Crandall Pond Abbreviated Watershed Based Plan

Recommendations for Protecting and Improving Water Quality in the Crandall Park Pond Watershed

Prepared by : The Tolland Watershed Management Team Tolland, Connecticut August 2014

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- Steve Lowrey, Town of Tolland Wetlands Agent
- Clem Langlois, Director of Public Works
- Rob Miller and other support staff of the Eastern Highland Health District
- Eric Thomas and Stan Zaremba of the Ct Department of Energy & Environmental Protection

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CRANDALL POND ABBREVIATED WATERSHED BASED PLAN

Executive Summary

Crandall Pond (CT 3106-06-1-22_01) is a small, approximately 2.64 acre, body of water located in the Town of Tolland, CT. used by the Town for recreational purposes. Years of water quality monitoring at Crandall Pond indicated that the water body experiences periodic closures due to high levels of *Escherichia coli bacteria* (*E. coli*) exceeding *Connecticut Water Quality* standards for recreational use contact. Monitoring records showed that the principal periods of increased bacterial levels occurred after heavy rains and are associated with storm water runoff otherwise known as "nonpoint source" pollution. As a result Crandall Pond was included by the Connecticut Department of Energy & Environmental Protection (CT DEEP) in the State of Connecticut's list of impaired water bodies. During the spring and summer of 2011, UConn collected water samples from seven locations in the watershed in order to assess potential sources of *E. coli* contamination in Crandall Pond. Results indicated that the most probable sources of bacteria were natural sources, although domestic pet, dog feces, septic tank leakages, and dumpster leachate could also contribute to elevated levels. This plan outlines Best Management Practices (BMPs) and a watershed scale strategy to address pet waste contributions, potentially failing septic systems and/or dumpster leachate.

Introduction

Crandall Pond is the centerpiece of Crandall Park, an over 400 acre park located in Tolland, CT. The park is managed by the Town of Tolland. The day use area of the park includes a public swimming area at Crandall Pond. The 2.64 acre pond is fed by three sources, two streams and a diversion from neighboring Powell Pond. The primary source of water to the pond is Paulk Brook, which enters from the north after paralleling the town green for approximately a mile.

A second unnamed stream feeds the pond from Crandall Park but with headwaters near the Tolland Public Works garage and multiple residential properties. The third source is an engineered culvert feeding the pond from Powell Pond after passing through a vegetated wetland area. The swimming pond is shallow (less than 8 feet deep) and a sandy bottom with organic material accumulated near the inputs in the western section of the pond. The lone outlet flows over a dam just above Cider Mill Road and then into the Tolland Marsh.

Crandall Pond has experienced chronic water quality issues related to elevated levels of *E. coli* bacteria for the past decade. Eastern Highland Health District (EHHD) bacterial sampling associated with the swimming area has exceeded the mandated value at least once in each of the past ten years. The principal periods of increased bacterial levels occur after heavy rains and are associated with storm water runoff otherwise known as "nonpoint source" (NPS) pollution. The Connecticut DEEP communicated with Tolland a desire to identify possible sources of this bacterial contamination. To address this issue, Tolland applied for and received a Federal Clean Water Act

Section 319 NPS grant in July 2010 (#2009-013) to fund a watershed scale study and focused management plan. The primary tasks of the study were:

- Investigate and identify potential nonpoint sources (NPS) of pollutants.
- Develop a Watershed Based Management Plan including possible best management practices designed to help alleviate the problem.
- Provide information to and help educate Tolland residents regarding the importance of the watershed and steps they can take to help improve water quality.

As part of this project, Tolland sub-contracted the assistance of the University of Connecticut, Department of Civil and Environmental Engineering to conduct an intensive sampling study to identify potential sources of bacterial to the pond. In addition to conducting pre- and post-event sampling from seven locations during 2011, (see figure 1) UConn conducted a stream walk to identify potential sources and evaluated prior *E. Coli* data collected by the EHHD for potential relationships with precipitation. The data collected by UConn in 2011 suggest that natural sources predominate but that additional measures may be taken to minimize potential secondary contributions. Additionally, prior EHHD data suggest a time-frame for beach closures following precipitation events. The reason for developing a Crandall Pond Watershed Plan is to identify potential sources of bacterial contamination and recommend implementation strategies to address the sources of contamination that will lead to restoring water quality standards to Crandall Pond, Paulk Brook, and improved water quality support for the receiving Skungamaug River.

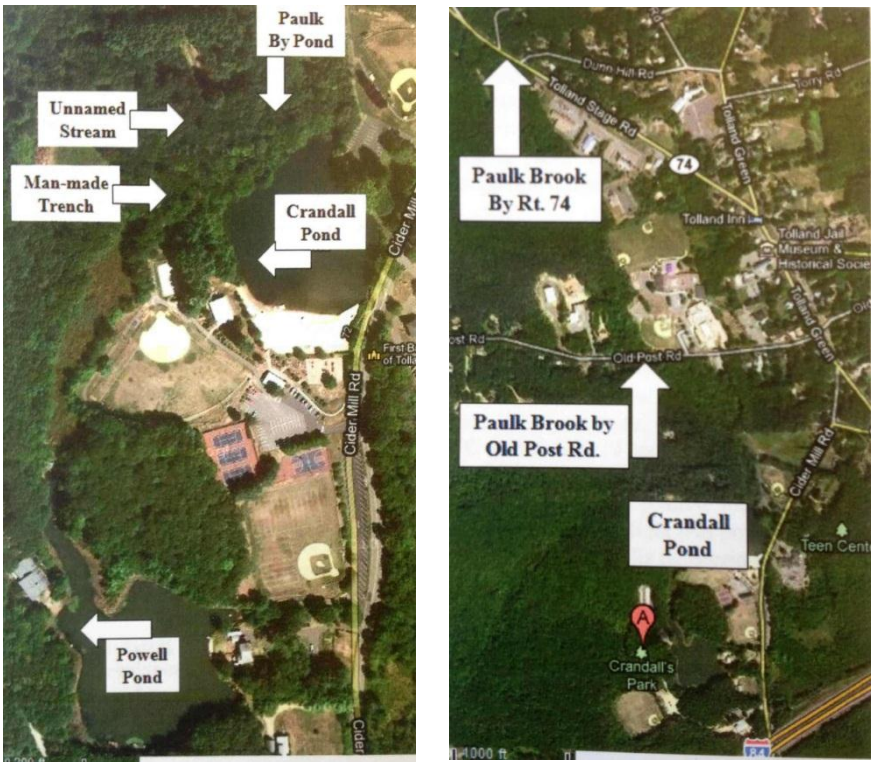


Figure 1 – Sampling Sites

Watershed Management Team

Watershed planning is a collaborative and participatory process. Tolland developed a Watershed Management Team which, at various times of this project, assisted with the investigation of potential sources of nonpoint source pollution impacting this watershed. Tolland staff met individually and collectively with group members to present data, share local knowledge and develop strategies. The team also participated in the development of the Plan's implementation recommendations. The following organizations were represented:

Team Member	Role
Tolland Recreation Department, Director, Tom Ainsworth	Coordinated effort to assess potential sources and identify management strategies
Tolland Planning Department Steve Lowrey, Wetlands Agent	Assisted with mapping and peripheral data collection
Tolland Department of Public Works Director, Clem Langlois	Provided tools, equipment and manpower as needed
UConn Dept. of Civil & Environmental Engineering, Joseph Bushey	Coordinated water sampling effort and field study for source assessment
UConn Center for Environmental Sciences & Engineering, Chris Perkins	Provided nutrient analysis and assisted in the development of the QAPP
CT DEEP, Eric Thomas, Stan Zaremba	Provided assistance & support with all aspects of the project as needed
Eastern Highland Health District, Director, Robert Miller	Provided historical testing data and sample outreach materials

