimizing potential human conflicts. By providing resource information and management options through publications, presentations and individual technical assistance, either by phone or through on-site inspections, the Wildlife Division hopes the public will have a better understanding of the options available for resolving human/beaver conflicts. While the Division will continue to use and promote a variety of solutions for site specific problems, the regulated beaver trapping season will remain a key management tool. Trapping is the only technique that limits the growth of the beaver population in a landscape with limited biological and cultural carrying capacity.

Where to Go for Help

If you have a beaver complaint or would like more information on controlling beaver damage, contact the DEP Wildlife Division office nearest you:

DEP Eastern District Headquarters
209 Hebron Road
Marlborough, CT 06447
860-295-9523

DEP Wildlife Division
Sessions Woods Wildlife Management Area
P. O. Box 1550
Burlington, CT 06013
860-675-8130

Dam safety issues should be directed to:

DEP Inland Water Resources Division
Dam Safety Unit
79 Elm Street
Hartford, CT 06106
860-424-3706

DEP web site: http:\\dep.state.ct.us

Questions concerning wetlands regulations should be directed to your town's wetland commission.

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Quick Facts

Mid-1800s: Beavers no longer existed in Connecticut. Habitat loss and unregulated harvest were responsible for their demise.

Early 1900s: Wildlife managers started livetrapping and relocating beavers to Connecticut.

1961: Year of the first regulated trapping season for beavers in Connecticut.

5,000 to 8,000 Beavers: Population estimate of beavers in 2000.

30 to 65 pounds: Weight of an adult beaver.

24 to 36 inches: Length of an adult beaver's body.

12 to 18 inches: Length of an adult beaver's tail.

Uses of a beaver's tail: Rudder when swimming, balance on land, fat storage, regulation of body heat and a warning device (slapped on water to alert other beavers of possible danger).

Foods: Outer and inner bark of trees, leaves, shoots, roots and a variety of aquatic plants.

January - February: Mating season.

May - early June: Young are born.

2 to 6 Kits: Normal litter size.

Age 2: Young leave colony to look for their own territory.

Age 3: Age at which most beavers first mate.

About this Document

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Connecticut Department of Environmental Protection
Bureau of Natural Resources
Wildlife Division
http://dep.state.ct.us

The Use of Water Flow Devices in Addressing Flooding Problems Caused by Beaver in Massachusetts

Commonwealth of Massachusetts
Department of Fisheries, Wildlife & Environmental Law Enforcement

Massachusetts
Division of Fisheries & Wildlife

The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts

Compiled by
Susan Langlois and Thomas Decker
Massachusetts Division of Fisheries & Wildlife

Publication Information

This booklet is a publication of the Massachusetts Division of Fisheries and Wildlife. The Division's mission is "to protect, conserve, restore and manage inland species of fish, plants and wildlife, and their habitat, for the benefit of the people of the Commonwealth." The Division is concerned for the welfare of all fish and wildlife including rare and endangered species and is staffed with professional biologists who inventory, conduct research and develop management plans to insure the continued existence of these species in the Commonwealth. Balancing the needs of people and wildlife is an ongoing mission.

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Copies of this publication are available from the Massachusetts Division of Fisheries and Wildlife, One Rabbit Hill Road, Westborough MA 01581. Copies can also be found in libraries throughout the Commonwealth.

This guide should be cited as: Langlois, S.A. and T.A. Decker. 1997. *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts*. MA Division of Fisheries and Wildlife. 13pp.

Acknowledgments

This booklet is a compilation of existing manuals, guides and research material regarding methods to address problems caused by beaver. Sources of information for this publication drew heavily from two existing comprehensive publications: *The Beaver Handbook: A Guide to Understanding and Coping With Beaver Activity* by R.G. D'Eon, R. LaPointe, N. Bosnick, J.C. Davies, B. MacLean, W.R. Watt and R.G. Wilson (Ontario Ministry of Natural Resources, Northeast Science and Technology, 1995, 76pp.) which is available from Lakehead University Bookstore (807) 343-8589; and *Beaver Damage Control Techniques Manual* by D. Hamelin, D. Dougherty, G. Fuerst, D. Jenks, J. Rinaldi, V. Gilligan, G. Goldja and B. Tullar (New York State Department of Environmental Conservation, Bureau of Wildlife, 1997, 40pp.) Sections of these publications are presented verbatim within this booklet. We are indebted to these agencies and their authors for the use of their materials in this booklet.

