POMPERAUG RIVER WATERSHED
Streamwalk Summary Report

Pomperaug River Watershed Coalition
Volunteer Streamwalk Program

May 2010

Pomperaug River Watershed Streamwalk Summary Report

February 16, 2014

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Pomperaug River Watershed Coalition

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Acknowledgements:
The Pomperaug River Watershed Streamwalk Program would not be possible without the assistance of local community volunteers. A special note of appreciation goes out to the more than 115 volunteers who willingly gave their time and effort to survey the Pomperaug River Watershed's streams and ponds (refer to Appendix A for a full list of volunteers). In addition, the Pomperaug River Watershed Coalition would like to thank the Connecticut Natural Resources Conservation Service, the Housatonic Valley Association, and the Audubon Center at the Bent of the River for their time and assistance with training volunteers.

The Volunteer Streamwalk Program has been funded in part by The Connecticut Community Foundation.

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INTRODUCTION

Every summer and fall for the past 10 years, teams of volunteers have walked segments of the Pomperaug River and its tributaries to collect visual information about the watershed's physical condition. The Pomperaug River Watershed Coalition (PRWC) began the Volunteer Streamwalk Program in the summer of 2000, shortly after the PRWC's incorporation, to collect and analyze the data needed to make sound management decisions about the watershed and the future use of its water resources. This program has since become a long-term monitoring and assessment tool, allowing the PRWC to document and track changes in the watershed over time.

The Streamwalk Program's goals are two-fold: 1) to document the physical characteristics of the rivers and streams in the Pomperaug River watershed, and 2) to involve the community in river conservation stewardship. Information collected through the Streamwalk surveys can be used to help make decisions about conservation and land use, plan future development, identify resource concerns and impairments, and to initiate restoration efforts in the watershed. This program is intended to complement and enhance the PRWCs mission of using science to ensure high water quality in the Pomperaug River Watershed.

The Volunteer Streamwalk Program relies on the generosity of volunteers who donate their time to walk along streams and record information about specific areas within the watershed. The information presented in this report is a direct reflection of the observations the volunteers recorded. As of spring 2010, 115 volunteers, representing all of the watershed towns, have been trained as Streamwalk Volunteers (see Appendix A).

BACKGROUND

Pomperaug River Watershed

The Pomperaug River, a major tributary to the Housatonic River, is located in west central Connecticut. The main stem of the Pomperaug River begins at the confluence of its two main tributaries, the Nonnewaug and Weekeepeemee Rivers, where it flows from the center of Woodbury through the town of Southbury and ultimately discharges into the Housatonic River at Lake Zoar (PRWC, 2001). Its watershed comprises a 90 square-mile area draining large portions of Bethlehem, Southbury and Woodbury, and smaller portions of Middlebury, Morris, Roxbury, Washington, and Watertown. The topography of the Pomperaug River watershed is diverse, ranging from 1,150 feet above sea level in its northern headwaters in the town of Morris to just 100 feet above sea level at its lowest point, where the Pomperaug empties into the Housatonic River (Meizner & Stearns, 1929). This largely undeveloped, rural watershed is dominated by deciduous forests and pasture/hay fields. Aside from agriculture, residential development is the most prevalent land use in the watershed, with the more dense residential, commercial and industrial development occurring at the town centers (PRWC, 2001).

Pomperaug River Watershed Coalition (PRWC)

The Pomperaug River Watershed Coalition is a partnership of local governments and businesses, environmental groups, state and federal agencies and citizens, all working together to ensure that water in the Pomperaug River watershed remains plentiful and pure. PRWC was formed in 1999 by the Boards of Selectmen and citizens of the towns of Southbury, Woodbury and Bethlehem, Connecticut. The Coalition uses science to understand how human activity impacts the quality and quantity of water in our rivers and underground aquifers, seeks to find ways to maintain the health and vibrancy of the watershed, shares that understanding with watershed residents and community leaders, and finds tangible ways to take care of our most valuable resource – water. The Coalition's primary objectives include developing a watershed resources management plan for the basin and working with the community to implement this plan through public outreach and education initiatives.

POMPERAUG RIVER WATERSHED VOLUNTEER STREAMWALK PROGRAM

The Pomperaug River Watershed Volunteer Streamwalk Program was initiated in 2000 to collect baseline data on the physical condition of our rivers and streams. This program is intended to evaluate water resources throughout the watershed, and educate and involve watershed residents in efforts to protect water quality. In the spring of 2005, the first five years of Streamwalk survey data were analyzed and summarized by the PRWC in the first *Volunteer Streamwalk Program Summary Report and Proposed Action Plan* (*2005 Streamwalk Report*). At that time, Streamwalk surveys had been completed on over half of the initial survey areas selected for observation. Five years later, the Streamwalk Program continues to build support for the activities of the PRWC and to collect valuable information on the physical characteristics of the Pomperaug River watershed.

Program Design and Methodology

The Volunteer Streamwalk Program is modeled after several successfully established programs in Connecticut, specifically the Natural Resources Conservation Service (NRCS) pilot project in the Norwalk River Watershed and the Housatonic Valley Association's Stream Teams (Brawley & Winters, 2005). The objectives of this program are to conduct visual surveys of

existing conditions in the Pomperaug River and its tributaries; identify any impairments (erosion, dams, discharge pipes, etc.) that may be impacting water or habitat quality; increase local awareness of watershed issues such as non-point source pollution; and develop a sense of community ownership and stewardship of our limited water resources.

As previously noted, the Pomperaug River watershed covers approximately 90 square miles. In order to conduct a Streamwalk survey of this entire area, it was necessary to first divide it into smaller, more manageable sections. The Connecticut Department of Environmental Protection has divided the Pomperaug River watershed into seven sub-regional drainage basins (or subwatersheds): the Pomperaug, the Nonnewaug, the Weekeepeemee, Transylvania Brook, East Spring Brook, Hesseky Brook and Sprain Brook (Figure 1). PRWC worked with the NRCS to further divide each subwatershed into smaller survey areas, or local basins, which could be visually surveyed within a day or two by pairs of trained volunteers.

In an effort to keep the program at a manageable size, only the three largest of the seven subwatersheds were initially selected for Streamwalk observation: the Pomperaug, the Nonnewaug and the Weekeepeemee. Combined, these three subwatersheds consist of 76 survey areas (Brawley & Winters, 2005). By the spring of 2005, Streamwalk surveys had already been completed on 44 of these local basins. Today all of the 77 survey areas in the three largest subwatersheds have been completed, as well as the southernmost survey area in Sprain Brook.