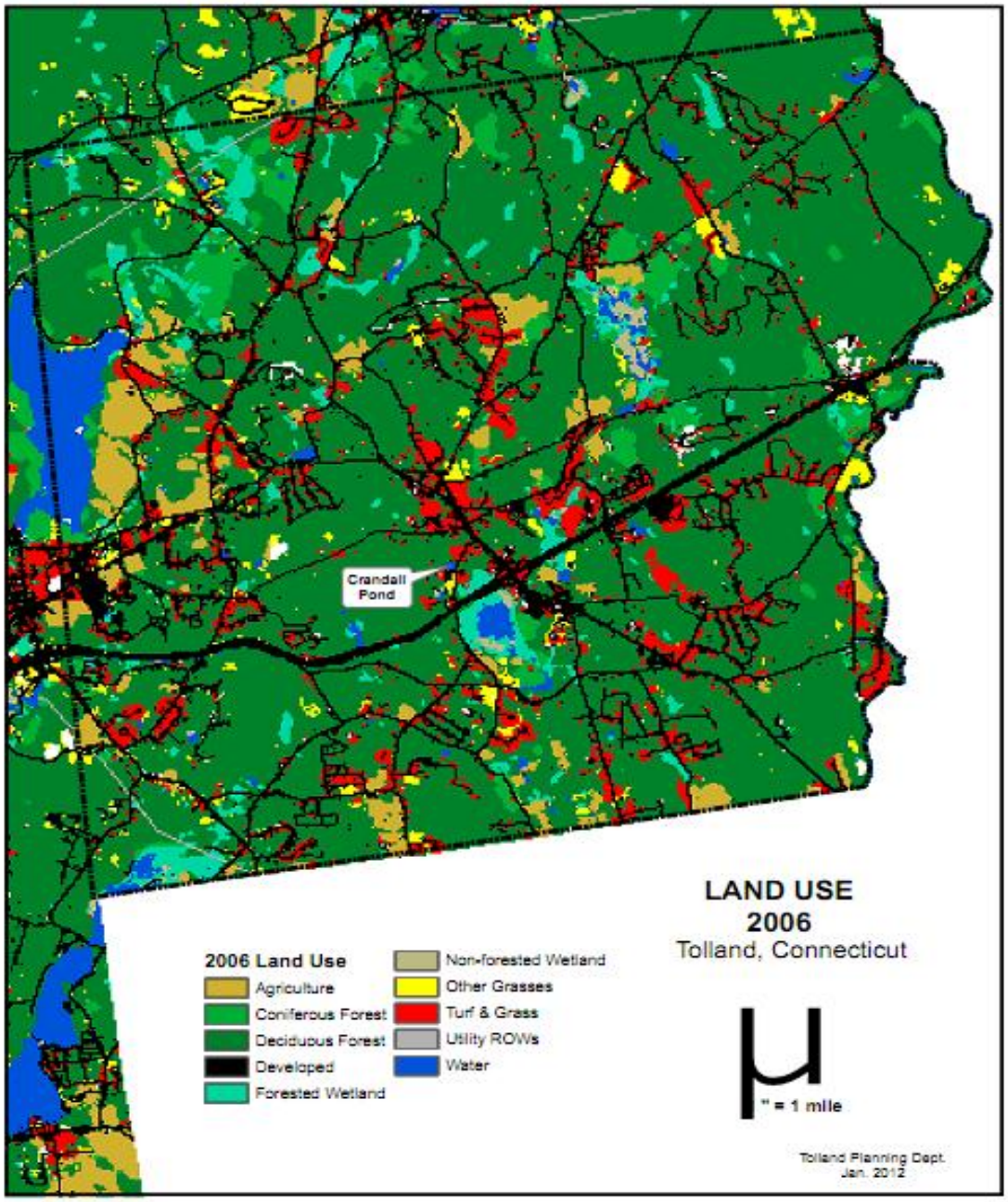
Public Participation

The public was invited to participate in this project through multiple press releases announcing various activities associated with this project. Updates were presented and discussions regarding the project were held monthly at the Parks & Recreation Board meetings which are open to the public. Additionally, signage concerning canine contributions was placed along the walking paths in Crandall Park describing the effort and potential water quality impacts (primarily bacteria and other pathogens) with dog feces. Multiple workshops concerning the project were held with youth participants in the Summer Camp program. Information concerning the project was posted at the Town beach.

Watershed Description

Crandall Pond is located in Tolland, CT. Tolland is a rural, yet developing, town located in the northeastern part of Connecticut. The area of Tolland is 40.3 square miles. The UConn Center for Land Use Education and Research (CLEAR), as part of their Connecticut's Changing Landscape project, used 2006 aerial data to estimate that Tolland is over 67% forested area with 4% wetland area. Developed areas represent over 14% of the watershed with an additional 6% as turf and grass area. Agriculture does not represent a significant land cover with less than 4%. Development

is increasing as represented by the 45% increase in developed land cover for 2006 relative to 2002. The 2000 U.S. Census documented the population of Tolland to be 13,146 people. In 2010, the population increased 15% to 15,067 people. To maintain the rural character and to protect wildlife, the town has included green corridors in the Town Plan of Conservation & Development, the highlight of which is Crandall Park and an area just to the southeast, the Tolland Marsh. Paulk Brook represents a critical connection to the additional open spaces in town to the north and east of the green, the Kollar Wildlife Management Area and the Nye Holman State Forest. See **Figure 2 - 2006 Tolland Land Use below:**



The entire watershed for Crandall Pond is located in Tolland, CT. **See Figure 3 - Crandall Pond Watershed Area,** page 9, Paulk Brook is a 1.35 square mile watershed within the Skungamaug regional watershed; part of the greater Thames River watershed basin. Paulk Brook flows into the Skungamaug River in Tolland Marsh just downstream of Crandall Pond. Tolland, Ct. has a generally temperate climate, with mild winters and warm summers. The January mean temperature range is 18 – 33°F (–8 – 1°C) and the July mean range is 32 – 79°F (17 – 26°C). Average annual precipitation in Tolland is 49.9 in/yr (1267 mm/yr). Precipitation tends to become evenly distributed throughout the year, although variations in precipitation from month to month are sometimes extreme. In the winter months, the precipitation often falls as snow. Weather patterns during the UConn watershed investigation were not average. March 2010 exceeded normal expected snowpack, with two large rain/melt events at the end of February and early March that raised the water table in the watershed considerably and brought many of the local brooks out of their banks. At the end of summer, Connecticut received a direct hit from Hurricane Irene on August 28th-29th with heavy rain. This event was followed less than two weeks later by the remnants of Hurricane Lee which again brought heavy rain to the already saturated area. Three streams contribute to Crandall Pond: Paulk Brook, an unnamed stream and an engineered culvert. The culvert enters from Powell Pond via a wetland with the watershed entirely within Crandall Park. A community meeting lodge with a septic system, two recreational ball fields and two parking areas are located in the park portion of the watershed. The Town public works garage and some residential properties are in the headwaters of the unnamed stream. Paulk Brook generally follows just west of CT SR 195, and subsequently CT SR 74, to just north of the town green. At this point the brook crosses to the east side of CT SR 74 where the stream forks, one branch following CT SR 74 west and the other following Burbank Road east. The homes in this area all have individual septic systems. There is a commercial dog training facility located along CT SR 74. All streams in this watershed have been designated surface water Class A; Potential Drinking Water Resources by the CT DEEP. Crandall Pond is created due to an impoundment across Paulk Brook. This dam is the site of a former cider mill that gave the road and adjacent pond their respective names. The culvert feeds into Crandall Pond from Powell Pond, which also results from an impoundment. Many historical small dams are located along Paulk Brook above Crandall Pond, particularly between Old Post Road and CT SR 74. These are mostly small stone and earthen impoundments that have been breached over several decades. The predominant and natural vegetative cover in this watershed is primary mixed deciduous forest. A small patch of planted pine is also located just upstream from the pond. With significant blocks of unbroken forested areas in Tolland, the Crandall Pond watershed contains important native wildlife habitat and corridors. Additionally, while not protected, Paulk Brook represents a significant wildlife corridor in the town. The area is protected from intensive development due to the presence of inland wetlands and has been included in the town Plan of Conservation and Development as a designated “green space.