We also thank David Gabriel for layout and design and Peter Mirick for design and editorial review. Nancy Haver and Shayna LaBelle-Beadman provided illustrations and drawings. Reference to a specific product or manufacturer does not imply endorsement by the Massachusetts Division of Fisheries & Wildlife.

Table of Contents

Introduction

This manual is designed as a reference tool for people who are incurring beaver problems. It explains the pertinent laws and permits that apply to the alleviation of such problems, and provides information on the various techniques currently available to resolve flooding problems caused by beaver activity. While the techniques covered here are highly effective at some problem sites, none will work in every situation. All have limitations, and sometimes unsuitable side effects or unacceptable costs. This manual provides the information necessary to determine which technique, if any, is the best option for any particular situation.

Information on beaver biology, natural history, population dynamics and the positive and negative aspects associated with beaver can be found in a companion publication entitled: *Beavers in Massachusetts: Natural History, Benefits, and Ways to Resolve Conflicts Between People and Beaver*. This publication is available at all Division offices (see list at back of booklet) and the University of Massachusetts Cooperative Extension Office in Amherst.

Beaver Management in Massachusetts

The statewide beaver management program includes public education, wetland management, and an annual regulated harvest season used to control the beaver population. This program also allows for traditional, cultural, social and economic activities, along with the utilization of a secure, sustainable wildlife resource.

Specific Goals for Beaver:

- Maintain beaver populations compatible with available habitat.
- Minimize beaver complaints and property damage caused by beaver.
- Allow a sustainable public harvest of beaver to control the beaver population within population density goals.
- Manage beaver for their aesthetic, economic, consumptive and ecological wetland values.

Dealing with Flooding Problems Caused by Beaver

The number of complaints and the amount of damage caused by beaver in the state is directly related to the size of the beaver population. Historically, beaver abundance was influenced by two predators: timber wolves and people. With the extirpation of wolves and the lack of any diseases that affect beaver populations on a large scale, the only factor left that can control beaver numbers today is regulated trapping.

The number of beavers in Massachusetts has typically been controlled by the number of beaver harvested by the public under regulated trapping seasons. Regulated trapping supports many of the management goals for beaver. The public may engage in the cultural and traditional uses of the resource, the beaver population can be maintained at levels compatible with existing habitat, and the amount of property damage incurred by the general public is reduced. The best prevention is to control growth and maintain the beaver population at suitable levels.

However, the adoption of an anti-trapping ballot referendum in 1996 has severely hampered the ability of the Division of Fisheries & Wildlife to control and manage beaver. Some problems related to beaver activity are increasing statewide. The net effect of the law actually maximizes the number of beavers found in Massachusetts. A maximized beaver population maximizes the amount of property damage and other related beaver problems incurred by citizens.

The state's beaver management program has historically regulated the number of beavers afield, maintaining the populations at levels compatible with suitable habitat for beaver. The new law eliminates proactive regulated management, yielding an uncontrolled expansion of the beaver population. It allows the citizens of Massachusetts to take only reactive measures to beaver that cause property damage.

Complaint Procedures, Permits & Regulations

In Massachusetts, beavers and beaver habitat (e.g., beaver lodges and beaver dams) come under the jurisdiction of the Division of Fisheries and Wildlife and are protected under state law. In addition, wetlands come under the jurisdiction of the Department of Environmental Protection and are also regulated under existing state law. Dependent upon the type of

damage one is incurring and/or the techniques employed to mitigate the damage, permits may be required from one or both agencies before any action may be taken.

Lethal removal of beaver. The Division of Fisheries and Wildlife is the state agency authorized to issue permits for the removal of problem beaver. If property damage is occurring, permits may be issued to remove beaver by lethal means outside the harvest season. (Note: The harvest of beaver during the open regulated trapping season is the recommended method of removal.) This permit will be issued to the tenant or landowner upon whose land the problem is occurring or to a Division of Fisheries and Wildlife approved agent that is designated by the permittee. People incurring beaver damage and soliciting guidance should report the problem to a regional Division of Fisheries and Wildlife office listed in the back of this booklet.