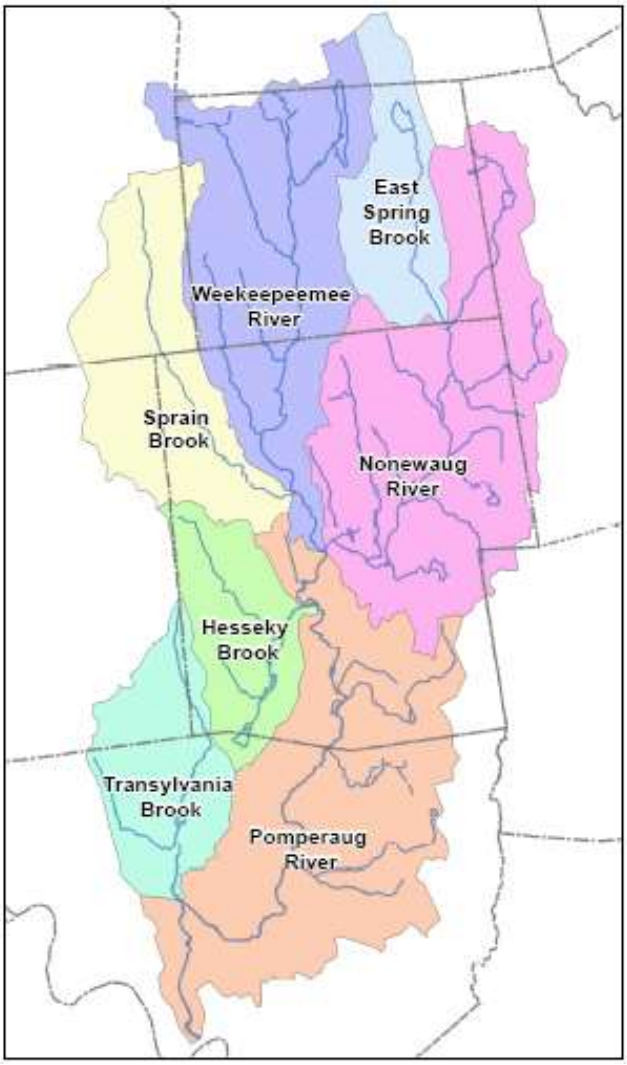

Figure 1. Subregional Drainage Basins of the Pomperaug River Watershed

Streamwalk Volunteers assess the streams and waterbodies in their survey areas through the use of Field Data Survey Forms (referred to as "survey sheet" hereafter). These forms have evolved over time as the program has developed, but the general scope of information included has stayed the same. The survey sheet currently in use is adapted from the Massachusetts Riverways Programs *Adopt-A-Stream Program* and the Natural Resources Conservation Service *Stream Survey Sheet* (see Appendix B). The survey sheets describe the existing physical characteristics of a stream segment, including such things as water depth, average width of the stream, color and clarity of the water,

composition of the streambed, type and amount of vegetation, and surrounding land use. The survey sheets were designed to record only physical observations within and adjacent to the stream corridors. While some of the survey questions are intended to provide a general description of the stream segment, the majority serve to draw the volunteer's attention to possible problems (or "impairments"), including channel alteration, fish barriers, excessive algal growth, sedimentation, lack of riparian zone vegetation, and potential sources of pollution (Table 1).

Each Streamwalk team is assigned a survey area and is provided with a field map and several survey sheets. As they walk their survey area, the survey teams are instructed to divide their section of stream into smaller segments based on changes in various stream characteristics such as slope, width, depth, substrate materials and streamside vegetation. A separate survey sheet is completed for each distinct segment, while segment locations are indicated on the field map. *A map showing the number of segments surveyed per local basin is included in Appendix C.*

Table 1. Impairment Categories and Associated Types of Conditions and/or Problems Reported

Impairment Category	Corresponding Conditions or Problems
Dams / Ponds	Dams, impoundments, man-made ponds
Dumps / Wastes	Dumping, trash, debris, rubbish
Erosion	Stream bank erosion, channel incision
Infrastructure	Channelization, concrete steps, road stream crossings (e.g. culverts), pipes (other than discharge), stream manipulation
Invasive Plants	Aquatic invasive plants, invasive plants in riparian zone
Low Stream Flow	Reduced or low stream flow areas or dry channels caused by dams, diversions, withdrawals, and reduced baseflow
Riparian Zone	Diminished or disturbed riparian vegetation, narrow buffers
Sediment	Sedimentation, silt accumulation
Water Quality	Runoff, discharge pipes, excessive algal growth, foam, scum, high turbidity, discolored water, livestock in stream or on streambanks, oily sheen or smell, sewage odor

Volunteer Training

As of Spring 2010, 115 volunteers have surveyed over 200 stream miles in the watershed. Volunteers have come from every watershed town and they range from high-school age to adults. A training program for Streamwalk Volunteers is held each spring with the assistance of the NRCS. Volunteers receive a basic course in stream ecology, morphology, water quality, non-point source pollution, and the relationship between their community and its rivers and streams. The training session increases volunteers' awareness and understanding of potential impairments to the health of a river. What volunteers learn in the training session is reinforced when they conduct the survey itself. The survey brings volunteers into direct contact with a river and creates the opportunity for them to better understand the way a river system works and how it impacts their communities.

Data Entry, Analysis and Mapping

Each season, PRWC staff thoroughly review the information collected and clarify data with the Streamwalk volunteers. The results from the surveys are then entered into an Excel database to document all impairments found in the watershed. In the Excel database, survey information is organized by subwatershed and clearly labeled with the survey-area code, segment location, date, types of impairments observed, and descriptions of specific areas of concern. Organizing the data in such a way allows for the development of simple charts and graphs to visually display the most common types of problems facing the subwatersheds and the Pomperaug River watershed as a whole. Additionally, the spreadsheets can be easily linked with PRWC's Geographic Information System (GIS) using the survey-area code. In this way, GIS can be used to geographically reference and associate survey data with other information characterizing the watershed (e.g. land use, roads, town boundaries, waterbodies, etc.). It may also be used to spatially display locations of common impairments to help identify priority areas needing attention.

Data Use and Limitations

The usefulness of Streamwalk survey data extends far beyond the program's primary goals of collecting baseline data and educating watershed residents. Findings from the Streamwalk Program shall be regularly incorporated into the PRWC's *watershed management planning* to help to identify potential Action Items (Winters, 2006). PRWC's Land Use Committee utilizes the survey data to identify areas within the watershed in need of restoration and preservation. Streamwalk data is also available as a resource to local town leaders, land use planners, residents in the community, and anyone else working to protect aquatic resources. Some watershed towns are even able to use the Streamwalk Program to help fulfill requirements of federal and state stormwater regulations, specifically the National Pollutant Discharge Elimination System (NPDES) Phase II regulations.

Streamwalk survey results can be used to gauge the health of the river, to identify resource needs, and to plan conservation measures in the watershed. Quantifying the data can help to determine the predominant resource concerns in the watershed. As survey areas are revisited, data can become part of a collection that captures trends over time. While the survey acts as a first step in establishing an understanding of the condition of a watershed, it is important to note that the information collected through the Streamwalk survey is not a complete assessment of the problems in or along the stream.

The data gathered through the Streamwalk Program differs from data collected through scientific study. Scientific studies follow strict protocols that ensure data is objective and repeatable, whereas the volunteer programs rely largely on personal observations; as a result, data collected by volunteers tends to have more variability than data collected by professionals. Furthermore, since conditions in a watershed change over time, data gathered should not be considered static. Because the information collected is really a "snap shot" in time of the river system, areas of concern may require more in-depth assessment by professionals and/or more

frequent monitoring. This is especially important to keep in mind when reviewing the *Summary of Findings* section below, since some impairments that were reported when the program first began may no longer exist today; alternatively, impairments may have become more severe over time. *A map showing the year in which each local basin was surveyed is included in Appendix C.*

The graphs, tables, and maps presented in this report illustrate the types and totals of impairments recorded in each survey area. The number of impairments should not be interpreted as an indication of the extent of the impairments or the severity of stream conditions. Furthermore, the number of segments surveyed per local basin may have an influence on the total number of impairments recorded, since the same impairment (e.g. invasive plants) may overlap several stream segments and therefore be recorded multiple times.

SUMMARY OF FINDINGS

As of spring 2010, volunteers have completed Streamwalk surveys on all of the local basins originally selected for observation within the subwatersheds of the Pomperaug, Nonnewaug, and Weekeepeemee Rivers, as well as one local basin in the Sprain Brook subwatershed. The results from all 10 years of surveys have been compiled into an Excel database and analyzed both collectively and by subwatershed. This section of the report will begin with a discussion of results for the whole watershed, followed by a more in-depth look at each of the completed subwatersheds. Activities and strategies for addressing specific impairments will be discussed in the following section, entitled *Recommendations.*

Watershed-wide Results

Impairments, both individually and cumulatively, can have impacts on water quality, water quantity, fish and wildlife habitat, and the general health of the river system. Pomperaug River watershed volunteers reported a total of 515 impairments within the 78 local basins surveyed. These local basins were further divided into 286 stream segments, with the number of segments per survey area ranging from 1 to 13. All impairments recorded for each segment were entered into an Excel database and tabulated. When this data is mapped, it can help to identify areas within the watershed in need of further examination, restoration, protection or preservation (Figure 2).

While the number of impairments observed in a survey area alone may not be an accurate indication of the severity of stream conditions in that local basin, it does provide some insight into where impairments tend to be concentrated within the watershed. A closer look at the local basins where a large number of impairments were recorded may reveal that many of the impairments are being caused by the same source (for example, extensive development along the stream corridor). Alternatively, the impairments may be scattered throughout the survey area with a variety of unrelated causes associated with them. The survey areas in each subwatershed with the highest numbers of recorded impairments will be examined in further detail later in this section.