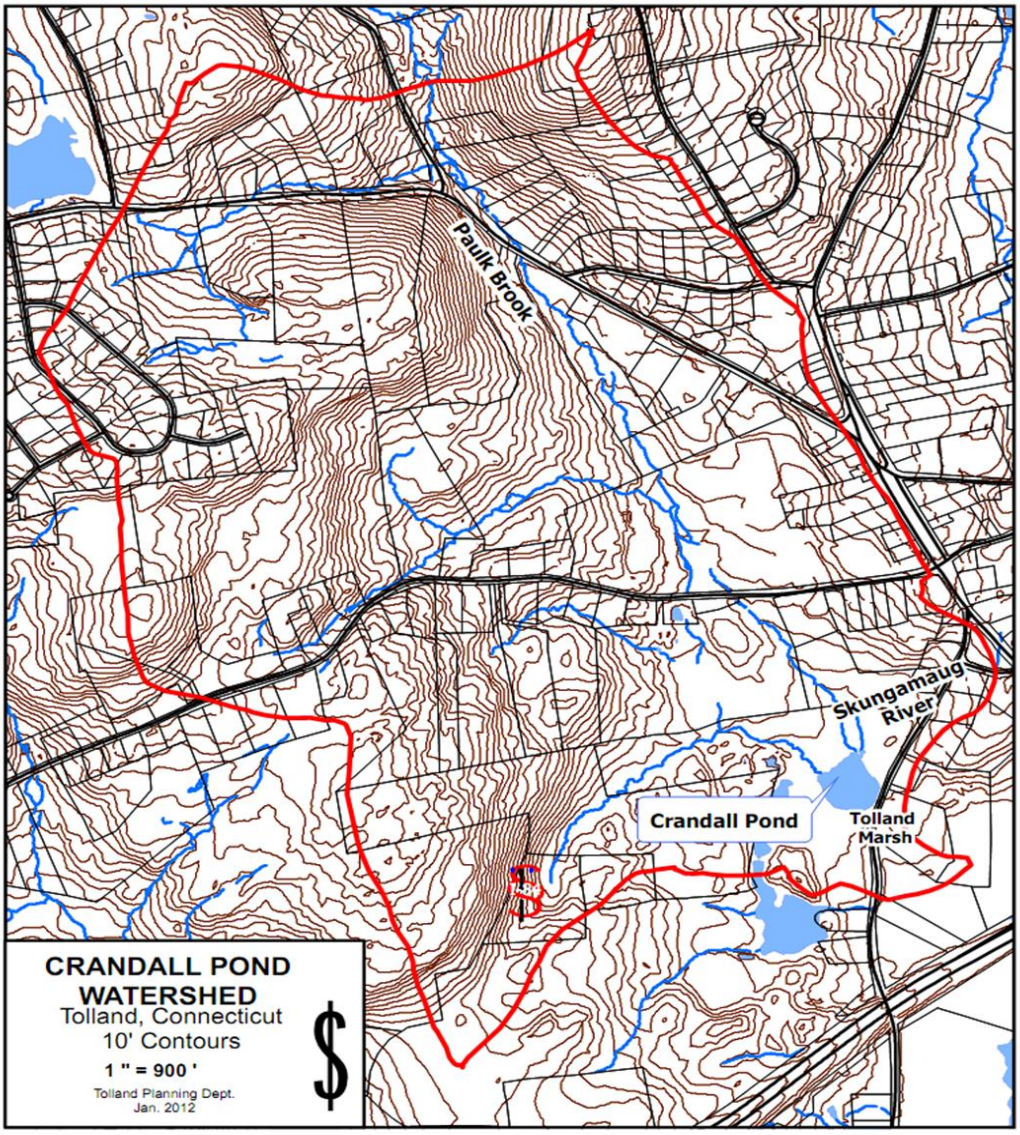


Figure 3 – Crandall Pond Watershed

Crandall Park contains a series of walking trails. These circumnavigate the Pond and extend to the school area along Paulk Brook. Additional trails go to the Lodge, ball fields and through the woods. These are used for hiking, biking and dog walking. Crandall Park also contains a pavilion for picnicking and play areas for children. The central part of Tolland, including the town offices, lay within the watershed. These buildings serve as the cultural center of Tolland and include Town Hall, the Public Library, and the Senior Center. Various small businesses also are located along the town green and north along CT SR 74. Additionally, the Tolland Intermediate School is located near the town offices.

Crandall Park is the main public park in town. It was started with the purchase of 37 acres in 1969 and has since grown with additional acquisitions to its current size of over 400 acres. The original property including Crandall Pond was purchased from the Crandall family. Cider Mill Road got its name from the cider mill they operated where the diving board area on the beach is located now. The Park contains a mix of active and passive areas with approximately 20 acres developed, and the remaining 380 acres undeveloped. 140 acres of open space was subsequently purchased by the Town in 2000.

Park Amenities include:

- Swimming area (seasonal) – Crandall Pond, 2.64 acres with sand beach, raft, diving board, and swim lanes. Open 1-6 pm daily from mid-June to August.
- Play area – for kids ages 8 and up with parental supervision.
- Three hard surface tennis courts – lighted from May to October.
- Lighted softball field with skin infield, 65ft base paths, 280ft outfield fence.
- Baseball field with 60ft base paths.
- Basketball court – lighted from May to October.
- Hiking trails – approximately 3.8 miles of wooded trails, different types of terrain, easy to moderate walk, some steep hills on side trails.
- Powell Pond – three acre pond for non-motorized boating, stocked with largemouth bass & bluegills. Boat launch area located off Crandall 2 parking lot.
- Accessible fishing bridge – overlooking Powell Pond.
- Crandall 2 – multi-purpose field (softball/baseball/soccer).
- Lodge – year-round rental facility for max of 100 people per event.
- Pavilion (open sided with picnic tables) available for rent. Maximum group size 100. Includes bathroom access, a sand volleyball court, and several sets of horseshoe pits.

Watershed Conditions

The State of Connecticut Department of Energy and Environmental Protection (DEEP) is responsible for establishing water quality standards for all of Connecticut. The Connecticut Water Quality Standards and Classifications were recently updated and adopted on February 25, 2011. The surface water quality classification of Crandall Pond and all of its tributaries is Class A, and is described as a potential surface water supply watershed area. Fishable and swimmable criteria also apply. The Connecticut Water Quality Standards and Classifications established the following criteria for *E. coli* bacteria in the State's surface waters to protect persons wishing to use the waters for recreational purposes such as swimming, canoeing, kayaking, wading, fishing, boating, water skiing, aesthetic enjoyment, and similar uses:

- Not to exceed 235 colonies/100ml (for official bathing areas) or 576/100ml (all other water contact recreation) for single samples;
- Not to exceed a geometric mean of 126 colonies/100ml for any group of samples.

EHHD summer water quality samples exceed single sample limits several times a year as well as the geometric mean values. UConn data from 2011 also exceeds each of these limits several times, demonstrating the consistent issue with bacterial levels in Crandall Pond for recreational uses.

