12-05b NCCD (P) – Broad Brook Watershed Based Plan Phase 2

Introduction/Context

The North Central Conservation District (NCCD), with project funding provided in part by the Connecticut Department of Energy & Environmental Protection through a United States Environmental Protection Agency Clean Water Act Section 319 Nonpoint Source Grant, was tasked with expanding upon the content of the Broad Brook Watershed Report, which was completed in 2010. Broad Brook is an 11.4-mile watercourse with a 15.8 square mile subregional drainage basin within the Scantic Regional Basin, which is within the larger Connecticut Major Basin, ultimately draining to Long Island Sound. The purpose of this report is not to restate the findings of the Broad Brook Watershed Report, but rather, to supplement the "Place-Based BMP Recommendations" of the original report. The Broad Brook Watershed Report represents a tremendous resource for understanding this unique watershed; including its geological history, soils, land use, impairments, sources of pollution, and general strategies for improving water quality within this particular watershed. Despite this resource, very little progress has been made toward delisting the Broad Brook Watershed from the impaired waters list. One barrier to project implementation has been the lack of site-specific water quality projects identified in this report.

The primary goal of this "Phase 2" Broad Brook Watershed planning effort was to identify specific and feasible projects within the watershed, which if implemented, could significantly improve water quality within Broad Brook and make significant progress toward delisting Broad Brook from the Connecticut Impaired Waters List. Broad Brook segments 1 and 2 (separated by and excluding Broad Brook Millpond in East Windsor, and otherwise comprising the entire length of Broad Brook) are currently listed as not meeting their designated uses for their Recreation and Aquatic Habitat functions as a Class A watercourse. A Total Maximum Daily Load (TMDL) was developed in 2012 as part of the statewide bacteria TMDL to address the Recreation impairment, caused by Escherichia coli (E. coli), a species of fecal coliform bacteria whose presence in waterbodies indicates a health risk from contact, generally through recreational activities. The Aquatic Habitat impairment has an unknown cause, according to the CT Impaired Waters List, although Broad Brook is included on the List of Waters for Action Plan Development by 2022 Identified in Integrated Water Resource Management Reports, with

"Nutrients" listed as the primary cause to be addressed to resolve the Aquatic Habitat impairment. Nutrient reduction (specifically nitrogen) has also been identified as a priority for solving the hypoxia issue in Long Island Sound, and reductions in subregional basins such as Broad Brook benefit this broader purpose as well.

Basis for Agricultural Focus

Unlike many impaired stream segments in more urbanized settings, heavily impacted by impervious surfaces and point source discharges, both the Broad Brook Watershed Report and Bacteria TMDL document the fact that the Broad Brook watershed is primarily characterized as wooded and agricultural, with only a quarter of the watershed characterized as urbanized. The Broad Brook TMDL documents that 88% of the watershed has impervious coverage of only 0-6%. This low level of impervious coverage is not typically associated with stream impairments, indicating that undeveloped areas in the watershed are also contributing significantly to the impairments. Furthermore, the most densely developed areas are located within the lower portion of the watershed, adjacent to segment 1, yet the 9-mile long segment 2 located upstream of that densely developed area is also impaired, despite its sparse development.

Mapping included within the Broad Brook Bacteria TMDL indicates that much of the critical riparian area bordering Broad Brook and its tributaries is comprised of forested and agricultural land. Additionally, the Broad Brook Watershed Report emphasizes the pervasive agricultural use in close proximity to watercourses in the Broad Brook watershed as a primary opportunity to implement Best Management Practices and reduce pollutant loading to Broad Brook. Furthermore, the Broad Brook Bacteria TMDL asserts that "Multiple agricultural fields and large livestock farms are located along and upstream of the impaired segments and are a likely source of bacteria to Broad Brook."

While many useful agricultural practices were listed within the Broad Brook Watershed Report, site-specific agricultural projects were not identified. This supplementary Phase 2 effort went one step further, using Geographical Information Systems analysis to identify priority areas to examine more closely for potential water quality projects, largely focusing on both agricultural and developed parcels in close proximity to a watercourse or waterbody. Once a database of priority parcels was developed, these sites were analyzed more closely via

aerial photography and/or on-site investigations. In-depth on-site investigations were possible on a few particularly critical parcels on which cooperation from landowners was achieved.

Both Oakridge Dairy and Roaring Brook Farm are large livestock operations the heart of the Broad Brook Watershed with manure management and livestock exclusion challenges. They both utilize and fertilize a tremendous amount of cropland on which they grow feed for their livestock. Their home farms are located within the upper portion of the watershed, not far from the densely forested headwaters within Shenipsit Forest. Watercourses, including Broad Brook and several tributaries, flow along and directly through agricultural fields and livestock areas. There are copious opportunities for improvement within these farms that would have a positive impact on water quality within Broad Brook. The willing participation of these operations in both this assessment and in future implementation efforts is considered essential to achieving the goal of delisting Broad Brook from the impaired waters list.

Additional Opportunities

While agricultural operations were the inevitable focus of this assessment, additional land uses in the watershed were identified as priorities for implementation as well. Some of these uses, highlighted in proposed projects below, include public parks, golf courses, educational facilities, gravel and material mining operations, local airports, and apartment complexes. In addition to these larger targeted sites, many smaller operations and residential properties provide opportunities for bacterial reduction, nutrient reduction, and water quality enhancement as well. The types of projects have been previously identified in the Broad Brook Watershed Report, and a list of parcels to potentially target has been generated through GIS analysis as part of this supplementary report.

The Broad Brook Watershed Report provides a comprehensive list of "Watershed-Wide BMP Recommendations", including vacuum-assisted street sweeping, regular maintenance of catch basins, catch basin filters, domestic pet waste management, agricultural waste management, education for agricultural operations, subsurface sewer disposal system maintenance and repair, vegetated buffers, and recommended alterations to municipal regulations. As for "Place-Based BMP Recommendations", the Broad Brook Watershed Report lists a number of practices for generalized agricultural operations, as well as recommendations

for unbuffered stream locations, subsurface sewage disposal systems, horse farms, waterfowl, wildlife, and nursery operations. There is also a list of potential projects identified during a trackdown survey of the Broad Brook main-stem, as well as more detailed project descriptions for Broad Brook Mill Pond and East Windsor Park (the latter two of which are restated and expanded upon within the assessment that follows). Aside from the projects identified in the trackdown survey and on the two town-owned parcels, these recommendations are generalized and are applicable to many common areas throughout the watershed.

Notwithstanding the many site-specific project recommendations identified within this supplemental Phase 2 evaluation, the original "watershed-wide" and "place-based" BMP recommendations of the Broad Brook Watershed Report remain relevant, and can be implemented where appropriate to reduce bacteria and nutrient loading. For example, there are many opportunities on residential properties to implement vegetated riparian buffers, and there are small farming operations that would benefit from nutrient management planning and a variety of BMPs. For a list of specific sites to target for BMP implementation aside from the larger projects highlighted in this report, refer to the appended database containing parcel data for those priority sites that were identified through GIS analysis.

Expectations of Load Reductions

While the Impaired Waters List identifies bacteria as the source of the recreation impairment, Broad Brook has been the subject of numerous studies over several decades, particularly due to its extremely high nutrient load. In an agricultural basin such as Broad Brook, the presumed primary source of bacteria (livestock) is also the primary source of nutrients, and the two are closely correlated. As load reduction predictions for nutrients are much more easily modeled than they are for bacteria, for this report, estimated reductions in nutrients and other pollutants from recommended BMPs were calculated as a surrogate for bacteria. It should be noted, however, that studies of Broad Brook show that nutrient reductions will likely require many years before they are observable in water samples. In a U.S. Geological Survey (USGS) publication prepared in cooperation with CT DEEP in 2006 entitled "Nutrient Loads and Ground-Water Residence Times in an Agricultural Basin in North-Central Connecticut", Broad Brook's nutrient loading from groundwater discharge is dissected in terms of age of the water. The study noted that due to the "extensive stratified glacial deposits"

within the Broad Brook watershed, groundwater makes up the majority of water discharged to streams, and that since it is a "high-intensity agricultural area", the groundwater may contain high nitrate levels. USGS previously found that "the Broad Brook Basin has the largest nonpoint yield of nitrogen of any basin sampled routinely in Connecticut." The study's simulation found that 50% of groundwater discharged to Broad Brook originated as groundwater recharge over 11 years ago, including 18% with a residence time of over 26 years and 8% with a residence time of over 46 years. The study determined that "These findings have important implications on the length of time required before water-quality improvements in Broad Brook can be observed following implementation of BMPs." The study concluded that even as BMPs are implemented, "The existing storage of nitrogen in the soil will take some time to deplete, and changes to the concentrations of nitrate reaching the water table are likely to be gradual." Therefore, a delayed improvement in nutrient concentrations within Broad Brook after BMP implementation should be expected, and impairments will not immediately be reversed.

Partners and Funding

Agency partners have already been instrumental in the recommendation of BMP projects at Oakridge Dairy and Roaring Brook Farm. Once landowner contact and cooperation was achieved and meetings commenced, priceless technical assistance and institutional knowledge related to project identification was contributed by Extension staff from the UConn College of Agriculture, Health, and Natural Resources as well as staff from the USDA Natural Resources Conservation Service (NRCS) in Connecticut.

Looking ahead toward implementation, continued partnerships with CT DEEP and NRCS are anticipated, as both EPA Clean Water Act Section 319 funds, locally administered by CT DEEP, as well as Environmental Quality Incentives Program (EQIP) funds from NRCS are needed to implement the recommended projects. In addition to these, the CT Department of Agriculture is anticipated as a partner, most likely through the Farmland Restoration Program, although the future of this state program beyond 2017 is unknown. Critical partners for each of these recommended projects will be the landowner of record, or the lessee of the land, whether it is a private landowner, corporation, land trust, municipality, state, or other. NCCD expects to further engage the individual landowners and either obtain contracts or assist as other entities obtain contracts through the various agencies identified as funding sources.

Task One : GIS analysis:

Refer to separate PDF of maps and spreadsheet of parcel data generated for this project

Tasks Two and Three: Detailed Site Assessments based on Field Assessment

Detailed site assessments below. Refer to separate spreadsheet for estimated pollutant load reductions, costs, permitting and contracted services required, and **Task Four**: funding sources

Roaring Brook Farm

Roaring Brook Farm is located at 18 Meadow Brook Road in Ellington CT, within the southeastern portion of the Broad Brook watershed, west of Route 83 and northeast of Ellington High School. Roaring Brook Farm's home farm consists of approximately 53 acres, and the farm also leases a significant amount of additional cropland to support their dairy operation. One of Broad Brook's primary tributaries, Kimballs Brook, runs directly through the farm. The majority of the home farm is located within local watershed basin 4206-02 (Kimballs Brook), with portions within 4206-04 (Kibbes Brook). Significant amount of leased cropland is located within local basins 4206-00 (Broad Brook main stem) and 4206-06, with additional areas within 4206-01 (Hydes Brook) and 4206-09 (Lake Heather). The surrounding land cover is primarily agricultural, and also includes residential and commercial properties, as well as Ellington High School and Ellington Airport. Much of the adjacent agricultural land, including land at Ellington Airport, is leased and cropped by Roaring Brook Farm. A tremendous amount of the surrounding agricultural land is owned by neighboring farm Oakridge Dairy.