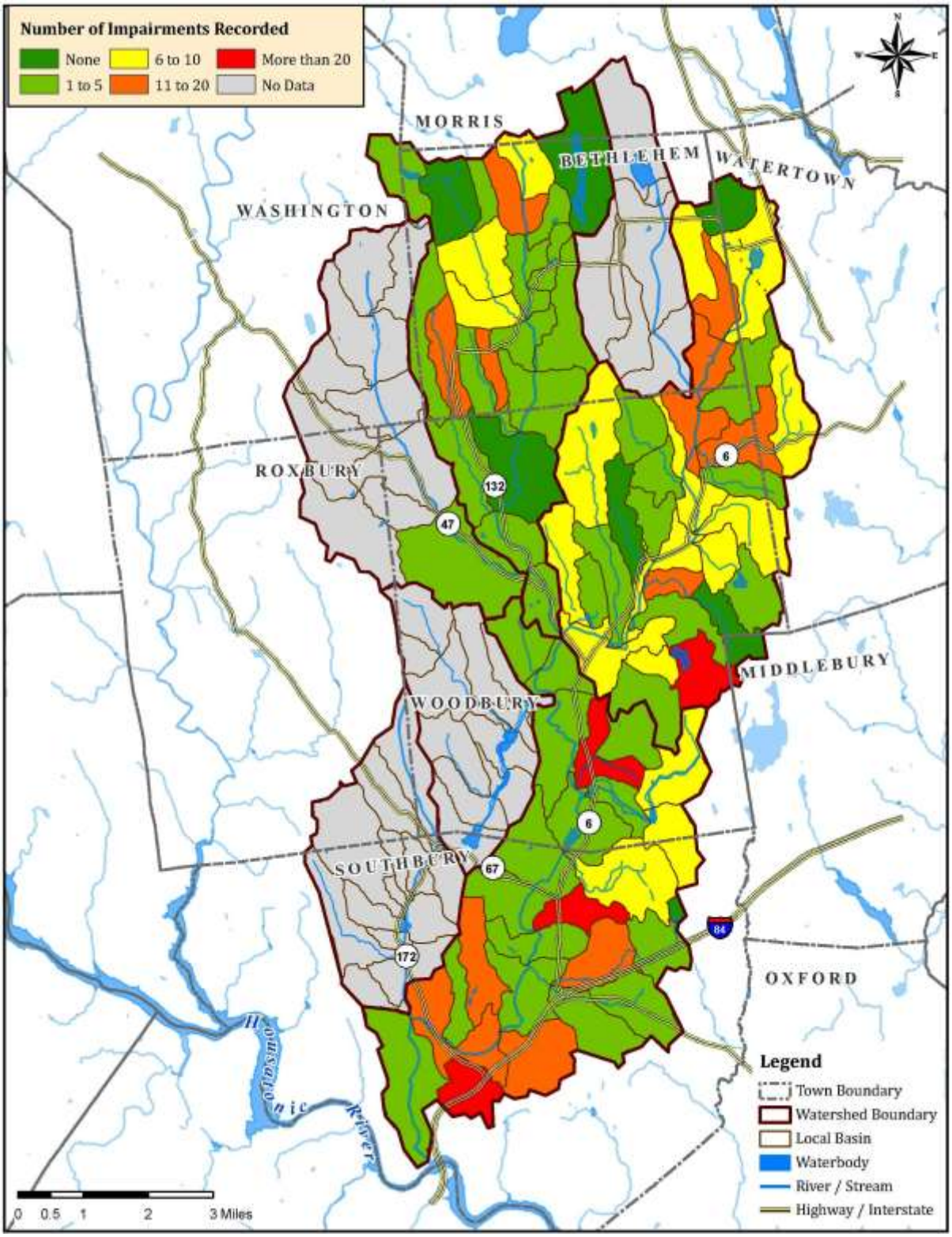

Figure 2. Number of Impairments Recorded per Local Basin

Categorizing and quantifying the various types of impairments reported can also help to determine the predominant resource concerns in the watershed. Of the nine major categories of impairments identified in the Pomperaug River watershed, the ones most commonly observed by Streamwalk volunteers were related to water quality, infrastructure, and riparian zones (Figure 3). When looking at these results, it is important to keep in mind that the "water quality" impairment category consists of a variety of related problems and conditions that result in or indicate diminished water quality (Table 1). Similarly, the "infrastructure" category consists of multiple infrastructure related techniques for directing or controlling the flow of water. The "riparian zone" category, however, consists exclusively of diminished riparian zones. In view of this distinction, the single most common impairment found along the Pomperaug River and its tributaries is diminished riparian zones.

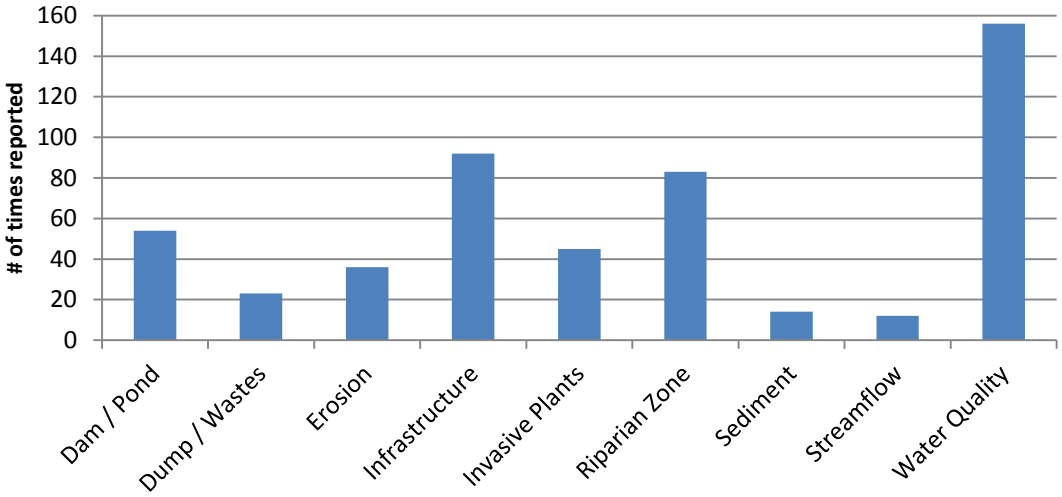

Figure 3. Number of Occurrences by Impairment Category

Water quality, infrastructure, and riparian zones, the predominant resource concerns in the watershed, are described in more detail below. Maps of the watershed showing the general distributions the each impairment category are included in Appendix C. When viewing these maps, it is important to keep in mind that the presence of impairment(s) in a local basin is not an indication that the entire local basin is impaired. For example, often there will be one or two occurrences of diminished riparian zone somewhere in the local basin, but it does not mean that the entire riparian zone in those basins is diminished.

Water Quality Impairments

Collectively, water quality impairments account for 30 percent of the total reported impairments in the watershed (156 occurrences). This impairment category consists of eight distinct conditions or problems commonly associated with diminished water quality. Of these, three are potential sources of pollution (discharge pipes, runoff, and livestock) and five are

noticeable signs of degraded or impaired water quality (high turbidity or discolored water, excessive algal growth, oily sheen or smell, foam/scum, and sewage odor).

Discharge pipes and potential sources of runoff were the most commonly reported water quality impairments in the watershed, together accounting for nearly half of all water quality impairments reported (Figure 4). Pollution concerns from discharge pipes, stormwater runoff and livestock include sediment, nutrients, toxins and bacteria. Impairments such as excessive algal growth and high turbidity are noticeable signs of degradation or pollution that may result from these pollutants.