Breaching, disturbing or removing beaver dams. State law makes it illegal for any person to disturb or tear open a beaver dam or beaver lodge without written permission from the Division of Fisheries and Wildlife. Permits are needed to disturb a beaver dam for any reason in Massachusetts. Permits to break dams are required regardless of the length of time a beaver dam has been in existence, and regardless of whether or not beavers are present or absent. Even dams that cause flooding require permits to be breached. Disturbing beaver dams includes breaching a dam (removing sticks, mud, rocks), adding vegetation and/or mud onto a dam, or installing a water flow device through a dam. A permit will be issued to a person who is incurring damage. If the permittee (affected party) does not own or legally control the site where the beaver dam is located, it is the permittee's responsibility to obtain permission to go on lands he or she does not own or legally control to carry out the permitted actions.

There is also overlap between beaver dam removal and wetland regulations. Activities that will affect wetlands, (such as altering a beaver dam), are also regulated by state laws designed to protect wetlands. Individuals who obtain a permit to breach a dam from the Division of Fisheries and Wildlife must also contact their municipal conservation commission before initiating any work. Penalties for failing to obtain proper permits may be as high as $25,000 per day as described in the Wetland Protection Act.

Water Control

Since beavers have the ability to build dams to impound water systems, they can dramatically alter the environment in which they live. When this activity is in conflict with human land use practices, it can result in extensive complaints due to damage caused by flooding. Techniques used to mitigate the flooding caused by beaver include breaching of beaver dams, protecting road culverts with fences or guards, and controlling water levels with water flow devices. All these techniques require a certain degree of effort and regular maintenance to insure water levels that can be tolerated (thereby preserving the positive aspects of the associated wetland).

Division personnel respond to hundreds of complaints yearly, conducting site visits and providing technical advice and educational information. Some of these complaints occur repeatedly, requiring sites to be revisited on an annual basis. Initial costs to install and maintain culvert guards/fences or water flow devices can be less than the costs to repair roads, property or buildings damaged by flooding. Recognizing chronic or potential problem sites and taking proactive preventive measures may be more cost effective in the long run.

Removing or Breaching Beaver Dams

Dam breaching is an immediate but very short-term solution to flooding problems caused by beaver. Beavers usually rebuild dams quickly, sometimes enlarging them in the process or creating step dams throughout the watershed. Beavers are most active at night. Therefore, dams should be breached in the morning to allow water to flow all day.

If the complete draining of a beaver pond is warranted, it is more successful during the dry summer months when there is less available water to resupply the ponds that are being drained. Ponds that are supplied by seasonal runoff can sometimes be drained during dry periods so as to discourage beaver and cause them to relocate. It may also be advantageous to eventually dismantle the entire dam once the beaver flowage is abandoned. A dam now rotten in the dam of an abandoned pond is easily plugged by wandering beavers.

Dismantling by hand. Potato hoes or stone hooks are the best tools for dismantling dams by hand. Shovels and spading forks are ineffective. Good water con-

tool is possible if the breach is kept shallow and broad so that the water level falls slowly. Opening a deep breach creates a dangerous situation and may cause serious flooding and erosion down stream.

Power Excavating. Tractor or truck mounted excavators may be used by town, county or state highway employees to remove large amounts of material from beaver dams but care should be taken to avoid downstream flooding. Neighbors should be told where, when, and why a dam excavation is going to be done. If the method is justified and must be used, it is best done in mid-summer when the water is low.

Road Culverts

The dam construction activity of beavers is instinctive behavior. It is believed to be a combination of water flow sensation and the sound associated with running water that stimulates the dam building activity. Culverts, especially ones made out of metal, will resonate the sound of the water rushing through them. Thus, beaver will commonly block road culverts with sticks, mud and rocks. Culverts blocked from the inside are difficult to clean and potentially dangerous. The use of meshes and grills, placed on both the upstream and downstream ends of the culvert, can prevent beavers from entering.

Precautions for working around road culverts.

Working around road culverts and other water control structures can be hazardous. Appropriate safety measures must be taken. Be aware of the following:

- fast flowing water
- irregular and slippery bottoms
- cold water
- being drawn into a culvert
- isolated work sites
- unstable pond bottom

Culvert Meshes and Grills

Pros (+) and Cons (-)

- \+ Relatively inexpensive
- \+ Easy installation
- \+ Works well if regular cleaning can be maintained