The home farm includes approximately 10 acres of pastureland where the milking cows graze during the summer. Much of the remaining land on the home farm, in addition to the leased land, is used to grow corn and hay for the dairy cows. In total, Roaring Brook Farm grows approximately 100 acres of hay and about 200 acres of silage corn (half of which they practice no-till on). There are approximately 180 milk cows and 200+ heifers/young stock supported by the operation and housed on the farm.

Stormwater runoff from agricultural land is a significant source of non-point pollution in the Broad Brook watershed. The intensive agricultural use on this land, either through heavy grazing, hay production, or corn production, has an impact on water quality in Kimballs Brook and Broad Brook. The farm does not currently employ any sort of manure storage system, which necessitates that the manure being scraped daily from all the barns and calf houses be

spread daily on the cropland. This is a time-consuming and energy-intensive process for the daily operation of the farm, and in terms of water quality, results in tremendous bacteria as well as excessive nutrients being applied to cropland in close proximity to a watercourse. The bacteria and nutrients contained within the manure being applied daily and directly adjacent to a watercourse represent a substantial source of pollution to Broad Brook, particularly during wet or frozen weather conditions. Manure storage and a method of processing and utilizing manure in alternative ways would alleviate the wasteful and harmful status quo of spreading manure daily. One option would be to install an anaerobic digester, which could serve to process manure to produce energy for heat and/or electricity as well as solids that may be used to replace expensive livestock bedding. The Connecticut Farm Energy Program would be an integral partner in this project. Roaring Brook Farm is now slated to receive a Comprehensive Nutrient Management Plan from NRCS, which will refine these manure management strategies.

Another important opportunity for improving water quality in Broad Brook is related to the configuration of livestock housing on the farm. Roaring Brook Farm currently has a sufficient freestall barn for its heifers/young stock, but has a severely undersized barn for its milking cows. During the winter months, the milking cows spend much of their time in a heavy use area (confinement field), which in the summer must instead be used to grow silage corn to feed the cows, during which time the cows are given access to a southern pasture. The pasture used by the milking cows in the summer months is accessed by crossing Kimballs Brook. No structural crossing is in place, but rather, the cows walk directly through the brook, and tend to loaf either within or next to the brook, using it as a source of water and as a resting spot. The cows have been observed to linger in that area and to defecate both within the brook and very close to the brook, which is an undeniable source of bacteria to Broad Brook. The owners of Roaring Brook Farm have expressed interest in altering portions of their operation and are very interested in constructing a new freestall barn to house their milking cows. The farm operator would ideally like to exclude the cows from the brook altogether, which can be achieved primarily through the construction of a suitable barn.

Other opportunities exist within Roaring Brook Farm to minimize pollutant runoff into watercourses, including treatment of milk wash wastewater and silage leachate, and remediation of stream segments and establishment of sufficient riparian areas. A list of feasible projects within the farm follows below.

Projects and Best Management Practices to improve water quality on Roaring Brook Farm:

Please see attached map, on which proposed project areas are numbered.

(1) Silage Bunker-replace/regrade and collect leachate

The primary silage bunker is deteriorating, and during the winter, the silage expands outside of the old silage bunker. The old silage bunker does not contain a leachate collection system. Regrading the silage area plus replacing the old bunker would allow enough storage for silage for the year. The new bunker could also contain a leachate collection system, minimizing the amount of silage lost and would minimize runoff of silage leachate. Silage leachate has an extremely high biochemical oxygen demand and is also very high in nitrates. Once it enters waterbodies, it can lead to fish kills, algal blooms, and eutrophication. See photos below depicting the primary silage bunker, overflow silage pile, and the roadway that the silage leachate drains across, toward the adjacent corn field.

(2) Stanchion Barn Milking Parlor – Riparian Planting/Milk Wash Wastewater Treatment

The area surrounding the Stanchion Barn Milking Parlor lacks a riparian buffer, and the landscape consists of mowed grass up to the stream bank. A vegetated riparian buffer of native plant species would minimize the effect of the adjacent heavy use areas on the stream while also benefiting wildlife. The buffer would work best using a variety of woody and herbaceous native plants to slow runoff and trap/uptake pollutants along the northern edge of the brook.

In addition, there is currently no system in place for collecting and treating milk wash wastewater, a byproduct of the constant cleaning of equipment that is necessary in the milking parlor. This wastewater has a tremendous volume, estimated at 5 gallons per cow per day, and would contain milk, cleaning chemicals, and various contaminants from the cows (manure, bedding, feed). Left uncollected and untreated, milk wash wastewater represents a source of pollution in the Broad Brook watershed. The creation of a bark bed or vegetative filter bed for collection of the milk wash wastewater from the milking parlor is recommended. This would serve as an effective outlet of waste that is not easily treated by traditional waste disposal systems and would prevent milk wash waste water from draining into the stream and contributing pollution to adjacent waters. Photo below depicts the back of the Shanchion Barn Milking Parlor, with the inadequate milking cow freestall barn and laneway visible in the background. This photo is taken from the main driveway, and in the foreground, the crossing over Kimballs Brook is visible.

(3) Free Stall Barn (Milk Cows)

The existing Free Stall Barn for the milking cows (visible in background of photo above and to the right of the laneway in photo below) is insufficiently sized to house all of the cows, which is of particular concern during the winter, as described and depicted above. The construction of a new barn (within a portion of the existing Winter Heavy Use Area) would allow the cows to stay inside during winter when most of the vegetation has died off and is not able to filter the pollutants before they wash in to the stream. Housing the cows within a new barn would also eliminate the need for cows to cross Kimballs Brook to access the summer pasture area to the south, greatly reducing a direct pollutant source.

(4) Holding Area

The Holding Area is only being used a few hours per week, yet grass does not have enough time to recover between uses. The landowner may consider converting this area to a properly designed heavy use area. In designing this area, it would be important to ensure that surface water drainage flows to appropriate catchments and collection systems.

(5) Laneway

The laneway (viewed from north in photo below) is in close proximity to the brook. The area east of the laneway may currently be used for hay production, in which case it would be recommended that manure not be spread in this area to improve water quality of the brook. This area would ideally be converted to a vegetated riparian buffer of native shrubs and herbaceous plants. If the new barn is constructed as recommended, the lane way could possibly be relocated or removed to further increase the vegetative buffer of the brook.

(6) Free Stall Barn (heifers)

The existing Free Stall heifer barn (depicted below) would benefit from an animal waste system, as the scrapings from the barn are currently spread on-site daily. By constructing a convenient covered manure storage facility, time spent spreading manure would be greatly reduced while also improving the quality of stormwater runoff into the adjacent streams.

(7) Old Dam

There is an old dam that was used for ice production, which was breached many decades ago. Remnants of the dam that still remain, which partially block the natural stream flow. Consider removing remnants that interfere with the stream and restoring the natural stream channel. Photos below show an in-tact portion of the dam, and remnants of the breach within the stream channel.

(8) Machinery Shed

There are existing piles of fill behind the machine shed that could be used during construction for future projects. With the removal of the fill, more vegetation could be planted near the stream to act as a buffer.

(9) Calf Hutches

The hutches have no bottoms and are moved regularly around the farm. Those currently placed near the machinery shed are surrounded by minimal vegetation that drains down a dirt road toward the brook. Additional vegetation near the stream would aid water quality.

(10)/(11) Calf hoop house / Calf exercise yard

Ensure that surface water drainage from both the calf hoop house (photo bottom left) and exercise yard flows to the appropriate catchments and collection systems. A vegetated buffer around the exercise yard would allow filtration prior to runoff reaching the stream.

(12) Silage Bunker - secondary

The secondary silage area south of the machinery shed (photo above right) does not have a solid base. There is also no leachate collection system for the silage bunker. If the area will continue to be used for silage storage, we recommend creation of second silage bunker, with the design considerations suggested for the main silage bunker above.

(13) Winter Heavy Use Area (Milk cows)

When the new cow barn is built, steps should be taken to confirm that the surface water drainage flows to the appropriate catchments and collection systems. The farm should construct a manure storage system, the system could store manure for longer periods, especially over the winter when spreading manure daily in frozen conditions is particularly impractical, wasteful, and harmful to water quality. The manure can then be spread in other seasons to prevent pollution from entering the stream during the winter when vegetation is sparse and the ground may be frozen. If the farm wishes to maintain this area as pasture, it should be designed with heavy use protection measures, and a management plan to rotationally graze should be developed.

(14) Summer Pasture (Milk Cows)

Currently, the only way for cows to access the southern pasture is by walking through the stream, which has disturbed the stream channel and represents a direct source of bacteria and nutrients to the brook. Use of this crossing and pasture should be discontinued to improve water quality, and the brook should be restored and a riparian area established. In discussions with the landowner, there was interest in converting this area to hay and fencing the cows out of the summer pasture area completely to exclude the cows from Kimballs Brook. In order to accomplish this goal and eliminate the need for cows to cross the brook and access the southern pasture, a new barn of sufficient size to house the milking cows must be built. The barn is proposed within the current winter heavy use area, which is typically planted with silage corn during the summer. An existing roadway for vehicle and farm equipment exists just east of the brook, but if access through the brook to the southern field is desired in the future for cows and/or pedestrians, a bridged crossing that preserves the natural stream corridor would be recommended.

See additional description and photos of this critical resource concern on the following page:

The following photos depict key portions of the southern pasture, used by the milking cows in the summer months.

The top two photos depict a heavily utilized portion of the southern pasture, adjacent to the stream, where milking cows tend to loaf under the trees. Bare soil is prevalent throughout the area, and continues up the hillside.

The bottom two photos show the cows accessing Kimballs Brook directly, using it not only as a crossing into the pasture, but also as a water source and a place to linger, directly introducing bacteria and nutrients into the watercourse. In the background of the bottom two photos, the Winter Heavy Use Area, which at the time of the photos was planted with corn for the summer, is visible. A new barn constructed within the northern portion of this field would exclude the cows from the brook and would allow adequate separation between the pollutant source and the brook.