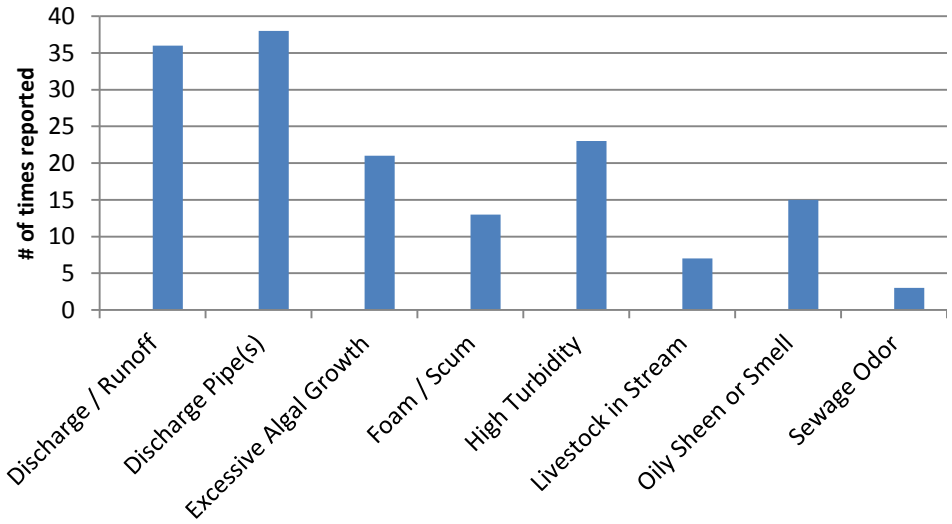

Figure 4. Water Quality Impairments Reported

Infrastructure Impairments

Road and stream networks—both being long, linear systems—frequently intersect, and the structures that are installed at these crossings may become problematic from the standpoint of stream health. Other structural alterations to stream channels, such as straightening, smoothing, underground piping, and armoring, have frequently been used to reduce flooding in specific areas, allow for development of river corridors, and otherwise control or redirect stream flow. Structural alterations such as these ultimately lead to degraded in-stream habitat, channel incision, and

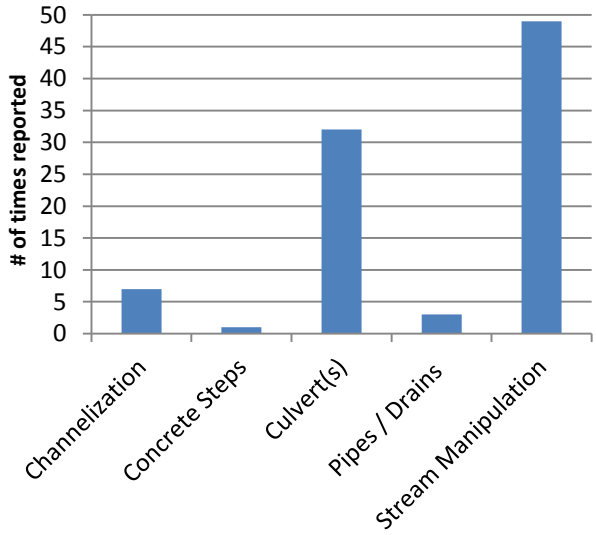

Figure 5. Infrastructure-Related Impairments

sedimentation, which alter channel morphology and inadvertently create flooding hazards downstream.

For the purposes of this report, problems related to structural alteration were collectively classified as infrastructure impairments. Ninety-two occurrences of infrastructure-related impairments were reported watershed-wide, accounting for approximately 18 percent of the total number of impairments observed. Of these, stream manipulation was the most commonly reported, followed by culverts, channelization, piping of the stream channel, and concrete steps (Figure 5).

Diminished Riparian Zones

Areas of disturbed or diminished riparian vegetation and narrow buffers were often reported throughout the watershed, with occurrences in well over half of the local basins surveyed (Figure 6). The riparian zone, commonly referred to as a buffer or vegetated buffer, consists of the land directly next to either side of a stream or river. The width, length, composition and complexity of vegetation in the stream's riparian zone are important factors that determine its effectiveness in filtering out nutrients, sediment, toxins and bacteria from overland runoff before it enters the stream channel.

Riparian vegetation also has a strong influence on aquatic habitat, including stream morphology, streambank stability, water temperatures, and biodiversity. The root systems of vegetation growing along the streambanks hold soil in place, helping to prevent bank erosion, while trees and shrubs provide

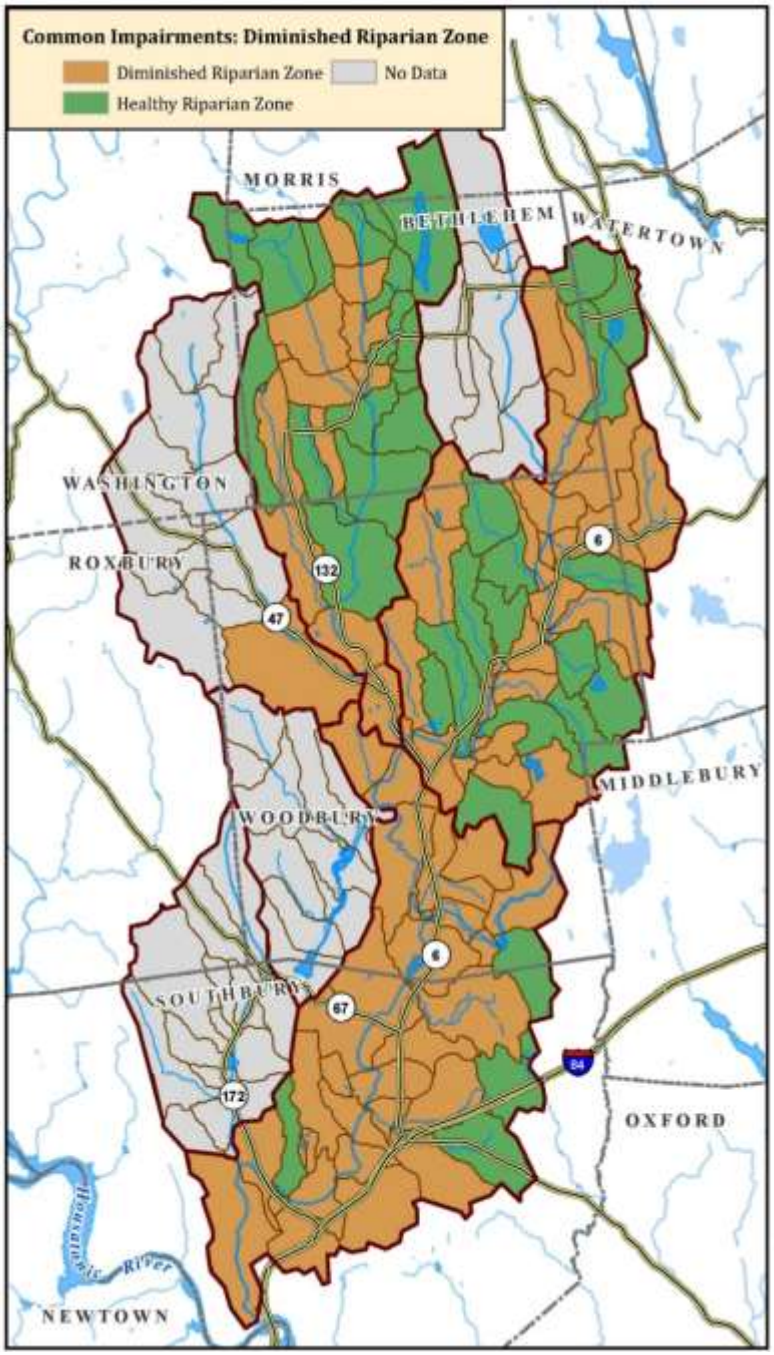

Figure 6. Survey Areas with Diminished Riparian Zones Reported

shade for the stream as well as food and protective structure for aquatic organisms. Streamwalk volunteers frequently reported insufficient vegetation, exposed banks, buffer widths of less than 25 feet, and lawns, hayfields, pasture, artificial bank materials, roads or other development displacing native riparian vegetation. Not surprisingly, diminished riparian zones were often reported in conjunction with streambank erosion, infrastructure impairments, water quality impairments, or invasive plants.