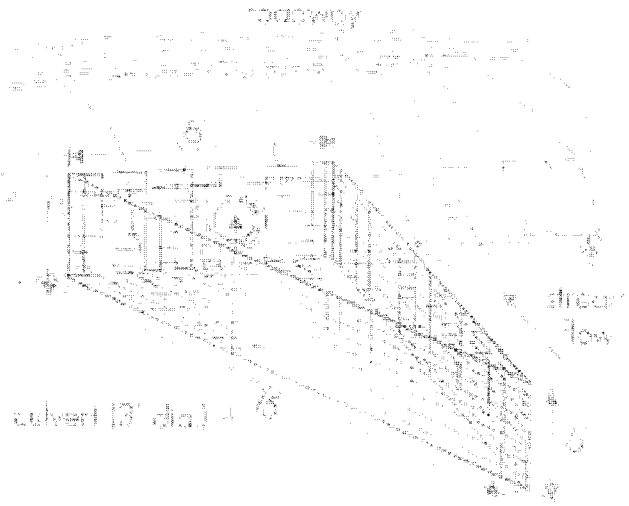
Requires frequent and regular cleaning

- \- May reduce discharge capacity (water flow) from original culvert design
- \- May block fish passage
- \- May be damaged by ice

Culvert Guards, Meshes and Grills

These devices prevent beaver from building a dam inside a culvert. This is a preventive measure and not a water regulation device. If beavers build a dam in front of the culvert, other measures should be taken.

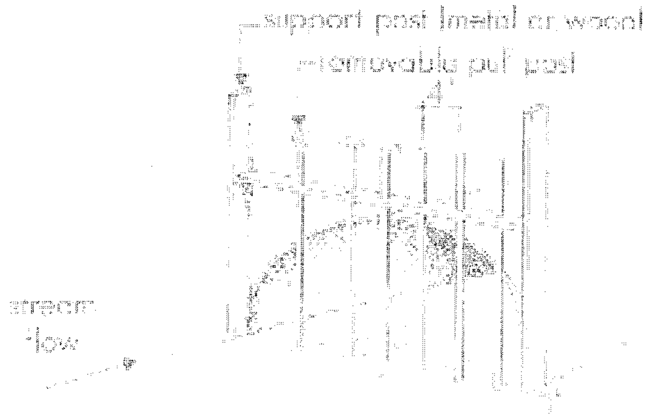
Note: It is not safe to constrict the flow of water through a road culvert. Culvert grates must be as open as possible, regularly inspected and cleaned of debris. It is also extremely hazardous to stand in the water in front of a culvert while unblocking it or to crawl into one to open it.)



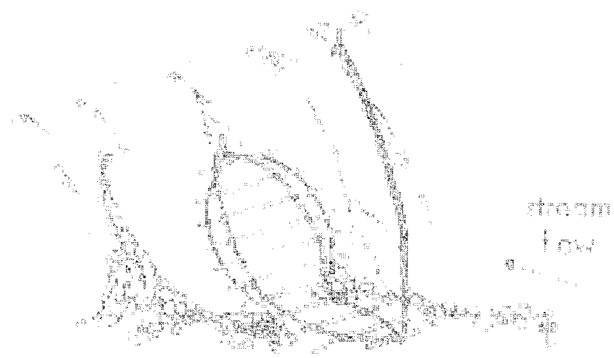
Triangular screen mesh design. Constructed from 1" mesh welded wire placed on upstream end of culvert so it can be removed during winter to prevent ice damage. Dimensions shown are for a 3 foot diameter culvert. Increase if increased flow required. (Drawing not to scale.)

Pitchfork-shaped guard - Removable Pull Rod Grill

This is made of 1/2"-3/4" heavy steel rods welded 6 inches apart and held together only at the top with two horizontal braces or a piece of 3 to 4 inch channel iron. This device is held in place by the current and by driving the vertical rods about 6 inches into the stream bed in front of the culvert. It is a preventive measure to keep beaver from getting inside a culvert and plugging it.



Removable pull rod grill is easier to remove than wire mesh because there are no horizontal bars to catch debris and material. After most material is cleaned, posts can be pulled out, allowing the current to wash away any remaining material.



Culvert protector-cleaner. Constructed by welding steel rods 24 inches apart across a hoop; the upper end is held by a bolt placed through the top of the culvert, the end is hinged back and anchored on road bank; end of chain can then be attached to a vehicle and the grill flipped up onto the road to clear culvert.