The swimming area at Crandall Pond is fed from multiple sources. While the Town controls Crandall Park and the Town facilities along Old Post Road, much of the watershed is privately held. The Town has taken numerous steps to address the high bacterial levels.

1. The Town of Tolland was awarded a 319 NPS grant in Spring 2010 to study potential bacterial sources.
2. Hired UConn to perform high-frequency storm sampling to examine bacterial counts.
3. Erected signs alerting the public to the bacterial problem in Crandall Pond and the potential for canine feces to contribute the high levels. The signage was meant to encourage dog owners to pick up and dispose of feces properly.
4. Tolland has included low-impact development as a standard practice in the Town Plan of Conservation and Development. The Planning Commission endorsed the following objectives and policies:

- Preserve environmentally sensitive natural resources by regulating encroachment by development on these resources permitted by statute.
- Enforce wetland encroachment to encourage natural treatment of runoff. Provision should be made to allow for use of these lands for recreation, open space, and environmental protection by using these areas as buffers, habitat corridors, wetland enhancement and/or mitigation, and other similar uses that are in the interest of the community.
- Permanently set aside lands having no development potential either through acquisition by the Town or a land trust, or through the use of conservation restrictions within the meaning of Section 47-42A of the Connecticut General Statutes.
- Avoid any development on ridge lines unless such development would reduce impact on wetlands and water quality or balance the effect of development by mitigation.
- Establish and enforce runoff and sediment and erosion control measures and standards for all new construction. Construction includes any excavation such as driveways, ponds, etc., where, because of the local slope and site topography, such measures are warranted and should not be limited to the construction of structures only.

Multiple data sets exist for Crandall Pond within this watershed. These include the EHHD weekly seasonal water quality data at Crandall Pond since 2001 as well as the UConn study. Key elements of the data available from these activities are:

- EHHD bacterial data at Crandall Pond 2001 – present;
- Evaluation of precipitation relative to bacterial exceedances in the EHHD data;
- Summary of a Crandall Pond stream walk (visual assessment) completed in Fall 2010 by UConn and included in a Quarterly Project Report to the Town of Tolland;
- Summary of the water quality data collected in 2011 by UConn at Crandall Pond. The data was collected under an approved QAPP (RFA 11022).

Copies of these reports and data sets are available by contacting the Town of Tolland Department of Recreation. In short, the impaired uses and/or water quality threats to the Pond are:

- Crandall Pond has been evaluated for *E. coli* concentration and for aquatic habitat support. The Pond does not meet the Connecticut Water Quality standards for recreational contact due to elevated concentrations of *E. coli* bacteria. The impaired water body includes the Pond (CT 3106-06-1-22_01), representing the swimming area. However, the watershed contributes to the exceedances in the Pond. The data used by the CT DEEP to support this impairment listing was collected during weekly EHHD sampling from two locations within Crandall Pond.

- Additional monitoring conducted during the summer of 2011 measured additional water quality issues related to exceedances of the Connecticut Water Quality Standards for *E.coli* upstream of the Pond. Monitoring data upstream of Crandall Pond indicates that Paulk Brook (CT 3601-06-1), an unnamed brook and the culvert from Powell Pond that represent the hydrologic sources to Crandall Pond are likely sources of bacterial exceedances in Crandall Pond. Bacterial counts higher than the acceptable level were measured in each following precipitation events. However, water samples also suggest potential internal contributions in the Pond towards elevated bacterial counts.

There is currently no flow data available in the Crandall Pond watershed. A water level logger is to be installed as an outcome of the UConn water quality study. However, the site remains to be determined. A potential site is below the Crandall Pond dam due to the concrete well-defined channel and the fact that the site is protected from vandalism. UConn did obtain precipitation data from a nearby National Climatic Data Center site to the north in Staffordville, CT, and compared the data to bacterial data to develop a correlation between precipitation metrics and bacteria concentrations in Crandall Pond.

Photo 1 - Crandall Pond outlet from Cider Mill Road, Potential Site for Water Level Logger

Pollutant Source Assessment

Nonpoint sources of water pollution originate from many diffuse locations rather than a more easily identified piped discharge. As a Class A watershed, point source discharges to surface waters have not been permitted in this watershed. Therefore, the sources of contamination are all from nonpoint sources or illicit discharges to the surface water. There are no significant agricultural areas in the Crandall Pond watershed. The Crandall Park and Paulk Brook area serves as a wildlife corridor, primarily for deer and common forest community animals. Tolland is located in DEEP Wildlife Zone 4A. An aerial estimate completed in 2006-07 by CT DEEP Wildlife staff conservatively estimated the deer population at 24.6 deer/mi2. There are no other known estimates for wildlife populations in the area. With the exception of the Town building and school along Old Post Rd. and a few homes along CT SR 195, the remainder of the homes and businesses rely on subsurface wastewater disposal systems. Soils vary within the watershed, with much of the streamside locations containing higher permeability soils. However, the riparian areas contain significant wetlands with the potential to deliver overland flow more directly to the stream during high water periods. A functioning home or commercial business septic system will direct treated wastewater into the ground, providing treatment via filtration of bacteria and other pathogens. Therefore, a well-functioning septic system is not likely to contribute to pathogen contamination. However, runoff from failing or poorly maintained septic systems associated with residential housing located close to stream banks or the associated wetlands may be a source of bacterial contamination. There is a high potential for unreported septic tank issues due to many factors, including the high cost associated with conducting repairs or installation of new subsurface waste disposal systems. Because septic systems discharge underground, it is not always obvious when they fail. In general, septic systems fail in three ways:

- They back up into the house;
- Septic tank effluent pools above the drain field;
- They pollute groundwater and eventually surface water.

The first type of failure consistently results in action by the homeowner. Sometimes the second also results in action. However, homeowners usually are unaware of (or unconcerned about) the third type of failure and this type can go uncorrected for years or decades. Septic systems generally have an estimated life span of 30 years. Cesspools without leach fields, if they were installed legally, are generally well over 30 years old. Many homes in Tolland along the Paulk Brook corridor are older than 30 years. The life expectancy of a septic tank is influenced by many different factors, including but not limited to the frequency of routine maintenance, the ground water level where the septic tank and leaching field are located, the compaction of the leaching field and avoidance of introducing improper items to the system. More frequent tank pumping and leaching field inspections along with the installation of low flow plumbing fixtures within a residential home, commercial business or public institution will reduce the pressure on septic systems threatened with upsets or ultimate failure.

Developed areas of Tolland with impervious cover represent more than 10% of the town, a number generally accepted as a threshold between impacted and non-impacted water quality. However the location of development within the watershed is an important factor. Much of the developed area in the Paulk Brook and unnamed stream watersheds is within 300 feet of the stream channel, particularly for the septic leaching fields. A common past management practice for storm water runoff was to collect it in storm water catch basins and direct it away from roadways as quickly as possible to prevent street flooding. However, some of the areas in the watershed pre-date even this practice with drains discharging storm water directly to the wetland riparian areas via level spreaders. Multiple such discharges were noted in the stream reach behind the development on CT 74 north of the green. Newer storm water management practices as outlined in the 2004 Connecticut Storm water Quality Manual encourage better site planning and design to address both storm water quantity and quality from developed areas, with a focus on spreading the storm water out, slowing it down and soaking it in to the ground before reaching the riparian area which both will decrease the quantity of runoff while at the same time, improving surface water quality. An associated issue with urban surface runoff is the leakage from dumpsters. Dumpsters are present behind the commercial buildings along CT 74 as well as at the school on Old Post Rd. The most likely potential for bacterial contamination from dumpsters exists for the school, due to the drainage structure and the proximity to the stream channel. The dumpsters do not have a secondary containment structure and a drain carries any runoff from the area presumably to the storm water conveyance system and the stream less than 75 yards away.