Pomperaug River Subwatershed Results

The Pomperaug River subwatershed, which contains the main stem of the Pomperaug River and its perennial tributaries, was divided into 26 local basins with survey sheets completed for 112 stream segments. Streamwalk volunteers documented a total of 230 impairments in this basin (Table 2). Similar to the watershed-wide results, the most commonly observed impairment categories along the main stem Pomperaug River were those related to water quality, infrastructure, and riparian zones.

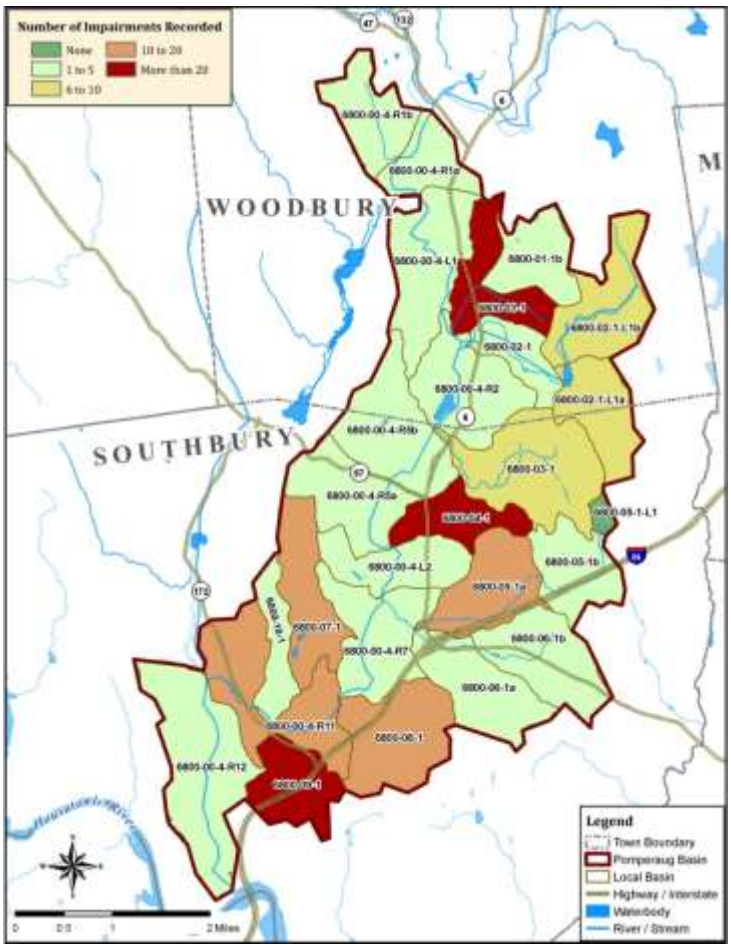

Figure 7. Number of Impairments Observed per Local Basin in Pomperaug River Subwatershed

With 41 documented occurrences, diminished riparian zones represent the single most common impairment found in this subwatershed. This is an interesting result when compared with the findings from the *2005 Streamwalk Report*, which indicated that diminished riparian zones only accounted for 10 of the 111 impairments recorded up to that point (Brawley & Winters, 2005). In 2005, the vast majority of impairments being reported in the basin were related to infrastructure concerns, whereas only a handful of water quality and riparian zone impairments were noted. By that time, Streamwalk volunteers had already surveyed 21 of the 26 local basins. Today, while infrastructure impairments are still commonly observed in this basin, water quality concerns and diminished riparian zones appear to have become a much larger problem than they were in the past.

Table 2. Impairment Tally for the Pomperaug River Subwatershed

Impairment	Total	Impairment	Total
Diminished riparian zone	41	Excessive algal growth	8
Stream manipulation	23	Trash / debris	7
Discharge pipe(s)	23	Foam / scum	6
Culvert(s)	20	Dumping	6
Dam / impoundment	19	Channelization	4
Bank erosion	16	Sewage odor or other evidence	3
Invasive plants	11	Sedimentation	3
Discharge / runoff	11	Livestock in stream / on stream banks	2
High turbidity / discolored water	9	Concrete steps	1
Oily sheen or smell	8	Pipes (other than discharge)	1
Dry channel	8	**Total Number of Impairments**	**230**

Survey Areas of Concern

Relatively few impairments to stream health were observed in most of the local basins in the Pomperaug River subwatershed (Figure 7), with 16 of the 26 survey areas reported to have fewer than five impairments. However, of the four local basins in the entire watershed with more than 20 reported impairments, three are located in this subwatershed. Although the number of impairments recorded is not by itself an indication of poor stream health, the disproportionate number of impairments observed in these local basins does call for a closer look at what is happening in these areas.

<u>Local Basin 6800-01-1 (Max Creek & Orenaug Brook)</u>

Surveyed: October 2000
Number of Segments: 12
Max Creek – 7 segments
Orenaug Brook – 5 segments
Number of Impairments: 27

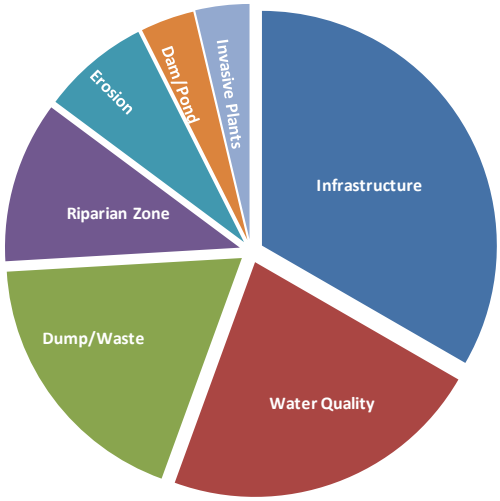

Figure 8. Breakdown of Impairments in Local Basin 6800-01-1

Summary of Concerns*: This local basin has the most infrastructure-related impairments of any local basin in this subwatershed. The upper section of Max Creek is repeatedly channelized and piped. Also on Max Creek, concrete and metal culverts under Sherman Heights Road were reported to be well above low flow levels on the downstream side. Infrastructure concerns on Oneraug Brook included channelization of the stream under Route 6 and under another road in the middle section of the stream. Water quality impairments and dumping were frequently reported in this survey area as well, especially on Orenaug Brook. These impairments included yard wastes, litter, discolored water, sediment, oil slicks, scum, runoff sources, and a large rusted tank.*

Local Basin 6800-04-1

Surveyed: August 2008
Number of Segments: 12
Number of Impairments: 30

Summary of Concerns*: Water quality-related impairments were the most frequently observed in this local basin, including turbid and oily water from discharge pipes, foam, scum, sewage odors associated with drainage pipes, and runoff sources close to the stream channel. Several dams/ponds and infrastructure related impairments are spread throughout the survey area. Two occurrences of severe bank erosion were reported in one segment. Stream flow levels may be of concern as well, since many segments in this basin were dry at the time of the Streamwalk survey (it is unclear whether these were intermittent streams which typically dry up or whether this was an unusual occurrence).*