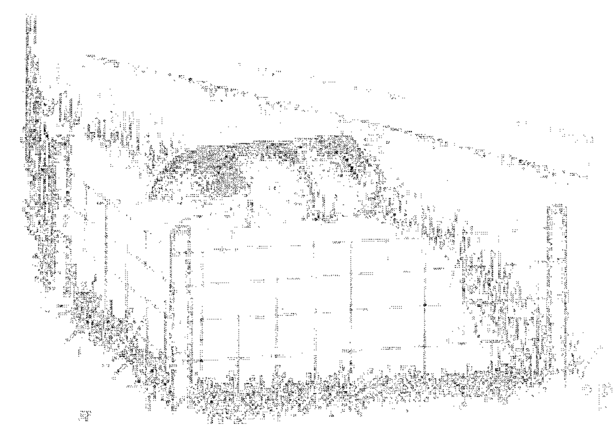
Electric breach guard - This is an electrically charged, smooth wire fence with dangling bolts. It is constructed in front of a dam to keep beaver away from a breach or away from a previously blocked culvert. A rigid main wire is suspended above the water on floats. Several short "dangle" wires hang from this main wire. These wires extend within an inch of the surface. When a beaver swims up to inspect the breach in the dam, it will receive a shock when it touches one of the dangle wires.

The main advantage of the beaver shocker is that is easy to install and is a fairly compact device to carry in the field. The device has to be checked daily after the installation until the beavers receive a shock and learn to leave it alone. Since the depth of the breach in the dam determines the depth of the water in the pond, a wide range of water level control can be provided with the use of this device. If the water becomes too shallow behind the dam, beaver may try to build a dam around the upstream side to try to neutralize the device.

Both the energizer and battery are expensive and are often stolen. Therefore, we suggest the use of a box with a lock for security. Maintenance is minimal. The device must be checked for battery condition and to make sure there is no debris in the breach that might short out the system and shorten the life of the battery. For these reasons, this device is often ineffective if not inspected and serviced frequently.

Beaver Fences

The purpose of the beaver fence is to physically exclude beaver from plugging the intakes of road culverts and prevent them from detecting the flow of water into the culvert.



Beaver Fence-Fence placed on upstream side of a culvert keeps the culvert clear and allows high water to flow over dam and through the culvert.

Beaver Fences

Pros (+) and Cons (-)

- + Maintains culvert clear and intact
- + High water flows will spill over dam and through culvert
- + Maintains constant water level
- + In conjunction with beaver pipes, can regulate water levels
- - Can be expensive, especially if area to be fenced is large
- - Usually requires regular maintenance
- - Can create impoundment which will affect road or railbed characteristics
- - Beavers may build dam higher than roadbed, which may flood road on sides of impoundment
- - May reduce water flow and fish passage

Deep Water Fence

These U-shaped or square fences, 10 to 20 feet on each side, are made of 6 by 6 inch reinforced steel mesh held by 6 foot steel fence posts. They are placed above intakes to prevent floodwater debris or beaver from plugging a culvert. If beavers place material against the fence, the resulting dam becomes a temporary emergency spillway which must be removed or modified to prevent the road grade from becoming a dike. If a Water Level Control Device (WLCD) is to be used in a culvert, it should be used in conjunction with a deep-water fence.

Deep-water Fence Installation Guidelines

1. Beaver must be prevented from gaining access to the culvert by keeping the wire exclosure tight against the bottom and extending the wire 18-24 inches above the surface of the water. It may be necessary to lay mesh across the top surface as well.

2. The exclosure must be of sufficient size to effectively eliminate the sensation of waterflow entering the culvert. If material is deposited on the wire and it becomes a temporary dam, the flow capacity of the exclosure must be at least equal to that of the road culvert. A 20 by 20 foot area is generally adequate.

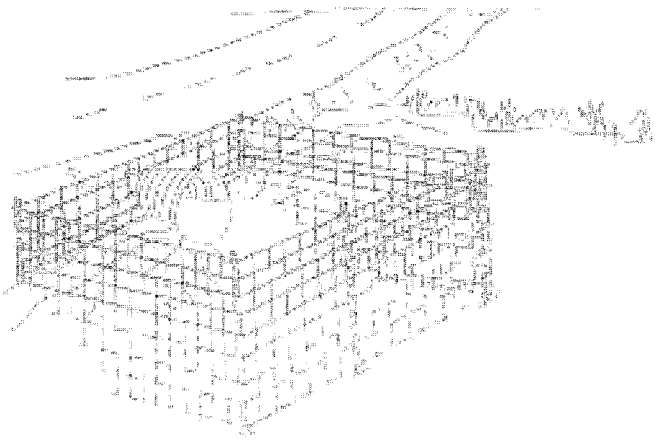
3. The larger the exclosure, the more effective it is in reducing the sensation of flow. Culverts with high flow may require a larger exclosure.