Photo 2 - Dumpsters located by the Tolland Intermediate School

The majority of the streams in the watershed meander through floodplains dominated by wetland areas and forests. While some erosion is noted along this section of the streams, the effect is often minimal. The only portion of the watershed subject to significant erosion is the portion of the brook that parallels CT SR 74 above Burbank Rd. The slope and level of development in this section without significant wetlands to spread out and slow down the flow demonstrates potential for erosion. With documented changes in precipitation events and frequency cycles throughout the northeastern US in recent years, additional concerns for localized flooding and further erosion can be expected and should be considered in the context of sound watershed planning.

Other Potential Pollutant Sources

- Pet waste – Crandall Park, with its network of hiking trails, is a popular location for dog walking in the day use area of the park. Dogs and other domestic animals are prohibited from the beach and ball fields. Signs were placed at the entrances to the trail system requesting park visitors to clean up their pet waste. However, pet waste stations with bags have not been available to encourage this behavior. Pet waste is still prevalent along the hiking trails in the park. According to some studies, one gram of dog feces contains 23 million fecal coliform bacteria. If this pet waste is not disposed of properly, bacteria can wash into storm drains or directly into the local streams, wetlands, ponds and contribute to bacteria impairments, beach closures and threaten public health. The observed number of pet dogs in back yards across the broader watershed, suggests their regular populations could contribute enough bacteria to temporarily close down a receiving waterbody with monitored bathing beach.

- Town Animal Control Facility – The dog pound for Tolland is located behind the Tolland Highway Garage. The facility operates on a trough system and a tank which captures runoff and has an alarm to alert the need to pump. This setup should be examined on a regular basis to ensure there are no issues and that a regular maintenance schedule is followed. The septic system for the highway building is located under the parking lot but is expected to be connected to the sewer line within the next year.

- Dog Training Facility – A second private dog kennel is located at the head of the watershed along CT SR 74. However, whether the facility captures and treats runoff in a septic system is unknown. Future plans should investigate whether the runoff is treated and if so, what the status of the septic system is.

Linkage of Pollutant Loads to Water Quality

The CT DEEP, as part of their routine annual bathing beach monitoring program, has been analyzing water samples collected at Crandall Pond for *E. coli* content since 2001. This data indicates that Crandall Pond has been failing water quality standards for recreational contact both due to single sample exceedances and a failure to meet the geomean standard of the annual sample set. To date, management options to prevent exceedances are limited.

UConn collected water samples throughout the Crandall Pond watersheds during Spring and Summer 2011 from seven locations before and after precipitation events. This data collection was conducted following an approved Quality Assurance Project Plan. In addition to the UConn monitoring project, the EHHD beach sampling program also collected water samples for bacterial analysis at Crandall Pond during the 2011 summer bathing season. The data summary along with a project report was submitted to the Town of Tolland, and subsequently the CT DEEP, on December 18, 2011. This data has been applied to the Connecticut statewide bacteria Total Maximum Daily Load (TMDL) plan. The 2011 water quality monitoring results indicate that the bacteria loading to Crandall Pond originate from a variety of sources, including internal and watershed contributions. All three streams entering the pond demonstrated the potential for high bacterial counts. Levels typically increased following precipitation events. However, the bacterial counts were not consistent between any of the sources and the levels in the pond.

The inconsistency and varied contributions among the watershed streams suggest that the dominant source of bacteria to Crandall Pond is from natural sources. Deer utilize the Paulk Brook riparian area and Crandall Park as a corridor. Numerous deer sightings and tracks were observed during the UConn research site walk and sampling. Deer and wildlife waste is likely to increase during the summer months as more deer seek the riparian areas for water in lieu of forest vernal pools. Also, as the water table recedes, the bacterial levels from feces contributions will not be diluted. While the natural sources are difficult to control, the additional human-based potential sources to the pond including septic failures, canine contributions, dumpsters and geese can be more effectively managed.

Identification of Critical Areas

Critical areas for reducing the *E. coli* concentrations in the waters of Crandall Pond include Powell Pond and unnamed stream watersheds in Crandall Park as well as the Paulk Brook watershed to the north. Given the variable and broad values measured in the focused water quality study, we are not confident that additional monitoring will be able to easily bracket contamination sources. Data suggests that the largest contributor is wildlife, a difficult source to remediate. However, general recommendations are provided concerning appropriate management options for other potential sources. Supplemental water quality monitoring may be able to assist in determining whether these options are effective.

Watershed Goals and Objectives

Management Objectives

The management objective of the Crandall Pond Watershed Based Plan is for Crandall Pond and its tributary streams to meet the State of Connecticut Water Quality Standards for recreational contact and to prevent future beach closures at Crandall Park. This plan contains a core list of water quality improvement opportunities. The list includes reasonable opportunities for improving Crandall Pond. This plan and the identified opportunities are not mandatory actions that stakeholders must implement, but rather a set of recommended options for achieving the plan objectives. The costs for implementing all the recommended opportunities currently exceed the funding capacity of all watershed stakeholders. Implementation, particularly significant structural best management practices (BMPs), will have to rely on leveraging opportunities as they arise, both from outside funding sources and in response to changing circumstances within the watershed such as redevelopment or property ownership transitions. The improvement opportunities will be presented to the public through a series of newspaper articles and PowerPoint presentations at the Tolland Town Hall. The public will be afforded an opportunity to provide feedback. The Crandall Pond Watershed Management Team will continue to provide the public with opportunities to comment and work on specific projects as they are considered for implementation. In addition, the management objectives will include anti-degradation policies for areas not demonstrating water quality concerns.

Tolland, along with the Crandall Pond Watershed Management Team, identified the following management objectives that need to be addressed in order to improve the water quality in the Crandall Pond watershed:

- Minimize contributions from pet waste;
    - Implement a Pet Waste Clean Up Policy;
    - Examine treatment of runoff from kennel facilities
- Address Crandall Park Management Practices;
    - Reduce wildlife in picnic grounds by continuing to perform routine cleanup of picnic areas;
- Address storm water runoff through better design and retrofit of poorly designed areas
    - Review Tolland land use regulations for storm water quantity and quality control;
    - Proper management of dumpster leachate;
- Reduce the chance for septic system failures and/or illicit discharges;
    - Provide educational and other assistance to homeowners regarding installation and care of septic systems, wells, underground petroleum storage tanks, and other conservation issues.
- Address stream bank erosion and restore riparian vegetation.

Minimize contributions from pet waste

- Implement a Pet Waste Clean Up Policy
  Pets are prohibited in the swimming area of Crandall Park, but are permitted along the walking trails. Tolland staff have observed pet waste deposits in the park. Park visitors have been encouraged to clean up their pet's waste with signage, including an explanation of the Crandall Pond Water Quality Study. The availability of pet waste disposal bags near walking areas and at trail heads would further facilitate the management of pet waste.
  The standing Watershed Team should also review town ordinances and promote broader awareness of existing, or recommend development of "pooper scooper" regulations or ordinance.
- Examine treatment of runoff from kennel facilities
  Two kennel facilities exist in the Paulk Brook watershed: the Tolland Animal Control Facility and a second kennel along CT SR 74. The town facility has an existing septic system. The second kennel should also be checked for proper waste management. The maintenance records for any waste treatment facilities should be examined with a regular maintenance (pumping) plan in place.