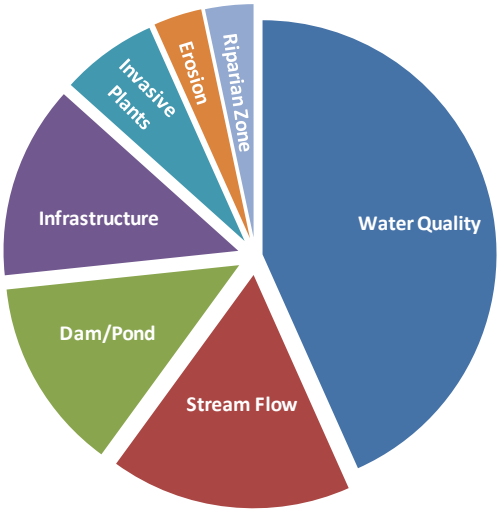

Figure 9. Breakdown of Impairments in Local Basin 6800-04-1

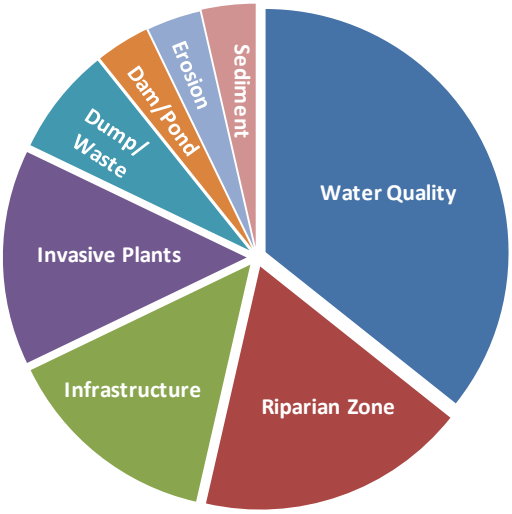

Figure 10. Breakdown of Impairments in Local Basin 6800-09-1

Local Basin 6800-09-1

Surveyed: September 2006
Number of Segments: 4
Number of Impairments: 28

Summary of Concerns*: Water quality-related impairments were the most commonly observed in this survey area, often reported in association with diminished riparian vegetation and infrastructure problems. Invasive plants were prevalent in this survey area: Phragmites and Purple Loosestrife were observed surrounding ponds, in wetlands adjacent to the stream, and along a long stretch of the middle section of the brook. Japanese Barberry was also reported along the middle section of the brook.*

Nonnewaug River Subwatershed Results

The Nonnewaug River subwatershed, which contains the main stem of the Nonnewaug River and most of its perennial tributaries, was divided into 28 local basins with survey sheets completed for 108 stream segments. Streamwalk volunteers documented a total of 189 impairments in this basin (Table 3). Similar to the watershed-wide results, the most commonly observed impairment categories in the Nonnewaug River subwatershed were those related to water quality, riparian zones, and infrastructure.

With 27 documented occurrences, diminished riparian zones represent the single most common impairment found in this subwatershed. Invasive plants, especially Multiflora Rose and Japanese Barberry, were also frequently reported in the riparian zones. In several cases these thorny invasives prevented the Streamwalk volunteers from being able to access some stream segments in their survey areas.

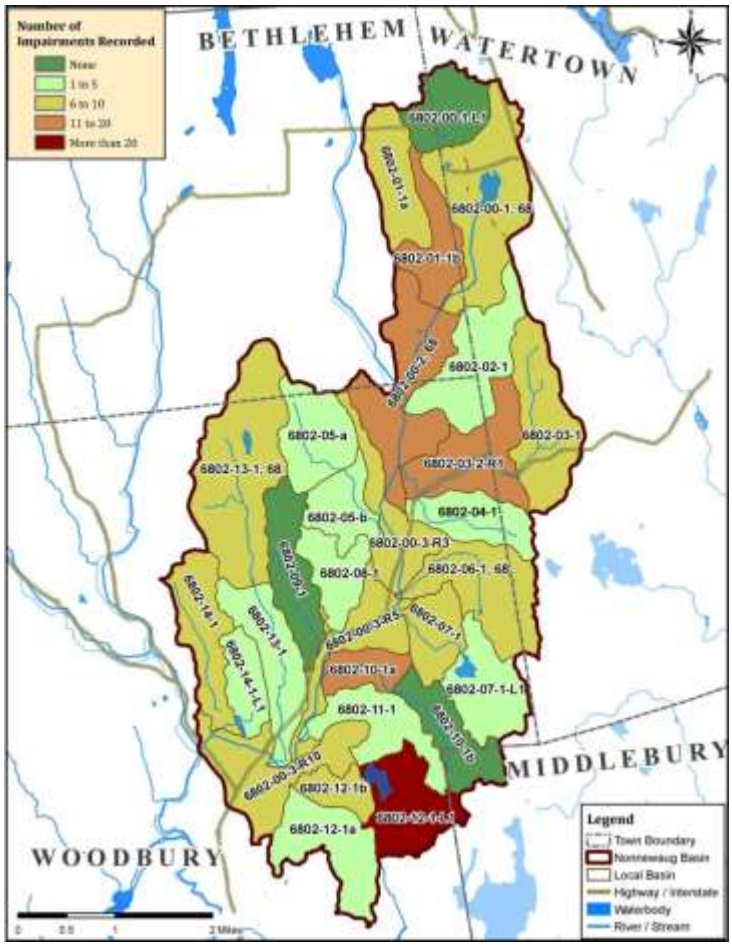

Figure 11. Number of Impairments Observed per Local Basin in Nonnewaug River Subwatershed

Table 3. Impairment Tally for the Nonnewaug River Subwatershed

Impairment	Total	Impairment	Total
Diminished riparian zone	27	Foam / scum	6
Invasive plants	23	Oily sheen or smell	6
Dam / impoundment	20	Sedimentation	5
Discharge / runoff	20	Livestock in stream / on stream banks	4
Stream manipulation	13	Trash / debris	4
Bank erosion	12	Dry channel	3
Culvert(s)	10	Dumping	2
Discharge pipe(s)	10	Silt accumulation	2
Excessive algal growth	10	Channelization	1
High turbidity / discolored water	10	Pipes (other than discharge)	1
		Total Number of Impairments	**189**

These results vary significantly from those in the *2005 Streamwalk Report*, which indicated that of the 92 impairments recorded up to that point, less than 10 were related to diminished riparian zones and another 10 were associated with invasive plants (Brawley & Winters, 2005). In 2005, the vast majority of impairments being reported in the basin were related to infrastructure concerns, while sediment, discolored water, and dams were the next three most common impairments observed. At that time, Streamwalk volunteers had only surveyed about half of the local basins in the Nonnewaug River subwatershed. Today, while infrastructure impairments are still a major concern in this basin, diminished riparian zones and invasive plants are becoming much more prevalent.

Survey Areas of Concern

While overall fewer impairments were recorded in the Nonnewaug River subwatershed than in the Pomperaug River subwatershed, the impairments observed in the Nonnewaug basin were more evenly distributed across the local basins (Figure 11). Of the 28 survey areas in this subwatershed, 21 had impairment counts between one and eight, while only four local basins had impairment counts of 15 or more (one had more than 20). The survey areas in this subwatershed with the highest numbers of recorded impairments are examined in further detail below.

Local Basin 6802-12-1-L1, aka 6802-12-c (Cat Swamp Pond & tributaries)

Surveyed: August 2006
Number of Segments: 9
Number of Impairments: 24

Summary of Concerns*: Invasive plants were the most frequently observed impairments in this local basin (Figure 12). Japanese Barberry and Multiflora Rose were observed along the banks and riparian zones of all three of Cat Swamp Pond's tributaries. In most cases the reports were of isolated plants, small clumps or widely scattered plants. Dams/ponds were the next most frequently observed impairment in this survey area. Aside from the Cat Swamp Pond dam, there were remnants of two small stone and earth dams reported in the upper half of one tributary and one man-made pond on another tributary.*

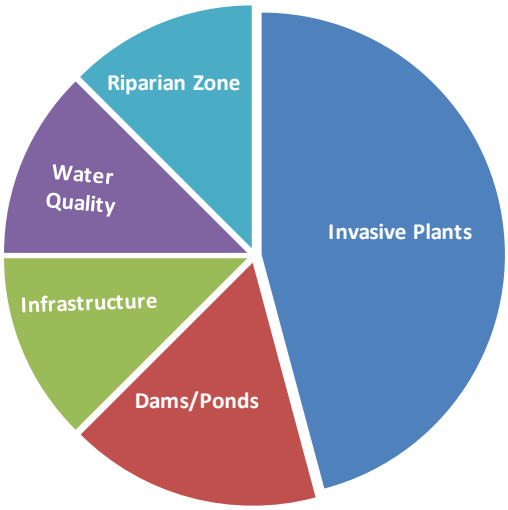

Figure 12. Breakdown of Impairments in Local Basin 6802-12-1-L1

Local Basin 6802-00-2, 68, aka 6802-00-c

Surveyed: August 2004
Number of Segments: 8
Number of Impairments: 18

Summary of Concerns*: A variety of water quality-related impairments were reported in this survey area, including discharge pipes, runoff, oily sheen, and excessive algal growth. In segment B there was a horse farm with the fence up to the bank causing heavy erosion and animal waste runoff. In several areas residential lawns or farmland replaced the native riparian vegetation and in other areas the riparian buffer was less than 25 feet wide. Infrastructure-related impairments and diminished riparian zones were found in association with bank erosion in segments A and B.*