(15) Field South of Houses

South of the houses, Kimballs Brook flows directly through a field, with no vegetative buffer. See map of Roaring Brook Farm with aerial imagery to best view existing condition of this field and of Kimballs Brook (labeled #15 on map). This field has been used for the production of corn and hay in various years. Planting a wide native vegetated buffer and excluding the use of manure and/or chemical fertilizers in close proximity to the brook would have the greatest effect in the reduction of bacteria and nutrients.

(16) Stream Crossing

The stream crossing for the main dirt road, which crosses the northernmost point of Kimballs Brook on the farm, could be improved to better prevent sediment from entering the brook, which would improve water quality downstream. The surrounding slopes should be stabilized with vegetation and/or riprap and/or permanent turf reinforcement mats to prevent sediment from entering the stream at the location of the main roadway crossing.


Roaring Brook Farm
Meadow Brook Road
Industrial Drive
Kimballs Branch
Hopkins Road
Maria Drive
Kimballs Brook
Ellington
State Hwy 83
83
Kibbes Brook
Legend
Roaring Brook Farm
0 0.075 0.15 0.3 0.45 0.6
Kilometers
State Hwy 140
140
N
W
E
S
Parking Lot
State Hwy 140
Gail Drive
Cider Mill Road
CT DEEP, USGS

Roaring Brook Farm

Industrial Drive

Meadow Brook Road

1

3

2

16

4

6

Kimballs Branch

7

5

Ellington

Ellington

15

8

13

11

10

9

Kimballs Branch

12

14

0.05 0.025 0 0.05 Miles

N

W E

S

CT DEEP, USGS

Oakridge Dairy

Oakridge Dairy farm is located along the southern edge of the Broad Brook watershed, north of Route 140 and both north and west of Ellington High School. The primary address is 76 Jobs Hill Road in Ellington, although the home farm spans many properties along Jobs Hill Road between Meadow Brook Road and Route 140, as well as along Meadow Brook Road south of Hoffman Road, and on Hoffman Road northwest of the intersection with Meadow Brook Road. Oakridge Dairy Farm owns 480 acres on 13 adjacent parcels of land. The majority of the home farm is located within local watershed basin 4206-00 (Broad Brook main stem), 4206-02 (Kimballs Brook), 4206-04 (Kibbes Brook), and 4206-03 (Bahlers Brook). The surrounding land cover consists of residential and commercial properties, with much of the backland being leased for agriculture. Oakridge Dairy also leases significant cropland to support the dairy operation. Agricultural runoff has been identified as a significant contributor of non-point pollution within the Broad Brook watershed.

Oakridge farm recently underwent a large transformation in operations, with a consolidation of their dairy production to their newly constructed 8-acre barn. Their goal is to have 2,600 milking cows and 400 dry cows by December of 2018. The new barn currently houses 1,800 cows and has a capacity of up to 2,700. Heifers/young stock will no longer be raised on farm; they will be shipped to Kentucky until they are old enough to produce milk. The farm also plans on constructing a Visitor Center and allowing tours and educational groups to visit the facility, which must be incorporated into future planning.

Currently, the farm grows 1,970 acres of corn and 890 acres of grass. Of that cropland, 95% has recently been converted to no-till management, and cover crops are also employed on much of the corn field acreage to further improve soil health, prevent soil loss, and reduce erosion. Oakridge Dairy is in the process of developing a Comprehensive Nutrient Management Plan, which will further address the manure management issues that we have identified below. Oakridge Dairy has worked with the Connecticut Farm Energy program to install a large solar array, and has expressed interest in also installing an anaerobic digester, which could process manure to produce energy for heat and/or electricity as well as solids that may be used to replace expensive livestock bedding. In addition to the conservation practices already being implemented, the managers of Oakridge Dairy have expressed interest in working with NCCD to improve water quality in Broad Brook and to implement conservation practices on their farm.

Projects and Best Management Practices to improve water quality on Oakridge Dairy Farm:
Please see attached maps (Oakridge Dairy North and Oakridge Dairy South), on which proposed project areas are delineated and numbered.

Oakridge Dairy North

(39) Outside Lot

Area (39) encompasses 6.9 acres of bare ground with substantial manure accumulation from its function as a heavy use area for cows. An intermittent watercourse, which ultimately drains to Broad Brook, runs through this lot. The goal for water quality improvement would be to stabilize and revegetate slopes that are too steep for agricultural equipment to operate, converting these slopes to permanent vegetative cover. The remaining acreage of this outside lot should be regraded and planted in a permanent grass for hay production. Approximately 3,550 feet of fencing would need to be removed in this area.

(19) Feed bunker

The feed bunker services the outside lot mentioned above, which we propose to exclude cows from and convert to hay in order to protect the intermittent watercourse. Once cows are excluded, the impervious feedlot will be unnecessary and should be removed to allow more acreage for hay production. The feedlot structure that must be removed is approximately 200' X 20', and an 18" high curb with headlocks and waterers must also be removed.

(35) Manure Waste Water

This is an uncovered, unlined manure structure used to collect manure from the feeding pad (19), which would be rendered unnecessary once cows are excluded from the outside lot (39). Remove floor and regrade to allow for crop production and the establishment of grass for hay in this area.

(53) Outside Lot

This outside lot consists of a 1.8-acre bare ground heavy use area. If the farm continues to maintain this, a management plan for rotational grazing should be developed. Animal access should be limited to maintain permanent grass cover. If lot 53 is kept as a grazing area, areas on lot 38 could be established as grass for hay for stabilization and regraded to prevent channelized flow and erosion from the area.

(38) Outside Lot

This outside lot consists of a 0.45-acre bare ground heavy use area. Cows have direct access to an intermittent stream when this lot is used. Removal of approximately 580 feet of fence is needed if this area will no longer be used to contain cows. As referenced above, this area could be established as grass for hay and regraded to prevent channelized flow and erosion from the area. Planting of native woody and herbaceous plants is suggested to create a riparian buffer on the stream.

(26) Manure Area

There are two manure storage areas in this location, adjacent to a barn. The first is a 28' x 12' walled area located just outside of the barn, which contains relatively dry manure. The second, lower storage area, depicted in the photo above on the left, is an uncovered, unlined manure structure with large concrete block walls that allow surface and groundwater into the storage area. This lower area collects the wetter materials that are scraped into it, and also collects rainwater from the concrete apron and from the dry manure area. The barn's roof area is 2,264 square feet, which generates significant stormwater runoff that flows through the manure storage areas, where it accrues excessive quantities of nutrients and bacteria and transports them to other areas in the form of polluted runoff. Both the manure storage structure and the barn apron area should be roofed and the surrounding area regraded to prevent surface water from entering the storage area.

(42) Outside Lot

Lot (42) consists of 1.99 acres and appears to be subdivided into separate grazing areas, based on bare/green areas visible in certain aerials, although there is variation in usage. The southern portion of this lot appears to contain wetlands. The remainder of the lot outside of wetlands should be revegetated into permanent grass for hay, which will stabilize the soil. Approximately 1,400 feet of fencing should be removed, although this amount of fencing to be removed may be larger if the lot is indeed currently divided into multiple areas. A concrete pad of approximately 1,500 square feet must also be removed to restore the lot. Portions of the lot may be eligible to restore wetland hydrology by revegetating with native wetland plants. This lot is adjacent to Bahlers Brook, and wetland restoration would improve the brook's health.

(52) Outside Lot

Lot 52 is made up of 0.38 acres and has bare soil in this heavy use area. If the farm wants to retain this as bare soil, it would be recommended to establish a minimum 50 foot grassed buffer along the southern edge of this lot. Alternatively, grass could be established over the entire area, and animal access could be managed using adequate rotational grazing to maintain adequate grass cover at all times.

(54) Pasture 1

This pasture includes an area of 0.66 acres, and if maintained as pasture, it should be managed with rotational grazing to keep an adequate cover at all times. If abandoning this pasture, removal of approximately 830 feet of fence would be necessary. Whichever option is selected, we recommend maintaining a 40 foot vegetated buffer along the brook.

(55) Pasture

Pasture (55) contains 1.7 acres, but looks to have been abandoned. Removal of 1300 feet of fencing is potentially needed. Allowing this to return to its natural vegetation, or planting pollinator species would aid in the recovery of the area.

(80) Heifer Building

This structure has gutters but the downspouts and outlet piping seem to be missing. The roof runoff appears to cross the animal walkway (80), carrying any accumulated manure from the walkway to the adjacent marsh area to the west. The roof drainage should be redirected to discharge to a sufficiently vegetated area. Additionally, allowing vegetation to grow around the structure may reduce some of the movement of sediment.

(79) Heifer Building

This building has no gutters at all. Water from the roof on both sides of this building flow through areas with accumulations of manure as it drains overland to the stream located to the west. Installing gutters, in addition to a downspout disconnect system, would allow for infiltration of most of the water. Alternatively, one could use the appropriate piping to move clean water to the marsh areas west of the barns.

(51) Outside Lot

Lot (51) contains an abandoned calf raising facility. This area has been allowed to return to woody vegetation. This area is a good candidate for restoration activity and is in close proximity to Broad Brook. Removal of the calf structure, as well as approximately 950 feet of fencing, followed by establishment of grass for hay and allowing vegetation to grow near the stream and wetlands would all be beneficial for water quality. Restoration of this area, in conjunction with the following two proposed projects, including the removal of the bunker silo (58), and the closure of the adjacent dry lot (50), would be a beneficial combined project.

(50) Outside Lot

Lot (50) consists of 3.72 acres of which 3,000 ft. of fencing should be removed. There is a large depressed area in the field that is fenced. Filling of this area may be required in order to return the area to productive cropland and establish grass for hay in this area, but further investigation is needed to determine if this is possible and/or recommended. Leaving a vegetated buffer around the wetland is recommended for water quality. This area is in the north of the lot and wraps around the silage bunker (58) to a 132' X 20' feeding pad (81). The curb and headlocks should be removed, and the concrete block walls. An additional feeding pad (83) exists in this dry lot, which measures 80' X 12' with low curbs on the long ends, which should be removed.

(58) Silage Area

The silage area (58) is 0.36 acres in size. This silage pad looks to be in good shape from the front wall. The leachate from the pad runs to the mouth of the silo and moves into a collection structure (84) that is grassed and surrounded by large concrete blocks to prevent vehicles from falling in. No pipe was visible at site and it is undetermined where any leachate or water flows from here. The apron of this silo is in much worse shape. Several large potholes are evident and the concrete is cracked in numerous places. Recommend removing pad, buckwalls, and leachate collection area if possible given long term goals, or reconfiguring silage area.

(59) Silage Area

Silage area (59) includes an area of 0.71 acres. Recommend the removal of the pad, buckwalls and leachate collection area, as appropriate (or reuse area to consolidate parking, see following project area description), and the establishment of grass for hay in this area and a restored vegetated buffer near the wetlands.