Address storm water runoff through better design and retrofit of poorly designed areas

- Review Tolland land use regulations for storm water quantity and quality control;
  Water contaminants, including *E. coli* bacteria, can be carried to local water bodies in storm water runoff from developed areas. Local land use regulations should be updated to reflect contemporary storm water management practices in accordance with the Tolland LID storm water design manual and relevant LID components in local regulations through the Planning and Zoning Commission and the Inland Wetlands and Watercourses Commission. Seeking opportunities to retrofit storm water outfall areas should be an ongoing process. Direct discharge of storm water into watercourses doesn't allow for any pretreatment of the water and may convey contaminants, including thermal pollution, into local streams, wetlands and ponds/lakes.

- Proper management of dumpster leachate;
  Dumpster leachate can contribute to enhanced *E. coli* populations due to decaying garbage and subsequent rainfall runoff. Open containers and the lack of a secondary containment system to capture leachate facilitate the delivery of contaminated leachate to the drainage system and nearby streams. Dumpsters should be checked along Paulk Brook and in Crandall Park to make sure that secondary containment is in place to capture leachate. This is particularly important in areas directly connected to storm drains such as at the Old Post Road school. Additionally training of town personnel and signage should highlight the importance of keeping the dumpsters closed and any drainage plugs sealed to prevent rainwater from entering or exiting the containers.

Reduce the number of potential septic system failures and/or illicit discharges

Septic systems located in small lots adjacent to stream channels, such as those found in the upper portion of the Paulk Brook watershed along CT SR 74, may need more frequent pump outs and leaching field inspections. These systems may also benefit from the use of newer technologies that are designed for small lots or soils with limited infiltration capacities. An inventory of system types, age, maintenance schedules and location in relation to a nearby watercourse will assist the Watershed team with evaluating systems that may be in need of repair or replacement. Homes with older plumbing fixtures may benefit by replacing those high volume fixtures with more modern fixtures that use less water. A rebate program to offset the cost of these updates will encourage more homeowners in critical areas of the watershed to update their plumbing fixtures. The Eastern Highland Health District, the local health department authority, collects data on septic tank repair permits issued. Examining this information for potential "problem" systems can better focus mitigation efforts. Tolland should contact the EHHD to identify such areas in the watershed, particularly along CT SR 74. Preferential flow paths in residential or commercial development areas may convey septic tank leachate or other contaminated runoff to nearby stream and wetland systems. A review of critical areas and septic systems may provide clues as to the location to check for preferential flow paths. It may be necessary to remove or interrupt the existing systems in order to restore the currently impaired water quality.

Address Crandall Park Management Practices

Reduce native wildlife in picnic grounds by continuing to perform routine cleanup of picnic areas. A number of picnicking areas, with grilling facilities, are located around the main entrance to the park and in close proximity to the brook and swimming pond. Those areas should continue to be properly maintained to eliminate any food waste from the site. Doing so will reduce the likelihood that wildlife will come to the area, which, in turn, will lessen the chance that wildlife feces will be in close proximity to the water bodies in this area. Maintenance of the areas can be achieved through educational means (e.g. signage in the picnicking area), reliance on informed park users, and with seasonal park staff. The longer-term more beneficial approach would be to educate the public and park users about the implications of leaving food waste, having unwanted visits from area wildlife, and the associated water quality concerns (i.e. signage, literature, outreach talks and programs).

Address stream bank erosion and restore riparian vegetation

Stream bank erosion, especially in areas adjacent to agricultural fields, can be a source of sediment, nutrients and bacteria to the stream and can have a negative effect on aquatic habitat. Restoring the woody, deeply-rooted streamside vegetation would serve to stabilize the stream banks, and provide protection of cold water habitat from direct solar exposure.

Load Reduction Targets

The load reduction targets of the Crandall Pond Watershed Based Plan are to reduce the amount of *E. coli* bacteria in water samples in order to meet the Connecticut Water Quality Standards as updated in 2011:

- Not to exceed 235 colonies/100ml (for official bathing areas) or 576/100ml (all other water contact recreation) for single samples;
- Not to exceed a geometric mean of 126 colonies/100ml for any group of samples.

The geometric mean of the CDPH data set for bacteria for samples collected during the summer 2011 bathing season in the Crandall Pond watershed was ~80 cfu/100 mL, below the state limit. However, the geomean had exceeded the state limit during past years. Data collected as part of the UConn study consistently exceeded the quantification limit of 2005 cfu/100 mL. However, given that the exact number is uncertain, estimating the load reduction for the stream sites using this data is not appropriate. Using the following formula, this would require a load reduction of at least 1490% as most values in the Pond are >2005 cfu/100 mL. These values reflect those following precipitation samples which results in the difference from the CDPH data set. ((Station Geomean -" " Target)/Target)x 100=% load reduction

By general consensus, rainfall >1.0 inches is used as a threshold for assessing rain events to determine when to close some inland water beaches in the State of Connecticut. However, most literature considers “wet weather” where rainfall is >0.1 inches. An assessment of the historical EHHD data suggests that precipitation greater than 1 in of rainfall during the prior week is likely to lead to an exceedance. The precipitation evaluation of the magnitude of the event and of the prior rainfall conditions as outlined in the UConn report can provide a measure of when and for how long the beach should be closed following a precipitation event.

Identification of Management Strategies

Existing Structural Controls

Flow from Powell Pond through the wetland and the culvert into Crandall Pond is controlled by a gated structure. This allows Tolland to control and limit contributions via the culvert to Crandall Pond following high precipitation events, preventing any contamination from Powell Pond from contributing. However, a flow restriction device does not exist between the wetland and the culvert, limiting the prevention of contributions from the wetland to the pond. The Watershed Team should investigate the available options from a qualified water resources engineer and present the findings for further Town consideration.

Existing Non-Structural Controls

Septic systems

- The Eastern Highland Health District routinely inspects onsite waste water disposal systems for proper function if they receive a request from a home owner or a complaint from a neighbor. It is the policy of CDPH to work with a homeowner to correct the problem. If there are signs of a breakout, they will have the homeowner immediately contact a licensed septic pumper to have the tank pumped on a routine basis to maintain the overflow. The homeowner is required to submit pumping receipts to CDPH. Their office aims to work with the owners to correct the problem, but if they receive no cooperation, the following steps are implemented:

1. An administrative order is sent to the homeowner to have the system repaired.
2. If system is not repaired within time constraint, information is sent to the housing prosecutor.

EHHD has also produced a brochure entitled *A Guide to Septic System Maintenance* which is available at several public locations thorough the region, including the Tolland Town Hall.

Pet waste

The Tolland Recreation Department has placed signs along the walking paths of Crandall Park alerting dog owners to the need to pick up pet waste. The signage should be maintained and updated to provide a connection to the project and to locations where additional information can be obtained.

Additional Strategies Needed to Achieve Goals

Each of the following management strategies have been broken down into structural and nonstructural controls. The effectiveness for reducing pollution loads for each strategy is rated low to high.

Implementation Program Design

Management Strategies

Addressing the watershed water quality issues in Crandall Pond will require time, a determined focus with established priorities that reflect limited resources and opportunistic funding. A list of structural management measures to reduce *E. coli* contamination of surface water is presented in Table 1 and a list of non-structural management measures is presented in Table 2. For each management measure, an interim milestone has been estimated into time intervals of Short-term (1 to 1.5 years), Mid-term (1 to 4 years) and Long-term (5 to 10 years or longer). Appropriate conservation partners and funding assistance possibilities have been provided for each measure. Cost estimates were broken into rough categories of Low, Medium and High to provide an approximate indicator of the monetary resources required. Indicators on how to measure progress are also presented.