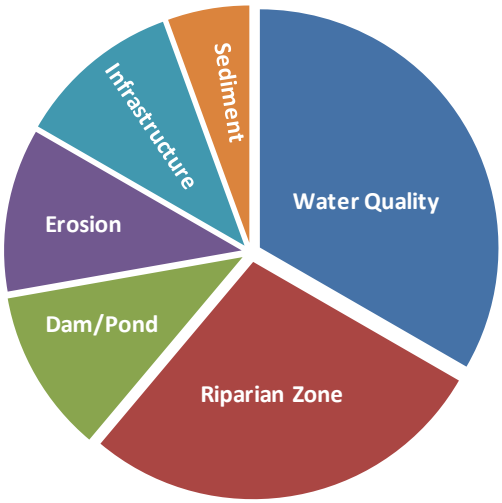

Figure 13. Breakdown of Impairments in Local Basin 6802-00-2, 68

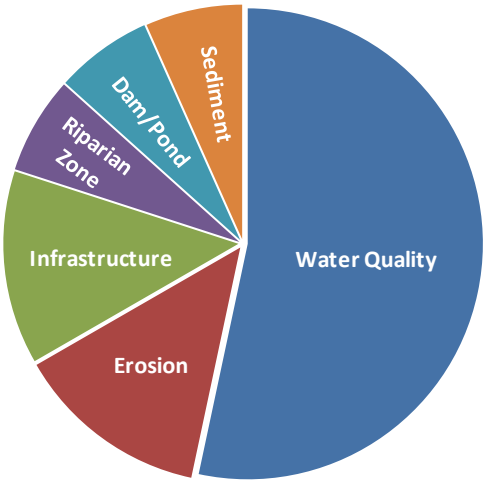

Figure 14. Breakdown of Impairments in Local Basin 6802-03-2-R1

Local Basin 6802-03-2-R1, aka 6802-03-a

Surveyed: August 2004
Number of Segments: 4
Number of Impairments: 15

Summary of Concerns*: This section of stream was described as flowing through agricultural areas and paralleling major transportation routes, with some areas of forest intermixed. Runoff from roads and cow pasture are the primary concerns in this survey area. Bank erosion was also observed in and around the cow areas. Foam and oil were observed in one segment near a road. Also noteworthy, a series of stone impoundments, concrete dams, bridges, and riprap located just before the confluence of Lewis Atwood River and the Nonnewaug River were counted as a single impairment. This impairment is noted as causing deeper, warmer, stagnant water with more aquatic vegetation.*

Weekeepeemee River Subwatershed Results

The Weekeepeemee River subwatershed, which contains the main stem of the Weekeepeemee River and its perennial tributaries, was divided into 22 local basins with survey sheets completed for 58 stream segments. Streamwalk volunteers documented a total of 94 impairments in this basin (Table 4). The most commonly observed impairment categories in the Weekeepeemee River subwatershed were those related to water quality, infrastructure, and dams or ponds.

Figure 15. Number of Impairments Observed per Local Basin in Weekeepeemee River Subwatershed

Dams and impoundments were the most frequently reported impairments within this subwatershed, most of which were small stone and earth dams used to create ponds on privately owned residential land. Lawns and residential development have displaced native riparian vegetation through long stretches of this basin, and invasive plants, particularly Japanese Barberry, Phragmites, and Multiflora Rose, have invaded the banks and riparian zones of large segments of stream. Not surprisingly, several areas of severe bank erosion were observed in association with diminished riparian zones, invasive plants, and dams.

Table 4. Impairment Tally for the Weekeepeemee River Subwatershed

Impairment	Total	Impairment	Total
Dam / impoundment	15	Excessive algal growth	3
Diminished riparian zone	14	Channelization	2
Stream manipulation	13	Culvert(s)	2
Invasive plants	11	Livestock in stream / on stream banks	1
Bank erosion	7	Water withdrawal / diversion	1
Discharge / runoff	5	Dumping	1
Discharge pipe(s)	5	Oily sheen or smell	1
High turbidity / discolored water	4	Pipes (other than discharge)	1
Sedimentation	4	Foam / scum	1
Trash / debris	3	**Total Number of Impairments**	**94**

When the *2005 Streamwalk Report* was written, only eight of the 22 local basins in the Weekeepeemee River subwatershed had been surveyed. At that time, erosion was the most common impairment reported (Brawley & Winters, 2005). Infrastructure, dams, and sediment were the next three most common impairments observed. Today, while dams and infrastructure impairments are still major concerns in this basin, diminished riparian zones and invasive plants have become more widespread.

Survey Areas of Concern

Fewer impairments were observed in the Weekeepeemee River subwatershed than in both the Pomperaug River and the Nonnewaug River subwatersheds. Of the local basins surveyed, only three had reports of more than 10 impairments (Figure 15). These three local basins are examined in further detail below.

Local Basin 6804-07-1b

Surveyed: July 2006
Number of Segments: 6
Number of Impairments: 18

Summary of Concerns*: The dominant impairments found along this small unnamed tributary are related to infrastructure. Stream manipulation was reported seven times. One section of stream of particular concern was channeled underground after a small impoundment. Another infrastructure problem occurred at Crane Hollow Road, where the stream flows under the pipe culvert, rather than through it, and the water becomes turbid with rusty brown scum just past it. Diminished riparian zones were also noted in several places, with lawns replacing native vegetation in two sites, a clear-cut area, and vehicle tracks disrupting the buffer near the confluence.*

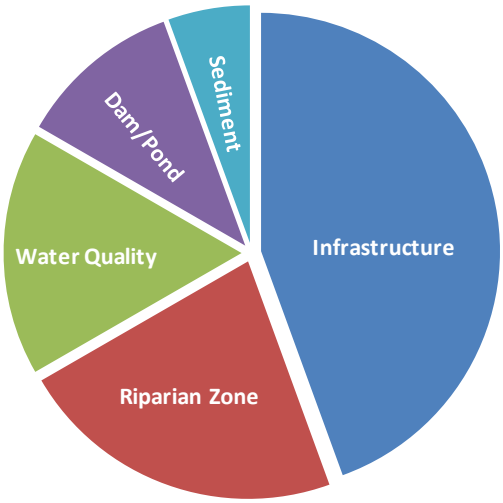

Figure 16. Breakdown of Impairments in Local Basin 6804-07-1b

Local Basin 6804-08-1

Surveyed: July 2009
Number of Segments: 5
Number of Impairments: 14

Summary of Concerns*: Invasive plants were the most frequently observed impairment in this survey area. Japanese Barberry was noted in the riparian zones of four of the five stream segments, ranging in extent from a few plants to dominating both banks of a long stretch of stream. Due to residential development, the average buffer width along much of this local basin is less than 25 feet. Water quality is a concern in three sites in this local basin: 1) where livestock have access to the stream, 2) runoff from a new construction site, and 3) two discharge pipes of unknown origin. Bank erosion due to cattle accessing the stream was also reported as a concern.*

Figure 17. Breakdown of Impairments in Local Basin 6804-08-1

Local Basin 6804-00-2-R1, 6804-00-1

Surveyed: September 2009 & October 2006
Number of Segments: 4
Number of Impairments: 11

Summary of Concerns*: While this section of stream was reported to be generally clean and undeveloped, some infrastructure and water quality concerns were observed. Infrastructure impairments included two sites of channelization (one 50-foot channel through a private lawn and another section channeled for about 200-feet). A clear-cut area used for motocross is causing excessive erosion and runoff concerns. At Todd Hill Road Bridge, the road is crumbling into the stream. Invasive plants, although counted as a single impairment, are a significant concern as well. Heavy Japanese Barberry thickets were observed north of Todd Hill Road, and Japanese Barberry and Multiflora Rose were abundant over the entire study area.*