(62) Vehicle Area

Vehicle area (62) has 9.39 acres and is mostly grassland. If the concrete pad under Silage Area 2 (59) is suitable, consider consolidating vehicle parking on the silage pad. This may be a good place for a fueling and washing station to be established, if the collection system is deemed to be appropriate for this use. Establishing a vegetated riparian buffer along the edge of the stream would reduce the runoff from the area into the brook

(49) Outside Lot

Lot (49) is 0.87 acres in size and 1,475 ft. of fence needs to be removed if its use is to be converted. The removal of an approximately 2,025 ft. sq. pad, as well as 90 ft. of buck wall, may be recommended depending on the final use of the building (16). The owners may want to retain the pad if this facility is converted into a mortality composting center. Alternatively, revegetating it as a lawn area pending construction/development of a visitor center may be preferable. This area is immediately adjacent to roads. There appears to be a possible wet area contained within this lot, which warrants further investigation prior to implementation and/or change in land use.

(15) Building

Currently, the landowner's plan is for this building (15) to remain a viable milking barn until the new facility is fully operational. This may, in the future, be adapted in the Visitor Center to show their cows or may be converted to another use.

(16) Building

This building may be converted to a composting structure. While the structure seems adequate, the proximity to the future Visitor's Center and distance from the livestock housing, carbon sources, truck scale (for tracking sales) and proximity to Broad Brook are all drawbacks to this location. Recommend a larger buffer from Broad Brook in this area and steps should be taken to confirm that the surface water drainage flows to the appropriate catchments and collection systems.

(64 & 65) Tracking Pads

Construct a vehicle tracking pad here to reduce vehicle movement of soil and manure onto public roadways and in to Broad Brook. Mud and other substances being carried by farm equipment are very common complaints received by towns from neighboring residents. These areas need to be addressed for a favorable image in the community, and to prevent further movement of pollutants into stormwater systems and watercourses.

(27) Manure Pit

It is recommended that manure be cleaned out from this area (27), and that the manure pit be abandoned in place until the future use of the area is decided. If using this barn for mortality composting, cover this area and use to accumulate screened compost for sale off-farm.

(43) Outside Lot

Clean area of accumulated manure until the final use of the building is decided. The future use of this area may warrant keeping the pad in place or relocating it.

(28) Manure Pit

Manure pit (28) has accumulated manure which must be cleaned out. Depending on depth and bottom composition, allow this pit to fill up as a pond or establish a constructed wetland in this area and the wet area between here and Outside Lot 5 (49) as part of Visitor Center design.

(45) Outside Lot

There are approximately 1,500 square feet of accumulated manure and there is a need to remove the concrete pad and buckwalls in this area. Revegetate as lawn, pending final design of Visitor Center.

(48) Outside Lot

Lot (48), containing 19.53 acres, is primarily a bare ground livestock loafing area directly adjacent to the main road. Recommend cleaning out accumulated manure and revegetate as lawn pending Visitor Center design.

(47) Outside Lot

Lot (47), containing 3.05 acres, needs regrading as necessary and approximately 1,850 ft. of fence needs to be removed. Another recommendation would be to establish permanent grass for hay if the soil condition is adequate. If too wet, allow it to return to native vegetation or possibly establish a pollinator habitat for use in educational programs through Visitor Center.

(56) Public Access

Lot (56) contains 29.2 acres and could be developed into a living wetland habitat for plants and wildlife with walking paths for visitors. Wildlife and or wetland habitat development could be potential projects in this area. Pollinator habitat, turtle habitat and rabbits should also be considered.

Oakridge Dairy South

(40) Outside Lot

Lot (40) contains 8.63 acres. This area has functioned as a large dry lot with several obvious channelized flow paths that allow runoff water to move manure directly into the wetland areas along the streams. The removal of approximately 5,000 feet of fence is needed if it does not remain pastureland. There is a 6,310 square foot concrete feeding pad as well as 223 feet of walls to be removed as well. Area to be established as grass, corn, or alfalfa, as desired. If corn is selected, establish grassed waterways in the obvious swales created by runoff from the dry lot.

(33) Manure Waste Water

Lot (33) is 0.14 acres, and is an unlined structure and accumulates manure scraped from the feeding area above. Runoff water has been observed to carry manure directly to the stream south of this structure. The removal of accumulated manure and removal of 160 feet of walls and floor (if present) would be beneficial. The lot will need to be regraded and amended to allow it to return to crop production.

(46) Outside Lot

This area is 19.5 acres and serves as a large dry lot area, yet could be more valuable to the farm as cropland than in its current use as a loafing area for cows. The removal of approximately 3,750 feet of fence is needed as well as regrading, as necessary, to remove cattle mounds and return to crop production. Establishment of alfalfa, grass, or corn as desired. If row cropped, a suitably sized buffer at the base of the slopes should be included in the vegetation planting design to protect the adjacent watercourse.

(37) Outside Lot

This dry lot has been down-sized considerably in recent years. If this lot is to remain, consider installing a berm along the northern edge of the lot to contain the runoff from the dry lot; thereby preventing pollution of the intermittent stream through the adjacent crop field. Cleaning accumulated manure, removing approximately 400 feet of fence and a 1000 square foot concrete pad as well as the establishment of grass to add to the adjacent hay lot is recommended.

(18) Building

Building (18) is a possible mortality composting building. Relative isolation and proximity to mortality and carbon sources are advantages to this site. Structure needs to be evaluated for suitability. Outside Lot (37) is adjacent to this structure on west side and could be covered and used to accumulate carbon material prior to composting in Building (18). Manure waste water area (34) adjacent to this structure on east side could be covered and used to accumulate finished compost prior to sale.

(34) Manure Waste Water

The lot (34) has a 2,200 square foot concrete pad and approximately 180 feet of buck walls/curbs. If Building 4 becomes a mortality composting area, consider covering this area and using it to accumulate finished compost prior to sale.

(31) Manure Waste Water

Manure area (31) has accumulated manure that needs to be cleaned, as well as removal of pad if present. Area needs to be leveled to return to crop production. Alternatively, it might make sense to retain this structure and use it to store surface water runoff from driveways and other areas around silage and new farmstead, although configuration is to be determined.

(29) Manure Pit

The manure pit (29) has accumulated manure which needs to be cleaned out. This manure structure should be evaluated for faults. If deemed to be functioning adequately, it poses no immediate threat and can be maintained for its designed lifespan. Otherwise, remove pad, push offs, & buckwalls if present.

(17) Building

The farm should consider retaining this structure (approximately 75' X 120') for mortality composting if deemed suitable for equipment.

(41) Outside Lot

This area contains 0.43 acres and runs into manure storage (29). Assuming the storage is functioning correctly, this area could be maintained indefinitely. Remove feed bunks, pads, walls, waterers and other impediments as necessary along with establishment lawn pending final disposition of buildings surrounding this area.

(44) Outside Lot

This 0.30 acre area runs into manure storage area (29). Assuming the storage is functioning correctly this area could be maintained indefinitely. Remove feed bunks, pads, walls, waterers and other impediments as necessary and establish lawn pending final disposition of buildings surrounding this area.

(25) Manure Pit

This pit appears to be relatively new, and if the design is deemed adequate, it can remain indefinitely. If this pit is to remain functional, consider roofing it to prevent loss of nutrients in runoff. If this manure pit is inadequate, design and build a new manure storage structure that is suitable to function in the new system.

(60) Silage Area

Silage area (60) is 3.23 acres and is near the new barn. This is a large silage and feeding area with no visible leachate or runoff collection system. A leachate collection system needs to be installed here. Bulk grain bins or upright grain storage, as needed, will be installed in this region possibly utilizing space regained from removing existing buildings. Care should be taken to ensure surface water flows to appropriate catchments and collection systems.

(63) Building

The building (63) is 35' X 275'. This building could become a mortality composting facility if the height and width of alleys adequately fit equipment, and it is in close proximity to the new barn. Might want to split length into east/west sections to shorten shuttle trips to build piles and remove compost. Adjacent outside Lot (44) could be covered (assuming a pad is present) to stockpile finished compost and to locate screening equipment needed to remove contaminants prior to sale. Location is close to manure solids and mature cow housing areas, which makes this location (whether existing structure will be adequate or not) a good first choice for mortality composting.


Oakridge Parcels
Legend
OAKRIDGE_DAIRY_LLC
Ellington_MrSID_Mosaic_Gen4.sid
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
N
W
E
S
0
0.1
0.2
0.4
0.6
0.8
Miles

Oakridge Dairy North

Oakridge Dairy LLC Proposed Broad Brook Project Areas

0 0.05 0.1 0.2 Miles

Oakridge Dairy South

Oakridge Dairy LLC Proposed Broad Brook Project Areas

0 0.05 0.1 0.2 Miles

Broad Brook Millpond

Broad Brook Mill Pond is located within the northeast corner of the intersection of Main Street (Route 191) and Depot Street in East Windsor. A dam exists at the southernmost point of the pond. The millpond is surrounded by dense residential development, particularly along the western edge and southeastern boundary. While the northern and northeastern edges of the pond are bordered by forestland, a large, very dense apartment complex (Mill Pond Village- addressed later in this document) exists further east of the millpond.

In terms of sources of pollution, Broad Brook Millpond is a prime location for nuisance waterfowl to gather, based on its size and lack of dense vegetation in certain areas. As identified in the Broad Brook Watershed Report, stormwater runoff from adjacent public roadways represents another likely source of pollution.

The photos below depict the dirt/gravel public parking area and boat access at Broad Brook Millpond, as well as stormwater outfall pipes containing significant sediment buildup.

The following options for addressing the sources of pollution, identified within the Broad Brook Watershed Report, still apply today:

- "Install catch basin filters in each catch basin that is part of the network discharging to the pond. The filters should be properly maintained to ensure maximum efficiency."
- "Construct either a detention basin or stormwater wetland to capture the runoff prior to entry into the pond. Both systems would require regular maintenance to ensure maximum efficiency."
- "Establish a controlled street sweeping program for the roads that have catch basins which discharge to the pond. Conducting such a program could serve as a way to evaluate the effectiveness of street sweeping and to assist in determining the best timing for sweeping to be conducted. Street sweeping could be performed as a standalone measure or in conjunction with any of the other measures suggested for the pond. As a complementary practice, sweeping would reduce the level of maintenance required for filters, detention basin, or constructed wetland because it would decrease the amount of solids being transported."
- "Buffer the western edge of the pond with woody vegetation. This may reduce the number of waterfowl that use the pond. Based on the size of the pond and the amount of visible surface area, this may have a limited effect in deterring waterfowl from using the pond. The establishment of a buffer will, however, help to mitigate any pollutant loading that is currently occurring from land bordering the pond."