Table 1 - Structural Controls

BMP	Reduction Estimate	Reference
Elimination of septic system failures	Medium	UConn Study
Containment/minimization of dumpster leachate	Medium	UConn Study
Install pet waste bag dispensers	Medium	UConn Study
Implement effective waste mgt at kennel facilities	Medium	UConn NEMO
Storm water mgt/LID implementation (e.g. rain gardens)	Low	UConn NEMO
Riparian buffer reconstruction	Low	UConn NEMO

Table 2 - Nonstructural Controls

BMP	Reduction Estimate	Reference
Create septic system database for age, type & work history	Medium	Identify potential problem systems
Water conservation/reduce pressure on wastewater systems	Low	Reduce waste volume in challenged systems
Check status of waste handling at dog kennel	Medium	Implement measures to provide effective handling procedures
Pet waste pick-up	Medium	
Wildlife exclusion at picnic areas	Medium	Routine food scrap cleanup

Table 3 - Structural Management Measures to Reduce E. coli Contamination of Surface Water

Management Measure	Interim Milestones	Technical Assistance/Potential Funding Source	Cost	Progress Indicators
Evaluate performance of Leachate drain field at Tolland Animal Control facility	Short-term	Town of Tolland	Low	Infiltration capacity
Secondary containment for Dumpsters at: Tolland Intermediate School, Post Office, Rt 74 Shopping Plaza, Senior Center	Short-term/ Mid-term	Town of Tolland Private Owners CT DEEP	Medium	Runoff to Drains
Pet waste bags	Short-term	Local animal agencies	Medium	Replacement rate of waste bags
Riparian buffers/proper drainage At Highway crossings	Mid-term	Town of Tolland CT DEEP	Medium	Linear feet restored BMPs implemented
Install rain gauge and flow gauge At Crandall Pond	Short-term	CT DEEP UConn Town of Tolland	Medium	Completed installation & data recording

Table 4 - Non-structural Management Measures to Reduce *E.coli* Contamination of Surface Water

Management Measure	Interim Milestones	Technical Assistance/ Potential funding Source	Cost	Progress Indicators
Promote septic system Inspection & maintenance	Short-term	EHHD Town of Tolland	Low	Materials distributed and articles published
Perform septic system Inventory	Mid-term	EHHD Town of Tolland	Medium	Completion of inventory
Seek funding for septic upgrades for financially challenged	Long-term	EHHD	High	Permit number in critical areas
Evaluate treatment system at Rte 74 private kennel	Short-term	EHHD CT DEEP	Low	Completion of evaluation
Promote cleanup of pet waste along trails	Short-term	Town of Tolland	Medium	Amount of replacement bags
Promote low flow plumbing In critical areas	Mid-term	EHHD Town of Tolland	Low/ Medium	Number of retrofits
Promote proper disposal of food items at park	Short-term	EHHD Town of Tolland	Low	Amount of garbage picked up at picnic areas

Schedule of Activities, Milestones, Cost Estimates and Progress Indicators

This project goal is to restore the water quality and restore all impaired waters to their designated uses within the Crandall Pond watershed. This can be accomplished by identifying likely sources and reducing bacterial contamination, as well as degradation from other non-point source pollutants including nutrients, and excessive sediment, will be achieved through the following objectives and schedules:

Objective 1. Minimize contributions from pet waste	
Actions/Milestones:	Solicit sponsors for management Install pet waste bags at park trail entrances with waste disposal cans Update park maintenance to empty cans on a regular schedule Undertake educational program for pet owners
BMP's:	Pet waste management bags
Responsible Parties:	Pet owners
Anticipated products:	Pet waste bags with sponsors
Estimated costs:	$2,000.00 for 4 stations, $600.00 for year supply of bags
Evaluation:	Completed installations, number of bags used
Timeline:	1-2 years

Objective 2. Address storm water runoff with better design & retrofit of poorly designed areas	
Actions/Milestones:	Identify priority sites for establishment of buffers Contact landowners to determine level of interest, cooperation, and obtain permission Obtain funding for implementation of at least two (2) buffer sites Design the riparian plantings or storm water BMP (develop a plan) Plant the buffers Conduct water quality monitoring
BMPs:	Established buffers/storm water mitigation devices
Responsible Parties:	Town of Tolland, CT DEEP, Conn DOT, land owners
Anticipated Products:	Planting/buffer design, plants; before/after documentation
Estimated costs:	$500-$2500 per acre; BMP storm water cost could be as high as $20 thousand
Evaluation:	Photo documentation; Pre/post water quality monitoring of sites, Documentation of number of sites and the linear feet buffered
Timeline:	3-6 years

Objective 3. Proper management of dumpster leachate	
Actions/Milestones:	Document dumpsters in critical area Notify property owners/responsible parties Construct secondary containment Monitor performance
BMPs:	Secondary containment BMP
Responsible Parties:	Town of Tolland, private owners
Anticipated Products:	Secondary containment berms or dumpsters; outreach materials
Estimated costs:	$500 for brochure; containment berms - $2-10 thousand per berm
Evaluation:	Construct at least 2 containment berms
Timeline:	1-3 years

Objective 4. Reduce the potential number of septic system failures and /or illicit discharges	
Actions/Milestones:	Work with Town sanitarian (EHHD) to evaluate the residential septic systems in the priority areas as defined by the WBP Perform water quality monitoring using DNA markers and/or anthropogenic compounds (e.g. caffeine, pharmaceuticals) to quantify human waste contribution to water quality issues Provide educational materials regarding septic system maintenance and municipal ordinances Prioritize areas for assessment Assess the sites Report findings Select sites for repair or enforcement Work with landowners to implement repairs Select and hire contractors Repair systems Follow up water quality monitoring after implementation
BMPs:	Repaired septic systems and eliminated illicit discharges
Responsible Parties:	Town of Tolland, EHHD, property owners
Anticipated Products:	Fixed septic systems and illicit discharges
Estimated costs:	DNA study (includes QAPP) - $7500 Outreach materials - $2500 Dye testing - $150/test
Evaluations:	Photo-documentation, sanitarian confirmation, follow up monitoring
Timeline:	1-3 years

Objective 5. Update Crandall Park management practices, including stream flow & precipitation gauges	
Actions/Milestones:	Install and calibrate flow gauge below Crandall Pond Install rain gauge Update pet waste collection practices Develop signage concerning proper disposal of food waste
BMPs:	Working, calibrated flow gauge Precipitation collector Signage for picnic areas Updated management plan
Responsible Parties:	Town of Tolland, UConn
Anticipated Products:	Rain gauge and discharge weir Updated practices Signage
Estimated costs:	Rain gauge and data logger - $100 Flow gauge - $250 (level logger already purchased on UConn Study) Picnic area signage - $250
Evaluation:	Data collection
Timeline:	1-2 years

Objective 6. Address stream bank erosion and restore riparian vegetation	
Actions/Milestones:	Identify priority sites for the establishment of buffers Contact landowners to determine level of interest, cooperation, & permission Obtain funding for implementation of at least two (2) buffer sites Design the riparian plantings or storm water BMP (develop a plan) Plant the buffers Conduct water quality monitoring
BMPs:	Established buffers/storm water mitigation devices
Responsible Parties:	EHHD, Town of Tolland, CT DEEP, Conn DOT, private land owners
Anticipated Products:	Planting/buffer design, plants; before/after documentation
Estimated costs:	$500-$2500 per acre; BMP storm water cost could be as high as $20 thousand
Evaluation:	Photo documentation; Pre/post water quality monitoring of sites, documentation of number of sites and the linear feet buffered
Timeline:	3-6 years

Information/Education Component

An extensive education and outreach component will be conducted as part of this Plan. A summary of activities to date and those planned for the future is provided previously. In order for this watershed based plan to succeed, continued outreach is necessary by the Crandall Pond Watershed Team members focused on their individual roles in the Plan implementation.