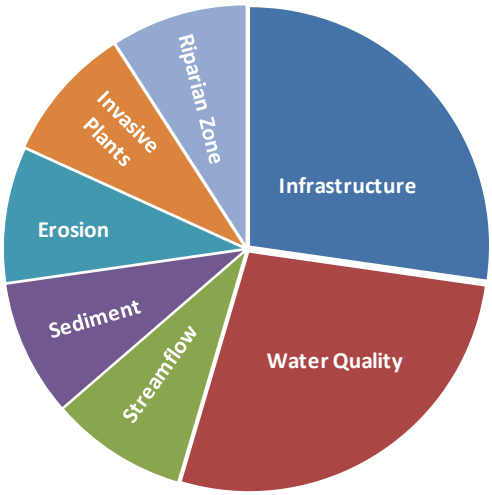

Figure 18. Breakdown of Impairments in Local Basin 6804-00-2-R1, 6804-00-1

RECOMMENDATIONS

The information collected through Streamwalk surveys can be used for planning purposes for both site specific and watershed-wide improvements and protection efforts. While the Pomperaug River and its tributaries currently maintain relatively high water quality (Wingfield, 2008), a large number of impairments have been identified throughout the watershed which threatens the overall health of the river. The *Summary of Findings* section of this report highlighted the most frequently reported impairments. The following pages contain recommended approaches for initiating restoration efforts for each category of impairment identified through the Streamwalk Program over the past 10 years.

Water Quality Impairments

Typical Problems Identified:

- ✓ Discharge pipes
- ✓ Runoff
- ✓ Storm drains
- ✓ High turbidity
- ✓ Excessive algal growth
- ✓ Oily sheen or smell
- ✓ Foam / scum
- ✓ Sewage odor
- ✓ Livestock in stream or on streambanks

Recommended Approaches:

- Continue the Volunteer Macroinvertebrate Survey program to monitor water quality.
- Develop a water-quality sampling program or incorporate water-quality sampling into the Streamwalk Program (e.g. volunteers could collect samples to send to a lab). ***Note: This is in the works and will be launched this summer.***
- Conduct follow-up visits to impairment sites with noticeable signs of water quality degradation to identify causes and determine if restoration actions should be taken.
- Monitor and sample effluent from known discharge pipes, especially those causing visible impacts to water quality. Report polluting discharge pipes to proper authorities.
- Work with local town Highway Departments to raise awareness about storm drains and to install sediment catch basins so less road sand washes directly into streams and rivers.
- Work with local and state officials, private landowners, and environmental groups to restore impaired riparian zones. Projects may include establishing or enhancing buffers by planting natural vegetation, seeding bare soils, diverting runoff into wooded or buffered areas, and implementing erosion control measures (e.g. silt fence) around construction sites.
- Work with agricultural landowners to install and maintain naturally vegetated riparian buffers and livestock fencing, and to implement practices such as rotational grazing, conservation tillage, and nutrient and waste management.

Infrastructure-Related Impairments

Typical Problems Identified:

- ✓ Stream manipulation
- ✓ Poor culvert design
- ✓ Channelization
- ✓ Concrete steps
- ✓ Channel armoring
- ✓ Pipes (other than drainage)

Recommended Approach:

- Initiate a watershed-wide culvert assessment. This assessment should take into account stream continuity for fish passage, the natural movement of stream materials and wildlife migration, as well as the durability and effectiveness of the culvert itself, especially in relation to the culverts' capacity to accommodate fluctuating stream flows.
- Report damaged culverts and other road-related impairment to the Highway Department.
- Based on culvert assessment results, prioritize problem culverts for replacement, prepare specifications for good culvert design, and provide this information to the Highway Department for use as the opportunities for replacing problem culverts arise.
- Existing infrastructure in the river corridor limits options and poses challenges to river restoration. Factors such as cost, political acceptability, and overall practicality will need to be evaluated when prioritizing infrastructure-related restoration projects. Efforts to restore impairments caused by infrastructure should be focused on areas where ample space allows for channel movement so that natural form and process can be established.

Diminished Riparian Zones

Typical Problems Identified:

- ✓ Narrow buffers
- ✓ Insufficient vegetation
- ✓ Exposed banks
- ✓ Lawns, hayfields, pastures, or other development displacing native vegetation

Recommended Approach:

- Continue and expand educational program targeted at property owners along the river about the importance of the riparian zone.
- Consider training Streamwalk volunteers to pay personal visits to homes where excess fertilization, pesticide application, and lack of a buffer zone may be affecting water quality,

to inform owners of the hazards of pesticide use, over-fertilization of lawns and the importance of buffer zones.

- Advocate for mandatory buffer zones and wetland ordinances as part of state and town regulations.
- Promote establishment of vegetated buffers between the stream and development.
- Plan a demonstration project to showcase the attractiveness of vegetated buffers to encourage homeowners to plant streamside vegetation.

Dams and Ponds

Typical Problems Identified:

- ✓ Large public works dams / impoundments
- ✓ Small ponds created by stone and earthen dams, many incorporated in to the landscapes of private residences
- ✓ Breached historic dams

Recommended Approach:

- Initiate a watershed-wide dam assessment to determine the degree to which dam structures impede fish passage and restrict natural channel form and process (could easily be combined with the culvert assessment as a connectivity study).
- Develop outreach materials targeted at property owners who have small dammed ponds on their property to educate them about proper maintenance of the ponds for protection of the stream's water quality and habitat connectivity.
- Work with local and state agencies to remove the remaining structures of breached or obsolete dams.

Invasive Plants

Typical Problems Identified:

- ✓ Invasive plants on streambanks or in the riparian zone
- ✓ Aquatic invasive plants in streams, ponds, or adjacent wetlands

Recommended Approach:

- Identify and map invasive species. Look into control techniques for specific problem species.
- Establish Early Detection Rapid Response (EDRR) plan.
- Develop an invasive species management plan.

Bank Erosion

Typical Problems Identified:

- ✓ Stream bank erosion caused by channel adjustment/migration
- ✓ Livestock trampling streambanks
- ✓ ATV's crossing streams or driving on streambanks.

Recommended Approach:

- ➢ Conduct follow-up visits to sites were severe bank erosion was reported to identify whether it is due to natural channel migration or unhealthy stream conditions. If an unnatural cause is identified, develop a restoration plan for addressing both the root cause and stabilizing the stream banks.
- ➢ Urge state and local officials to enforce no-trespassing laws for ATVs in the riparian zone.
- ➢ Work with agricultural landowners to install and maintain naturally vegetated riparian buffers and livestock fencing.

Dump/Wastes

Typical Problems Identified:

- ✓ Dumping / debris
- ✓ Trash / litter
- ✓ Historic rubbish piles
- ✓ Abandoned equipment

Recommended Approach:

- ➢ Investigate dump sites that have been reported for signs of hazardous materials and work with state and local officials to clean up large and/or potentially hazardous dump sites.
- ➢ Organize cleanups of shoreline, especially in areas where dump sites and excessive litter have been identified. Arrange for bulky waste to be removed.
- ➢ Ask businesses to put up fencing to prevent their trash from going into the waterways.

Sediment

Typical Problems Identified:

- ✓ Sedimentation and silt accumulation caused by large-scale clearing of vegetation for development, logging, mining, and road building.

✓ Inadequate or failing erosion control techniques.

Recommended Approach:

- Work with state and local officials to remediate construction impacts.
- Advocate for construction-site erosion control ordinances as part of town regulations.
- Continue the Volunteer Macroinvertebrate Survey program. A shift in the composition of the macroinvertebrate community is a common result of fine sediment clogging gravel-bed streams.

Streamflow

Typical Problems Identified:

✓ Reduced or low stream flow caused by dams, diversions, or withdrawals
✓ Dry channels due to reduced base flow

Recommended Approach:

- Confirm permits issued to businesses and residences using or diverting stream water.
- Encourage the use of low-impact development techniques in the watershed.
- Conduct follow-up visits to dry channels to determine if they are natural occurrences or caused by man-made alterations to flow patterns. If they are being caused by man-made alterations, develop a restoration plan for addressing the underlying problem.

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