In addition to the options identified within the Broad Brook Watershed Plan, an additional measure is recommended as part of this supplementary assessment:

- Waterfowl fencing could serve as an effective barrier to local and migratory geese. Geese can destroy vegetation and pollute areas adjacent to ponds and other waterbodies. The waterfowl fencing is a very simple and economical solution, and works by attaching string to several stakes at the proper height so that the geese cannot easily step over the string.

East Windsor Park (Reservoir Road)

East Windsor Park is a 21.5-acre town park located on Reservoir Road in East Windsor, and includes a swimming pond, sports facilities and fields, and passive recreation areas. Chestnut Brook, a primary tributary of Broad Brook, flows along the western perimeter of the park. Of particular interest is the half-acre in-stream swimming pond, which was originally excavated directly within the stream channel. In addition, just upstream from the swimming pond is a settling pond, separated from the swimming pond by an earthen dam, with a culvert joining the two waterbodies together. Potential sources of pollution at the park were identified in the Broad Brook Watershed Report as waterfowl waste and stormwater runoff.

In our supplementary assessment of the site, we observed that East Windsor park does not allow dogs, with clear signage posted, so pollution from dog waste is much less of a concern than from waterfowl. Across the road is a proper fenced dog park, and signs are posted instructing owners to pick up after pets, which is important as it is near open water as well.

Two options for water quality improvement projects proposed in the Broad Brook Watershed Report remain relevant and are restated below, and an additional measure is proposed as well:

Option 1:

"No riparian vegetation exists along the eastern side of the settling pond or the swimming pond. It is recommended that a vegetated buffer be planted along the eastern side of the ponds. The buffer should be a minimum of 25 feet wide. Along the settling pond the buffer should extend the length from Reservoir Road, where Chestnut Brook feeds the pond, to just beyond the earthen impoundment dividing the settling pond and the swimming pond."

"The vegetated buffer along the swimming pond should start at the impoundment separating the two ponds and stop just before the beach area. Additional vegetated buffers could be planted along the eastern side of Chestnut Brook downstream from the ponds..."

"The installation of this buffer would minimize pollutant loading from stormwater runoff originating elsewhere in the park. The buffers may also serve as a deterrent for any geese or other waterfowl that are using the ponds. Goose waste was observed on the grounds around the ponds. The length of buffer along the settling pond is approximately 440 feet, while the reach of Chestnut brook downstream from the swimming pond is 425 feet, and 135 at the southern end of the swimming pond could be buffered. Together the three segments total 1000 feet. If all three segments are replanted with a tree and shrub establishment at the minimum width of 25 feet, just over ½ acre would be planted."

Option 2:

As identified in the Broad Brook Watershed Report, a manhole labeled as a sewer line runs through the park, and adjacent to Chestnut Brook. There is also a catch basin junction box adjacent to the brook. There have been no changes to this area since the original report. The recommendation from the Broad Brook Watershed Report still stands as an option: "It should be determined if stormwater runoff is being discharged from either of these lines directly into the brook. If the lines are directly discharging into Chestnut Brook, catch basin filters can be installed. Furthermore, if the sewage line is active, the material should be treated prior to discharge in order to minimize or eliminate pollutant loading. A leaching area could be constructed on site to treat the effluent prior to discharge into the Brook."

Option 3:

Waterfowl fencing could serve as an effective barrier to local and migratory geese. Geese can destroy vegetation and pollute areas adjacent to ponds and other waterbodies. The waterfowl fencing is a very simple and economical solution, and works by attaching string to several stakes at the proper height so that the geese cannot easily step over the string.

Brookside Park

The town-owned public park is located north of Route 140 and west of Hatheway Road, occupying the entire 41-acre parcel located at 45 Sadds Mill Rd, Ellington. It is located in the south central portion of the watershed, and a tributary of Broad Brook runs south-north through the park until its confluence with Broad Brook, which runs along the northern property boundary. There is large parking lot and many athletic fields, as well as basketball and tennis courts. The park is very flat, with land coverage consisting mostly of lawn and turf grass.

In 2011, the North Central Conservation District was awarded Supplemental Environmental Project (SEP) funds through the CT Department of Energy and Environmental Protection (CT DEEP) to correct some water quality concerns along the stream that bisects Brookside Park. Through this effort, NCCD excavated and planted a vegetated bioretention area, consisting of native grasses and perennials, to filter and infiltrate stormwater runoff from the large parking area before it discharges to the stream. In addition, NCCD planted three shrub buffer areas along the stream, and also installed a footbridge across the stream to resolve the streambank erosion that was resulting from many pedestrians routinely crossing the stream by foot. While there has been some shrub mortality along the eastern edge of the parking lot, the majority of the SEP work remains functional (current view of bioretention area in photo below on right).

During this supplemental Broad Brook investigation, additional areas for improvement not addressed by the SEP work were identified.

- There is extensive amount of lawn on the property. Practicing fertilizer efficacy and using only the amount of fertilizer that the lawn requires will decrease the excess nutrients in the runoff that eventually travel into Broad Brook.
- The northern edge of the property closely borders Broad Brook. There is a particularly narrow buffer north of the soccer fields, occupied by a sizable area of mowed grass. Increasing the width of the vegetated buffer along Broad Brook by planting additional vegetation would benefit the water quality of the stream, and would reduce the quantity, velocity, and pollutant load of runoff from the adjacent fields.

Ellington High School

This school is located in central Ellington on the southern border of the Broad Brook Watershed. The property contains 59 acres and is relatively flat, surrounded largely by agricultural and residential land uses. The high school has a large parking lot and several athletic fields. There is a general lack of vegetation around the school, with extensive impervious surfaces. Water cannot infiltrate naturally into the earth; instead it rushes across the landscape, carrying pollutants and biological contaminants into our waterways, with negative implications on fish, wildlife, and humans. Using green infrastructure can be beneficial, leading to reductions in pollutants and in peak flow during storms.

- Based on the many athletic fields on the property, there is most likely significant fertilizer usage. Excessive fertilizer that washes into storm drains eventually makes its way into bodies of water, such as rivers and lakes, causing pollution. Although the environmental impact of excessive nutrient inputs on farms is considerably greater, athletic fields remain a concern. The misuse of fertilizer often has negative effects on fish and other aquatic animals. Algae feed off of the nutrients in fertilizers, using oxygen that fish and other animals need. Since more fertilizer is often applied than needed, implementing changes to utilize less fertilizer would be beneficial to the environment.
- The large parking lot on the property presents a water quality concern due to the copious impervious pavement. Retrofitting this existing parking area with bio-infiltration swales along the edge of the parking lot would capture runoff in channels

that provide treatment and retention as they move stormwater from one place to another. Vegetated swales slow, infiltrate, and filter stormwater flows. As linear features, bioswales are particularly effective retrofits for parking lots.

- Alternatively, for smaller areas around the school, including the grass island in the parking lot, rain gardens could be effective when designed appropriately to slow and reduce runoff and provide a source of water. This practice could be particularly valuable in summer months to reduce demands on increasingly limited water supplies.
- The roof of the school is quite large and generates ample runoff. This water is likely discharged directly into a storm drainage system. Downspout disconnection is a simple practice that reroutes rooftop drainage into rain collection systems or permeable areas. Rain water can either be stored or allowed to infiltrate into the soil. If water is currently discharging to town systems, downspout disconnection could also benefit municipality.

Ellington airport

Ellington airport is located at 360 Somers Road, also known as Route 83, in the northcentral region of Ellington. It is within the eastern side of the watershed. Hydes Brook, a tributary of Broad Brook, flows through the southern portion of the airport property between agricultural fields. Hydes Brook flows from Kimball forest east of Route 83, which serves as the brook's headwater, and is largely unimpaired, with a substantial riparian area, until it reaches the airport. Maintaining Broad Brook's tributaries' water quality is a good step toward improving water quality in Broad Brook itself. The river has a forested buffer along its southern border near Route 83, but the canopy opens up to agricultural fields near the runway. The property contains 125 acres and is relatively flat land surrounded largely by agricultural land, residential developments to the west and east, and commercial buildings to the southeast. Several of the fields within the airport's land are leased to local Roaring Brook farm for corn production.

- The implementation of a vegetated riparian buffer along watercourses has a significant positive impact water quality in streams; providing environmental benefits, and helping maintain the quality of the water downstream. The implantation of a wide vegetated buffer would increase shade, improve bank stability, limit the use of fertilizers adjacent to the watercourse, capture sediments/nutrients, and minimize impacts of adjacent land uses.

189 Sadds Mill Road – Horse farm/Equestrian Center

A large horse farm/equestrian center is located at 189 Sadds Mill Road, also known as Route 140, in Ellington. The farm is in the northwest corner of Ellington and just north and west of the center of the Broad Brook Watershed. This farm comprises approximately 18 acres, and includes a large equestrian barn which occupies approximately 2/3 of an acre. Creamery Brook, a slow running tributary of Broad Brook, is largely located north and west of the farm. Additionally, there is a large wetland area located east of the large barn, and a dirt farm road crosses over a stream that connects the wetland area to Creamery Brook. This private equestrian facility offers horse boarding, training, and sales. The farm has a large amount of pastureland, an outdoor sand arena, as well several heavily used areas. If not properly disposed of, the significant horse manure generated on-site could contribute to pollutant loading in the watershed.

There are several practices that could aid in the reduction of NPS pollution on the farm

- The large wetland on the property has a very small buffer and is suffering from eutrophication. If left unchecked, the wetland could undergo transformation to upland in the near future. Increasing the buffer area would allow for the filtration of nutrients and bacteria that could potentially enter the wetland.
- Increasing the amount of vegetation around the heavy use areas and pastures would additionally improve the quality of the runoff in addition to the aesthetics of the farm.
- There is stockpile of fill in the back of the property that is very close to the wetland. A dirt channel appears to have formed between the pile and the wetland. Leaving exposed soil in piles can increase the amount of sediment that is entering the wetland. Removing, covering, or vegetating the stockpile, as well as stabilizing and vegetating the channel, would reduce the amount of sediment and pollutants that enter the wetland.

Mill Pond Village - (Broad Brook Millpond)

Mill pond Village is a large, densely developed apartment complex in the eastern section of East Windsor. It is located east of Main Street/Route 191, north of Depot Street, and is the only parcel on Mill Pond Road. It is located within the western edge of the Broad Brook watershed. Both Broad Brook and a wetland area are just north of the complex; and the Broad Brook Millpond immediately adjoins the property to the west. The brook moves very slowly at this point and develops into a floodplain wetland prior to reaching the Millpond. The property contains approximately 47 acres and is relatively flat, surrounded by residential as well as some commercial buildings, with the floodplain and a forested riparian area associated with Broad Brook to the north.