4. In areas with uneven bottoms, a floor may be added to prevent beaver from swimming underneath the exclosure.

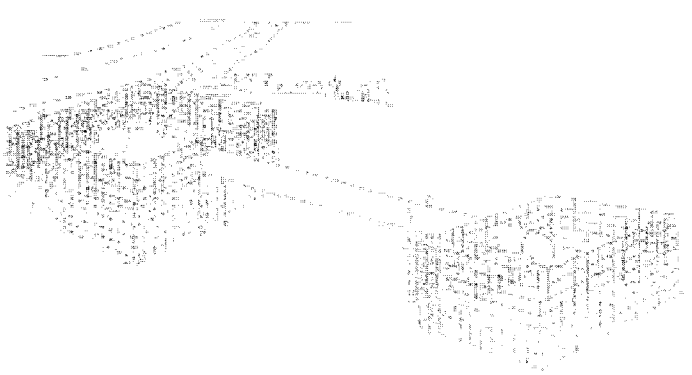
Materials needed

1. 6 x 6 inch mesh concrete reinforcement wire (6 gauge) has been found to exclude beaver and still allow debris to pass through. This comes in 5 x 10 foot panels and in 90 inch wide rolls.

2. Heavy duty 6 foot steel posts.

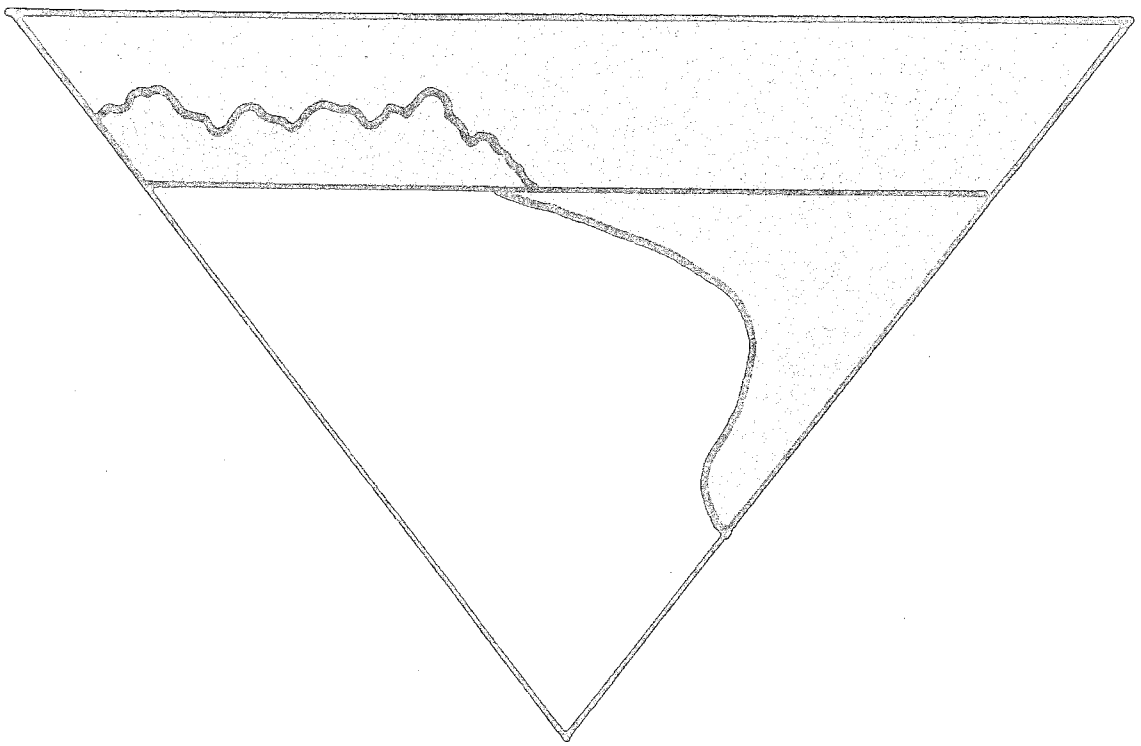


If beavers do begin to construct a dam against a fence installed to protect a culvert, it may then be necessary to install a WLCD to regulate the water level. The deep-water fence protecting the culvert will act as an emergency spillway during high run-off conditions when the WLCD cannot handle the flow. (Note: Road grades cannot usually be used as dikes. Deposited debris may have to be removed or modified.)