Table 5 - Outreach roles for the members of the Crandall Pond Watershed Mgt. Team Members

Member	Role(s)
Town of Tolland	Hold informational meetings presenting project and results Collect and distribute appropriate outreach material to address the issues Speak to local groups as requested Keep updated project information on the Town website Mail pertinent outreach material to homeowners
EHHD	Assist with outreach information Provide relevant data as requested
CT DEEP	Provide technical and financial assistance as needed
UConn	Work with Tolland to provide technical expertise at town meetings Install stream flow gauge, assist Tolland in purchase of precipitation gauge Work with Tolland and local homeowners concerning preliminary plans for BMP design

Monitoring Component

The EHHD, as part of their routine monitoring of the bathing water at Crandall Park, will continue to collect water samples for *E. coli* concentration analysis. Additional monitoring may also be coordinated through UConn as funding allows. With additional funding, a species specific *E. coli* identification program and/or chemical tracers can be introduced in critical areas to test for the absence or presence of human and canine fecal bacteria DNA markers in water samples, followed by a quantification analysis of human related sources if the presence/absence test indicates it is necessary. This monitoring would serve to better determine the source of *E. coli* contamination in the watershed.

Evaluation Framework

In order to determine the overall success of the Crandall Pond Watershed Based Plan, it is recommended that the Crandall Pond Watershed Management Team meet on an annual basis at a minimum to report on progress of the implementation strategies outline in this Plan. During the first eighteen months, these meetings should be more frequent.

1. The Team should develop a work plan with an agreed upon process on how to determine next steps to take. One task should be to review the Crandall Pond water body data.
2. The Team should review the core document and the specific Skungamaug River/Crandall Pond appendix to the 2012 Connecticut Statewide Bacteria TMDL. Important findings and watershed specific next steps and recommendations are included for watershed team consideration.
3. The Team should develop and maintain a Crandall Pond watershed progress "database" to document completed projects and other activities within the watershed. The tracking database or registry will likely be the primary means for demonstrating progress towards water quality improvements.
4. The team should develop site specific management activities, including storm water "retrofits", that include illustrations of recommended BMP(s), estimated pollutant loading reduction as a result from this action (focusing on bacteria but not exclusive to other NPS pollutants), and estimated cost and required partners to implement the BMP (s).
   The Team can then use these visual documents to reach out to necessary stakeholders to build effective partnerships.
5. The Team should conduct follow up water quality monitoring, including possible revisions to the approved QAPP as necessary, and evaluate any trends in water quality.
6. The Team should review and revise the Plan as necessary.
7. The Team should continue to solicit input from local, state and federal agencies as appropriate.

In the short term, the Town of Tolland leadership and land use commission representatives, along with the EHHD, and CT DEEP Watershed/NPS Management program staff should meet to review the Plan objectives and findings relative to suspected septic system and possible illicit discharge issues in the Plan's prioritized areas, and to gain a more comprehensive understanding of local policies and practices. Further, the meeting participants should review opinions from both the Town and the EHHD in terms of a practical and effective strategy to move necessary investigations and analysis further along to aid decision makers on recommended next steps.

Photo 3 – Paulk Brook near Recreation Center

Photo 4 – Paulk Brook crossing under Old Post Rd

Photo 5 – Paulk Brook from Crandall Park pedestrian bridge crossing

Photo 6 – Paulk Brook continuinginto Crandall Pond

Photo 7 – View of Crandall Pond from Lion's Field

Photo 8 – Crandall Pond Dam from Lion's Field

Photo 9 – Powell Pond from the Lodge

Photo 10 – Powell Pond from Crandall 2

Photo 11 – View of Lodge from Powell Pond Drawdown

Photo 12 – Wetlands Connector from Powell Pond to Crandall Pond

Photo 13 – Culvert Connecting Wetlands to Crandall Pond

Photo 14 – Channel for Wetlands to Crandall Pond

Photo 15 - Unnamed Brook Entering Crandall Pond near Lion's Field

Appendix A: Potential Funding Sources for Implementing Watershed Plans

Reasonable financial estimates for each management practice have been provided in Table 3 and 4 in this document. However, costs associated with the development and implementation of each proposed measure will need to be estimated individually as management strategies are undertaken. Financial assistance in the form of grants is available from multiple sources, including federal, state, and local sources, including but not limited to Community Development grants, Clean Water Act §319 grants, and environmental and professional organizations grants. Funds may also be available in the form of donations and in-kind services provided by local businesses and environmental organizations. Numerous grant applications are strengthened by the availability of cost matches and in-kind services. A sampling of funding opportunities is listed below.

EPA Healthy Communities Grant
kodakawards@conservationfund.org
http://www.conservationfund.org/kodak_awards

CTDEEP Open Space and Watershed Land Acquisition
http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323834&depNav_GID=1641

CTDEEP Recreation & Natural Heritage Trust Program Rolling
http://www.ct.gov/deep/cwp/view.asp?a=2706&q=323840&deepNav_GID=1642

Northeast Utilities Environmental Community Grant Program
http://www.nu.com/environmental/grant.asp

CTDEEP CWA Section 319 NPS Program
Non-point Source Management http://www.ct.gov/dep/nps

NRCS Wildlife Habitat Incentives Program (WHIP)
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/whip

River's Alliance Watershed Assistance Small Grants Program
http://www.riversalliance.org

America the Beautiful Grant Program
www.ct.gov/dep/forestry

Grant Search Resources
Please also see the following grant search resources for assistance in finding additional state, federal, local, and private sources of funding related to watershed planning and nonpoint source pollution management:

Grants.gov
http://grants.gov/

Catalog of Federal Domestic Assistance
https://www.cfda.gov/

CT DEEP Watershed and Stormwater Funding Website
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=335494&depNav_GID=1654&pp=12&n=1

CT OPM Small Town Economic Assistance Program (STEAP)
http://www.ct.gov/opm/cwp/view.asp?a=2965&q=382970&opmNav_GID=1793

EPA Catalog of Federal Funding Sources for Watershed Protection
www.epa.gov/watershedfunding

EPA Watershed Funding
http://water.epa.gov/aboutow/owow/funding.cfm

Infrastructure Funding Website EPA Green
http://cfpub.epa.gov/npdes/greeninfrastructure/fundingopportunities.cfm

Foundation Center: Philanthropy News Digest
http://foundationcenter.org/pnd/rfp/cat_environment.jhtml

OTHER FINANCIAL OPPORTUNITIES

Property Tax
These taxes generally support a significant portion of a county's or municipality's non-public enterprise activities.

Sales Tax/Local Option Sales Tax
Local governments, both cities and counties, have the authority to add additional taxes. Local governments can use tax revenues to provide funding for a variety of projects and activities.

Special Assessments
Special assessments are created for the specific purpose of financing capital improvements, such as provisions, to serve a specific area.

Impact Fees
Impact fees are also known as capital contribution, facilities fees, or system development charges, among other names.

Stormwater Utility Districts
A stormwater utility district is a legal construction that allows municipalities to designated management districts where storm sewers are maintained in order to the quality of local waters. Once the district is established, the municipality may assess a fee to all property owners.

User Fees, Taxes, and Assessments
Taxes are used to fund activities that do not provide a specific benefit, but provide a more general benefit to the community.

Donations

Donations can be a major source of revenue for supporting watershed activities, and can be received in a variety of ways.

Membership Drives

Membership drives can provide a stable source of income to support watershed management programs.

State Appropriations – Direct State Funding

http://www.cga.ct.gov/

Bonds and Loans

Bonds and loans can be used to finance capital improvements. These programs are appropriate for local governments and utilities to support capital projects.

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