Vermont Better Backroads Manual

Clean Water You Can Afford



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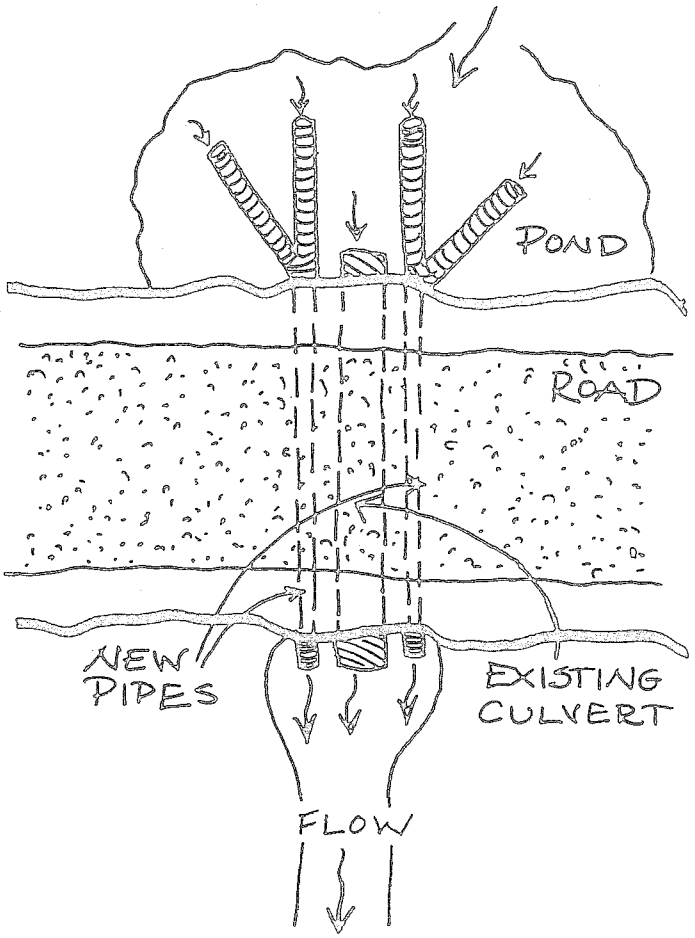
Beavers:

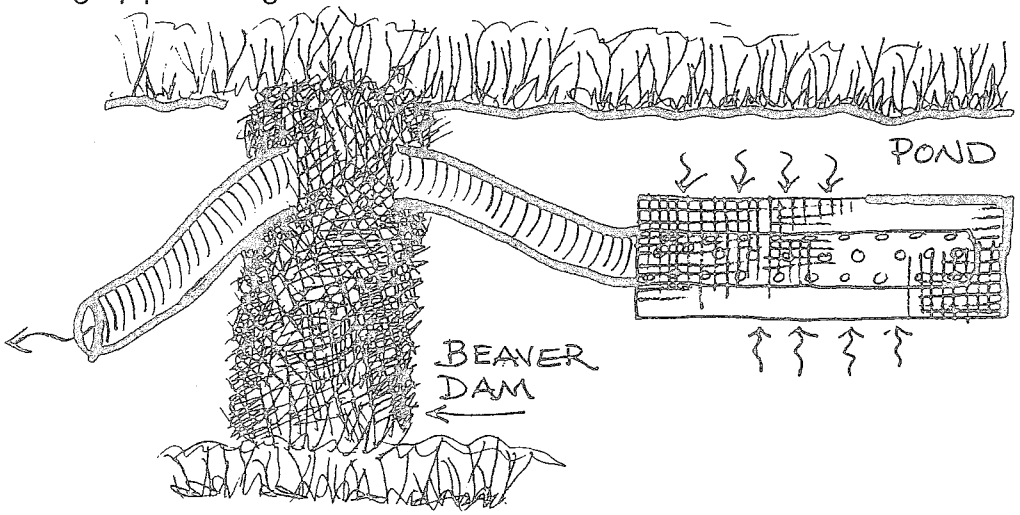
Beavers play an important role on the Vermont's natural landscape by creating pond and wetland habitat. But beavers can create problems for road crews by building dams that block culverts and impound water that can be released during a flood, washing out roads and bridges and releasing massive amounts of sediment. Beavers particularly like to build dams at culverts. This creates a recurring problem for road crews since beavers tend to rebuild dam after dam at the same spot. In recent years, many inventive people have developed methods to deal with the beavers other than dismantling dams or extermination. Here are some options:

- ☐ **Ignore the problem.** Evaluate the real threat to the road. Perhaps a "live and let live" approach would be easiest on all involved.
- ☐ Hang a 36"X36" **white flag** attached to two poles near the culvert when beavers begin to construct a new dam. The color and motion cause the beaver to leave and not come back.
- ☐ **Avoid sudden destruction** of a dam. The resulting release of water and accumulated sediment from behind the dam can cause massive turbidity and flooding problems downstream and may result in a violation of VT Water Quality Standards. If a dam must be removed, do so gradually.
- ☐ **Weld an elbow onto the culvert.** A 90° angle pointing downward below water level results in continual drainage, and the beavers won't be able to plug the inverted culvert end.
- ☐ **Try some of the new water level control** ideas in use around the country. These designs seek to limit the depth of the water behind a dam, but do not remove the dam itself. Below and at right are some ideas. More details can be obtained from your district Fish and Wildlife office, the VT Local Roads Program, USDA Wildlife Services, or the Wetlands Office of the Department of Environmental Conservation.

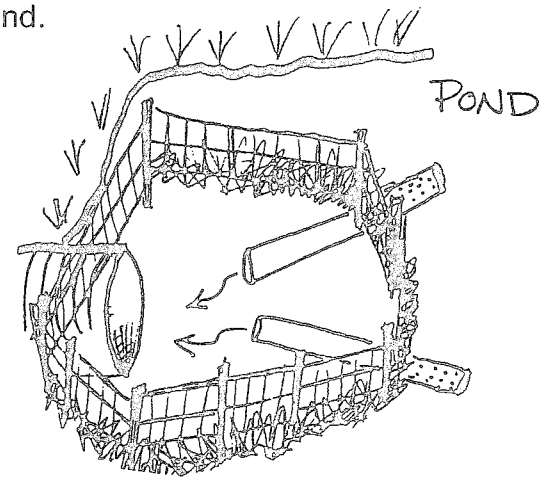
1. **"Beaver Reliever"** Designed by the US Forest Service, this installation features four additional and parallel pipes next to the culvert. These extra perforated pipes help maintain the water level in the pond below the level of a culvert.

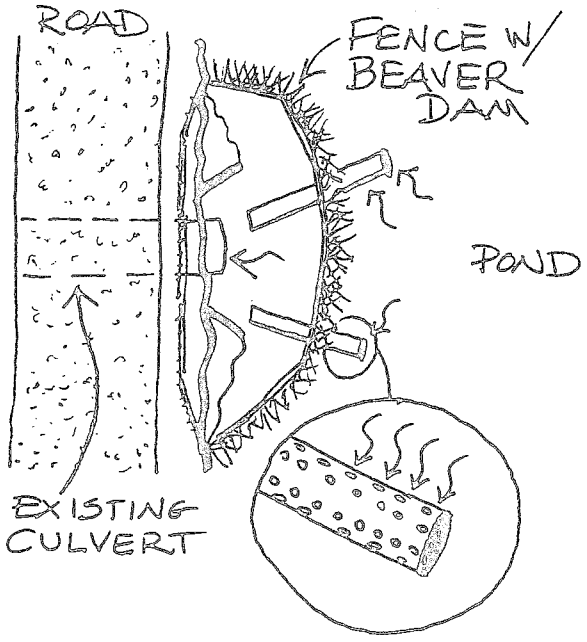


2. **Beaver Baffle** A baffle system is a drain for the dam itself, creating an outlet for water straight through the dam. It requires only shallow digging into the dam. There are several versions of this involving perforated pipe intakes and inserting the discharge pipe through the dam.



3. **Build a fence.** Build a horseshoe shaped fence (heavy gauge wire) around the upstream side of a culvert to keep beavers from plugging the culvert. You can more easily remove dam material from the fence, or for persistent problems, install perforated pipes through the fence into the pond.





ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, active adult, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality and/or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is reviewed by the local Conservation District and approved by the ERT Subcommittee, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438, e-mail: ctert@comcast.net