There are trails along the northern portion of the property that follow Broad Brook, including both walking trails as well as trails created by all-terrain vehicles (ATVs). There is a considerable amount of trash behind the complex and some of the debris has spread into the river. In the northern portion of the property, aquatic duckweed is prominent and covers a slow moving channel within a braided portion of Broad Brook. While this aquatic plant can be a nuisance to humans engaging in recreational activities, it actually helps to filter and uptake excessive nutrients that run off from agricultural and other lands.

- There was a cylindroid object sticking out of the ground, which is likely associated with a stormwater outfall drop structure. Further investigation is needed to observe the discharge point, which we were unable to access.
- The roof surface between all the buildings is quite large and can collect an ample amount of water. This water is presumably drained directly into a storm drainage system and/or discharged to Broad Brook. Downspout disconnection is a simple

practice that reroutes the rooftop drainage pipes, draining runoff into a rain collection system, cistern, or permeable area. Rain water can either be stored or allowed to infiltrate into the soil to retain more natural hydrology.

- Informal trails have been established by all-terrain vehicles (ATVs) within the riparian area along Broad Brook and its floodplain. Exposed soils were observed, and trails were also observed through wetland areas, causing erosion and contributing sedimentation to Broad Brook. ATV access points should be eliminated wherever possible and signs posted to deter destructive recreational use within the Broad Brook floodplain.

Sand and Gravel Operation – Sadds Mill Road

The parcel is located northwest of the intersection of Sadds Mill Road (Route 140), Muddy Brook Road, and Green Road in Ellington, CT. The facility is primarily within the main stem of Broad Brook, yet some of the land is within the Creamery Brook local basin, very close to the confluence with Creamery Brook (on adjacent property), with Broad Brook directly across Sadds Mill Road. The company has been in operation since 2001 and expanded in 2004. It consists of 3 parcels totaling 52 acres; of which proximately 45 acres are currently open, exposed earth.

- There is one approximately 0.4-acre sediment basin on-site. The sediment basin appears very cloudy both in person and in aerial photographs, and does not appear to be allowing sediment to settle out before discharging as it should. It is unclear if the sediment basin has an overflow. The large, open site could use either more sediment basins or a larger sediment basin. Additionally, the use of measures such as flocculants, to allow fine particles to settle out more effectively, may be beneficial.

- This facility is permitted under the CT Industrial Stormwater General Permit, which includes a monitoring requirement in Appendix B under mines & quarries. This facility is subject to the general monitoring requirements, and stormwater discharges from the sediment basin must be sampled. The general requirements specify that the site should be visually inspected quarterly and sampled and tested semi-annually. The pollutants to be tested include: rainfall pH, sample pH, O&G, COD, TSS, P, TKN, NO3, Cu, Pb, and Zn. We also recommend that if the sediment basin does not have an outlet, it should have an emergency overflow in case of heavy rainfall.
- Sand enters the road and adjacent catch basin, which presumably discharges across the street directly into Broad Brook. It would be beneficial to install a riprap construction entrance to protect the roadway and catch basins from sediment.
- The extent of exposed soils increases the vulnerability to wind erosion as well. According to the 2002 CT Erosion and Sediment Control Guidelines, areas should be temporarily seeded if they will be inactive for more than 30 days. If an area will be inactive for more than a year, the area should be permanently seeded.

Landscaping Materials Operation – Sadds Mill Road

This facility is located at 277 Sadds Mill Road, Ellington, on the corner of Sadds Mill Road and Reeves Road. The location within the Broad Brook watershed splits between the Creamery Brook local basin and the main stem Broad Brook basin. The operation mainly produces landscaping products such as mulch, soil, compost, and organic/recycled materials, and also recycles/composts yard waste and food scraps and leases equipment. About 13 acres are open and actively used for material stockpiles and compost windrows. Most of the remaining acreage is vegetated, either agricultural or forested, with forestland on adjacent parcels.

- The approximately 2-acre pond located on the property has minimal vegetation surrounding it, particularly on its eastern side. The pond appears to be accessed by an area of occasional bare ground. There is also a dirt roadway that runs along the entire eastern edge of the pond. The summer of 2016 aerial imagery displays the 2-acre pond to be an opaque green color, indicating excessive nutrient loading. A wide vegetated buffer would benefit this pond.
- The long dirt driveway that is used to access the facility seems to bisect Thompson Pond, a small pond located south of the larger pond. Thompson Pond appears quite green in recent aerial photos, and serves as the headwaters for the Thompson Brook, a small tributary of Broad Brook. Excessive nutrients seem to be entering Thompson Pond, contributing to the impairment of Broad Brook. Stabilizing the slopes along the road and vegetating would catch some of the sediment that is building up in the pond.

McNight Farm

This farm is positioned very close to the center of the Broad Brook watershed. The farm is located on the intersection of Muddy Brook Road and Sadds Mill Rd at 141 Muddy Brook Rd, Ellington. McNight Farm leases approximately 120 acres to Roaring Brook Farm, of which a significant portion of the land is used to produce corn for feed for dairy cows. Broad Brook runs along the southern edge of the property. The surrounding land cover is primarily composed of agricultural and residential properties. The primary sources of pollution for this property would be spreading of excess manure.

- The edge of the southern corn field is in close proximity to Broad Brook and there is a minimal vegetated buffer. Increasing the buffer width would be beneficial to the water downstream and improve infiltration of runoff.

Country Club

The public golf course is located south of Route 140 at 76 Sadds Mill Rd, Ellington, in the south central portion of the watershed. The country club consists of an 18-hole golf course, as well as a bar and a golf store. The golf course is 184.8 acres and relatively hilly with mostly grassland. There are 2 water hazards, as well as a pond that pre-dates the course, to the north and adjacent to the main parking lot (photos of pond and recommendations on following page).


- Due to the many golf greens, there is most likely a great deal of fertilizer used to maintain the grass. Excessive fertilizer will eventually make its way into bodies of water, such as rivers and lakes, contributing to pollution. Although the overuse of fertilizers on farms poses a considerably larger environmental impact, golf courses remain a concern. Often, more fertilizer is applied than is needed; and implementing changes to use less fertilizer would be beneficial to the environment.
- The pond north of the parking lot has a very minimal vegetated buffer around it, and appears to have been recently cleared. The pond has a high potential for geese to gather, since there is very little vegetation to impair their line of sight and deter them. There seems to be eutrophication starting to occur on the pond from the excess nutrients entering it. Increasing the vegetated buffer around the pond would help to prevent additional nutrient input from geese.
- Work has recently occurred and the tree coverage around the pond was thinned. This could increase the amount of sunlight the pond receives and increases algae growth. Replanting some trees near the pond to provide some shade would reduce algae growth and improve the water quality.
- The large dirt parking lot is on an incline towards the pond, with vegetation planted between the parking areas, parallel to the slope. Re-orienting the vegetation so that it is perpendicular to the direction of flow, would allow it to slow stormwater runoff. Regrading these vegetated islands, to serve as bioswales, would allow filtration of runoff before it travels to the lawn area and to the pond. Stabilizing the parking area, possibly by using pervious pavement, would decrease the amount of sediment entering the pond as well.

Dairy Farm and Sand, Stone and Topsoil Operation

This dual-purpose facility is located in the south central boundary of the watershed. The businesses are both located on Route 140 at 90 Sadds Mill Rd, Ellington. The dairy farm, a small local provider of milk since 1971, is the primary use of the land, and the other use at this site is a small stone and gravel mining operation that produces raw materials for construction. The property consists of approximately 106 acres and is largely surrounded by agricultural fields and residential buildings. There are two ponds on the property located along Bradleys Brook, which runs south-north through the center of the property until its confluence with Broad Brook, which flows along the northern edge of the property as well.

- The northern portion of the property would aid from a larger buffer area for both Bradleys Brook and Broad Brook. The lack of vegetated buffers allows for sediment from the mining operation and nutrients from the farm to travel into the brooks. There is ponding occurring in the northeastern field, where a natural floodplain would be. This area would be best restored as a riparian buffer.
- There is stockpile located very close to the smaller pond and Bradleys Brook. These areas appear as though they are being filled in from sediment contained in runoff from the stockpile. Moving the stockpile to a different location, away from water, or covering/vegetating the pile when not in use could prevent the pond and stream from being filled in.

Refer to separate spreadsheet (multi-use on tab 1, farm on tab 2) for the rest of **Task 2 (estimated pollutant load reductions, costs, permitting and contracted services required), and for **Task Four**: funding sources

	Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	SED (ton/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Expected Permits	Contracted Services
North	Oakridge Farm	39	Outside Lot	Critical Area Planting	6.90	ac.	$316.02	$1,817.12	13.70	15.22	47.06	25.24	NRCS/319	NA	NA
North	Oakridge Farm	39	Outside Lot	Forage and Biomass Planting	6.90	ac.	$381.61	$2,194.27	13.70	15.00	47.00	25.00	NRCS/319/CT-FLRP	NA	NA
North	Oakridge Farm	19	Feed Bunk Pad	Obstruction Removal	4000.00	sq ft.	$13.67	$45,560.00	3.00	-	10514.00	1148.00	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	39	Outside Lot	Obstruction Removal	3550.00	ft.	$0.86	$2,556.00	13.70	-	14677.00	1414.00	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	35	Manure Waste Water	Forage and Biomass Planting	0.09	ac.	$381.61	$28.62	1.00	2.00	4.00	2.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm	35	Manure Waste Water	Waste Facility Closure	6400.00	cu ft.	$0.20	$1,088.00	1.00	-	5838.00	1168.00	NRCS/319	IWWA	Engineering and Construction
North	Oakridge Farm	53	Outside Lot	Forage and Biomass Planting	1.80	ac.	$381.61	$572.42	3.00	3.00	8.00	4.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Grazing Management Plan	1.80	ac.	$2,006.92	$3,010.37	3.00	3.00	8.00	4.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Fence, Portable	360.00	ft.	$0.59	$176.40	-	-	-	-	NRCS/CT-FRP	NA	NA
North	Oakridge Farm	38	Outside Lot	Obstruction Removal	580.00	ft.	$0.86	$417.60	2.18	3.00	9.00	5.00	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Forage and Biomass Planting	0.45	ac.	$381.61	$143.10	2.18	3.00	9.00	5.00	NRCS/319/CT-FLRP	NA	NA
North	Oakridge Farm	26	Manure Area	Roof Runoff Structure	500.00	ft.	$12.82	$5,340.00	0.15	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Waste Storage Facility	3200.00	cu ft.	$3.83	$10,208.00	0.15	-	576.00	115.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Roofs and Covers	3200.00	sq ft.	$11.11	$29,632.00	0.15	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Underground Outlet	355.00	ft.	$18.77	$5,552.20	0.15	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Lined Waterway	2.00	CuYd.	$86.28	$143.80	0.15	-	200.00	95.00	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Diversion, Clean Water	100.00	ft.	$4.74	$395.00	0.15	-	259.00	81.00	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	42	Outside Lot	Forage and Biomass Planting	1.99	ac.	$381.61	$632.84	3.50	3.00	9.00	5.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	1500.00	sq ft.	$3.32	$4,155.00	3.50	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	1400.00	ft.	$0.86	$1,008.00	3.50	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Wetland Restoration	1.00	ac.	$488.00	$406.67	3.50	-	6054.00	318.00	NRCS/319	IWWA	Engineering and Construction
North	Oakridge Farm	52	Outside Lot	Forage and Biomass Planting	0.38	ac.	$381.61	$120.84	1.00	-	1.00	1.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Field Border, Grass Buffer	0.00	ac.	$82.82	$0.08	1.00	2.00	4.00	2.00	NRCS/319	NA	NA
	Oakridge Farm			Fence, Portable	150.00	ft.	$0.59	$73.50	-	-	-	-	NRCS/CT-FRP	NA	NA
	Oakridge Farm			Prescribed Grazing	0.38	ac.	$32.39	$10.26	1.00	-	768.00	115.00	NRCS	NA	NA
	Oakridge Farm			Heavy-Use Area Protection	16552.80	sq ft.	$3.46	$47,672.06	1.00	-	3458.00	1556.00	NRCS/319/CT-FLRP	IWWA	NA
North	Oakridge Farm	54	Pasture 1	Prescribed Grazing	0.66	ac.	$32.39	$17.81	1.12	-	3.00	2.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	830.00	ft.	$0.86	$597.60	1.12	-	3.00	2.00	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Wetland Restoration	0.66	ac.	$488.00	$268.40	1.12	-	475.00	19.00	NRCS/319	IWWA	Engineering and Construction
North	Oakridge Farm	55	Pasture	Forage and Biomass Planting	1.70	ac.	$381.61	$540.62	3.27	-	9.00	5.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	1300.00	ft.	$0.86	$936.00	3.27	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Wetland Restoration	1.70	ac.	$488.00	$691.34	3.27	-	9.00	5.00	NRCS/319	IWWA	Engineering and Construction
North	Oakridge Farm	80	Heifer Building	Underground Outlet	630.00	ft.	$12.42	$6,520.50	-	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Lined Waterway	1.48	CuYd.	$86.28	$106.41	-	-	-	-	NRCS/319	IWWA	Engineering & Construction

	Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	SED (ton/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Expected Permits	Contracted Services
North	Oakridge Farm	79	Heifer Building	Roof Runoff Structure	310.00	ft.	$12.82	$3,310.80	-	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Underground Outlet	360.00	ft.	$15.41	$4,622.40	-	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Lined Waterway	2.00	CuYd.	$86.28	$143.80	-	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	51	Outside Lot	Possible Match	-	-	$0.00	$0.00	1.45	-	-	-	NA	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	950.00	ft.	$0.86	$684.00	1.45	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Forage and Biomass Planting	0.24	ac.	$381.61	$76.32	1.45	-	475.00	19.00	NRCS/319/CT-FLRP	NA	NA
North	Oakridge Farm	50	Outside Lot	Forage and Biomass Planting	3.72	ac.	$381.61	$1,183.00	7.88	-	14677.00	1414.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	167.00	ft.	$0.00	$0.00	7.88	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	3000.00	ft.	$0.86	$2,160.00	7.88	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	58	Silage Area 1	Possible Match	-	-	$0.00	$0.00	-	-	-	-	NA	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	15725.00	sq ft.	$13.67	$179,107.75	2.78	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	59	Silage Area 2	Forage and Biomass Planting	0.71	ac.	$381.61	$225.79	4.08	-	10.00	6.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	19600.00	sq ft.	$13.67	$223,244.00	4.08	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	62	Vehicle Area 1	Possible Match	-	-	$0.00	$0.00	12.77	-	-	-	NA	IWWA	Engineering and Construction
North	Oakridge Farm	49	Outside Lot 5	Critical Area Planting	0.87	ac.	$316.02	$229.11	0.87	1.00	4.00	2.00	NRCS/319	NA	NA
	Oakridge Farm			Obstruction Removal	1475.00	ft.	$0.86	$1,062.00	0.87	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	2025.00	sq ft.	$3.32	$5,609.25	0.87	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	90.00	sq ft.	$13.67	$1,025.10	0.87	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	15	Building 1	Possible Match	-	-	$0.00	$0.00	6.96	-	-	-	NA	IWWA/BP	Engineering and Construction
North	Oakridge Farm	16	Building 2	Possible Match	-	-	$0.00	$0.00	3.03	-	-	-	NA	IWWA/BP	Engineering and Construction
North	Oakridge Farm	64	Tracking Pads	Heavy-Use Area Protection	5850.00	sq ft.	$7.04	$34,339.50	0.79	-	-	-	NRCS/319/CT-FLRP	IWWA/DEEP/USACE	NA
North	Oakridge Farm	65	Tracking Pads	Heavy-Use Area Protection	3600.00	sq ft.	$7.04	$21,132.00	0.92	-	-	-	NRCS/319/CT-FLRP	IWWA/DEEP/USACE	NA
North	Oakridge Farm	27	Manure Pit 2	Waste Storage Facility	-	-	$0.00	$0.00	1.34	-	7823.00	1074.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Roofs and Covers	12150.00	sq ft.	$11.11	$112,509.00	1.34	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Roof Runoff Structure	270.00	ft.	$7.73	$1,738.80	1.34	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Underground Outlet	260.00	ft.	$6.12	$1,326.00	1.34	-	4.00	2.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Lined Waterway	32.00	CuYd.	$86.28	$2,300.80	1.34	-	4.00	2.00	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	43	Outside Lot 15	Manure Management	-	-	$0.00	$0.00	0.47	-	7823.00	1074.00	NRCS/319/CT-FLRP	NA	NA
North	Oakridge Farm	28	Manure Pit 2	Waste Facility Closure	826875.00	cu ft.	$0.20	$140,568.75	4.07	-	9713.00	936.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Wetland Restoration	2.50	ac.	$488.00	$1,016.68	4.07	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Pond	30625.00	CuYd.	$6.49	$198,756.25	4.07	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Lined Waterway	10200.00	sq ft.	$0.84	$7,140.00	4.07	-	350.00	140.00	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	45	Outside Lot 17	Waste Facility Closure	-	-	$0.00	$0.00	0.54	-	9713.00	936.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	1500.00	sq ft.	$13.67	$17,085.00	0.54	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Critical Area Planting	0.34	ac.	$316.02	$89.54	0.54	1.00	3.00	1.00	NRCS/319	NA	NA

	Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	SED (ton/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Expected Permits	Contracted Services
North	Oakridge Farm	48	Outside Lot 4	Critical Area Planting	0.22	ac.	$316.02	$57.94	0.91	1.00	4.00	2.00	NRCS/319	NA	NA
North	Oakridge Farm	47	Outside Lot 3	Forage and Biomass Planting	2.00	ac.	$381.61	$636.02	6.32	-	15.00	5.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Conservation Cover	1.05	ac.	$544.03	$476.03	6.32	8.00	23.00	13.00	NRCS/319	NA	NA
	Oakridge Farm			Obstruction Removal	1850.00	ft.	$0.86	$1,332.00	6.32	-	-	-	NRCS/319	IWWA	Engineering & Construction
North	Oakridge Farm	56	Public Access 1	Wetland Restoration	29.20	ac.	$488.00	$11,874.76	53.73	-	106.00	57.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Conservation Cover	29.20	ac.	$544.03	$13,238.11	53.73	50.33	160.97	86.35	NRCS/319	NA	NA
	Oakridge Farm			Wetland and Wildlife Habitat Management	29.20	ac.	$0.00	$0.00	53.73	-	106.00	57.00	NRCS/319	IWWA	Landscaping Design
	Oakridge Farm			Trails and Walkways	-	ft.	$4.50	$0.00	53.73	-	106.00	57.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm	40	40	Obstruction Removal	5000.00	ft.	$0.86	$3,600.00	11.06	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	6310.00	sq ft.	$3.32	$17,478.70	11.06	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	223.00	sq ft.	$13.67	$2,539.97	11.06	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Forage and Biomass Planting	8.63	ac.	$381.61	$2,744.43	11.06	-	39.00	21.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Grassed Waterway	12000.00	sq ft.	$0.25	$2,520.00	11.06	-	39.00	21.00	319	IWWA	Engineering & Construction
South	Oakridge Farm	33	Manure Waste Water 3	Obstruction Removal	6098.40	sq ft.	$13.67	$69,460.78	3.10	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm						-	-	-	-	-	-	NA	IWWA	NA
	Oakridge Farm						-	-	-	-	-	-	NA	IWWA	NA
	Oakridge Farm			Forage and Biomass Planting	0.14	ac.	$381.61	$44.52	3.10	-	12.00	7.00	NRCS/319/CT-FLRP	NA	NA
South	Oakridge Farm	46	Outside Lot 2	Forage and Biomass Planting	19.50	ac.	$381.61	$6,201.20	26.91	-	86.00	46.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Obstruction Removal	3750.00	ft.	$0.86	$2,700.00	26.91	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm				-	-	$0.00	$0.00	26.91	-	-	-	NA	IWWA	NA
	Oakridge Farm			Contour Farming	19.50	ac.	$8.29	$134.75	26.91	27.00	86.00	46.00	NRCS	NA	NA
	Oakridge Farm			Field Border, Grass Buffer	19.50	ac.	$111.36	$1,809.60	26.91	27.00	86.00	46.00	NRCS/319	NA	NA
	Oakridge Farm			Riparian Herbaceous Buffer	-	ac.	$974.08	$0.00	26.91	-	86.00	46.00	NRCS/319	NA	Landscaping Design
	Oakridge Farm	37	37	Obstruction Removal	400.00	ft.	$0.86	$288.00	3.95	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Obstruction Removal	1000.00	sq ft.	$3.32	$2,770.00	3.95	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Roofs and Covers	9000.00	sq ft.	$18.41	$138,060.00	3.95	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Forage and Biomass Planting	0.21	ac.	$381.61	$66.78	3.95	-	15.00	8.00	NRCS/319/CT-FLRP	NA	NA
South	Oakridge Farm	18	Building 4	Animal Mortality Facility	8400.00	sq ft.	$0.00	$0.00	5.00	-	-	-	NRCS	NA	NA
South	Oakridge Farm	34	Manure Waste Water 4	Roofs and Covers	2600.00	sq ft.	$11.11	$24,076.00	0.78	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm						$0.00	$0.00	0.78	-	-	-	NA	IWWA	NA
South	Oakridge Farm	31	Manure Waste Water 1	Waste Recycling	1.00	each	$422.94	$352.45	2.44	-	12408.00	2482.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	26140.00	sq ft.	$3.32	$72,407.80	2.44	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Water and Sediment Control Basin	92.50	CuYd.	$7.86	$605.88	2.44	-	12408.00	2482.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Diversion, Clean Water	1450.00	ft.	$4.74	$5,727.50	2.44	-	5584.00	1737.00	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Forage and Biomass Planting	-	ac.	$381.61	$0.00	2.44	-	15.00	8.00	NRCS/319/CT-FLRP	NA	NA

	Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	SED (ton/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Expected Permits	Contracted Services
South	Oakridge Farm	29	Manure Pit 3	Waste Facility Closure	139500.00	cu ft.	$0.20	$23,715.00	3.85	-	3743.00	19579.00	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	2475.00	sq ft.	$13.67	$28,190.25	3.85	-	-	-	NRCS/319	IWWA	Engineering & Construction
South	Oakridge Farm	17	Building 3	Animal Mortality Facility	9000.00	sq ft.	$0.00	$0.00	5.72	-	-	-	NRCS	NA	NA
South	Oakridge Farm	41	Outside Lot 13	Possible Match	-	-	$0.00	$0.00	3.46	-	-	-	NA	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	18730.00	sq ft.	$3.32	$51,882.10	3.46	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Critical Area Planting	0.43	ac.	$316.02	$113.24	3.46	5.00	14.00	7.00	NRCS/319	NA	NA
	Oakridge Farm	44	44	Obstruction Removal	13068.00	sq ft.	$3.32	$36,198.36	1.02	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Critical Area Planting	0.30	ac.	$316.02	$79.01	1.02	2.00	5.00	2.00	NRCS/319	NA	NA
	Oakridge Farm			Roofs and Covers	12500.00	sq ft.	$18.41	$191,750.00	1.02	-	-	-	NRCS	IWWA	Engineering and Construction
South	Oakridge Farm	25	Manure Pit 4	Roofs and Covers	-	sq ft.	$11.11	$0.00	0.55	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Waste Storage Facility	-	-	$0.00	$0.00	0.55	-	2797.00	559.00	NRCS/319	IWWA	Engineering and Construction
South	Oakridge Farm	60	Silage Area 3	Heavy-Use Area Protection	140698.80	sq ft.	$0.46	$64,721.45	10.43	-	1690.00	163.00	NRCS/319/CT-FLRP	IWWA	NA
	Oakridge Farm			Waste Transfer	1500.00	ft.	$11.93	$14,910.00	10.43	-	1690.00	163.00	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Pumping Plant	3.00	BHP	$743.16	$1,857.90	10.43	-	-	-	NRCS	IWWA	Engineering & Construction
	Oakridge Farm			Underground Outlet	1500.00	ft.	$31.75	$39,690.00	10.43	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Obstruction Removal	3500.00	sq ft.	$13.67	$39,865.00	10.43	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Oakridge Farm			Diversion, Clean Water	500.00	ft.	$4.74	$1,975.00	10.43	-	761.00	114.00	NRCS/319	IWWA	Engineering & Construction
South	Oakridge Farm	63	Building 5	Animal Mortality Facility	9625.00	sq ft.	$0.00	$0.00	1.46	-	-	-	NRCS	NA	NA
	Oakridge Farm			Obstruction Removal	9625.00	sq ft.	$13.67	$109,628.75	1.46	-	-	-	NRCS/319	IWWA	Engineering & Construction
South	Oakridge Farm	8	Grazing Field	Fence	3550.00	ft.	$2.53	$7,490.50	-	-	-	-	NRCS/CT-FRP	NA	NA
	Oakridge Farm			Heavy-Use Area Protection	320.00	sq ft.	$3.46	$921.60	24.10	-	78.00	42.00	NRCS/319/CT-FLRP	IWWA	NA
	Oakridge Farm			Prescribed Grazing	13.00	ac.	$32.39	$350.87	24.10	-	78.00	42.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Watering Facility	1.00	each	$805.26	$671.05	24.10	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Trails and Walkways	1000.00	ft.	$14.06	$11,720.00	24.10	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Livestock Pipeline	1000.00	ft.	$2.60	$2,170.00	24.10	-	-	-	NRCS	IWWA	Engineering & Construction
	Oakridge Farm			Grazing Management Plan	13.00	ac.	$0.00	$0.00	24.10	-	78.00	42.00	NRCS/319/CT-FLRP	NA	NA
South	Oakridge Farm	13	Grazing Field	Heavy-Use Area Protection	320.00	sq ft.	$3.46	$921.60	7.53	-	12266.00	1826.00	NRCS/319/CT-FLRP	IWWA	NA
	Oakridge Farm			Prescribed Grazing	11.00	ac.	$32.39	$296.89	7.53	-	27.00	15.00	NRCS/319/CT-FLRP	NA	NA
	Oakridge Farm			Watering Facility	1.00	each	$805.26	$671.05	7.53	-	-	-	NRCS	IWWA	Engineering and Construction
	Oakridge Farm			Trails and Walkways	1000.00	ft.	$14.06	$11,720.00	7.53	-	-	-	NRCS/319	IWWA	Engineering and Construction
	Oakridge Farm			Livestock Pipeline	1000.00	ft	$2.60	$2,170.00	7.53	-	-	-	NRCS	IWWA	Engineering & Construction
	Oakridge Farm			Fence	4720.00	ft.	$2.53	$9,959.20	-	-	-	-	NRCS/CT-FRP	NA	NA
	Aborn Farm	1	Silage Bunker	Silage Storage	12790.30	sq ft.	$13.10	$167,552.93	1.00	-	3000.00	650.00	NRCS/319	IWWA	Engineering and Construction
	Aborn Farm	2	Stanchion Barn Milking Parlor	Field Border, Grass Buffer	2768.27	sq ft.	-	$2,000.00	0.64	1.00	3.00	2.00	NRCS/319	NA	NA
	Aborn Farm	2.1	Stanchion Barn Milking Parlor	Distribution Tank & Flow Treatment	-	-	-	-	-	-	-	-	NRCS/319	IWWA/DEEP/USACE/BP	Engineering & Construction
	Aborn Farm	3	Free Stall Barn (Milk Cows)	Barn management	3625.49	sq ft.	-	-	0.40	-	-	-	NA	NA	NA

	Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	SED (ton/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Expected Permits	Contracted Services
	Aborn Farm	4	Holding Area-	Grazing Management Plan	13840.60	sq ft.	-	-	0.82	-	2902.00	526.00	NRCS/319/CT-FLRP	NA	NA
	Aborn Farm	5	Laneway	Obstruction Removal	1716.35	ft	$2.53	$4,345.80	1.68	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Aborn Farm	6	Free Stall Barn (heifers)	Waste Storage Facility	200.00	per cow	$232.00	$46,400.00	1.45	-	6416.00	1283.00	NRCS/319	IWWA	Engineering and Construction
	Aborn Farm	7	Old Dam	Stream Obstruction	-	-	-	$10,000.00	0.86	-	-	-	319	IWWA/DEEP/USACE	Engineering and Construction
	Aborn Farm	8	Machinery Shed	Obstruction & Planting	6409.42	sq ft.	-	$1,500.00	0.99	-	-	-	NRCS/319	IWWA	Engineering & Construction
	Aborn Farm	9	Calf Hutches	Planting	1033.92	sq ft.	-	$200.00	0.30	-	2.00	1.00	319	NA	Landscaping Design
	Aborn Farm	10 & 11	Calf Hoop House & Calf exercise yard	Planting	6223.15	sq ft.	-	$600.00	0.30	-	2.00	1.00	319	NA	Landscaping Design
	Aborn Farm	12	Silage Bunker	Silage Storage	2704.45	sq ft.	$15.00	$40,560.00	0.11	-	1.00	1.00	NRCS/319	IWWA	Engineering and Construction
	Aborn Farm	13	Winter Heavy Use Area *(Milk cows)	Forage and Biomass Planting	2.80	ac.	$381.61	$1,068.51	5.00	-	8000.00	2000.00	NRCS/319/CT-FLRP	NA	NA
	Aborn Farm	13.1	Winter Heavy Use Area *(Milk cows)	Waste Storage Facility	180.00	per cow	$232.00	$41,760.00	-	-	-	-	NRCS/319	IWWA/DEEP/USACE	Engineering and Construction
	Aborn Farm	14	Summer Pasture (Milk Cows)	Trails and Walkways	-	-	-	$9,000.00	2.00	-	-	-	NRCS/319	IWWA/DEEP/USACE	Engineering and Construction
	Aborn Farm	14.1	Summer Pasture (Milk Cows)	Stream Restoration	500.00	sq ft.	$75.00	$37,500.00	2.00	-	-	-	319	IWWA/DEEP/USACE	Engineering and Construction
	Aborn Farm	15	Field South of Houses	Field Border, Grass Buffer	1.04	ac.	$381.61	$396.88	3.37	4.00	13.00	7.00	NRCS/319	NA	NA
	Aborn Farm	16	Stream crossing	Riparian Herbaceous Buffer	1087.72	sq ft.	-	$1,000.00	0.27	-	9.51	0.89	NRCS/319	NA	Landscaping Design
	McNight Farm	1	South Field	Riparian Herbaceous Buffer	26.50	ac.	$100.00	$2,650.00	26.50	31.50	29.00	3.00	319	NA	Landscaping Design

NRCS - Natural Resources Conservation Service Environmental Quality Incentives Program (EQIP)
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DEEP - Connecticut Department of Energy & Environmental Protection
USACE - US Army Corps of Engineers
BP- Municipal Building/Zoning Permit
TN- Total Nitrogen
TP- Total Phosphorus
BOD- Biochemical oxygen demand
COD - Chemical oxygen demand
TSS - Total Suspended Solids
NA- Not Applicable

Location	Item Number	Name	Recommended Practices	Amount	Unit	Cost Rate	Total Cost	Contributing Drainage Area (ac.)	BOD (lbs/yr)	COD (lbs/yr)	TSS (lbs/yr)	LEAD (lb/yr)	ZINC (lb/yr)	TN (lb/yr)	TP (lb/yr)	Funding Sources	Permits	Contracted
Broad Brook Millpond (ducks, water fowl)	1	Millpond	Catch Basin Filters	7.66	ac.	$ 1,305.48	$ 10,000.00	7.66	U	73	618	0	0	2	0	NRCS/319	IWWA/DEEP/ USACE	Engineering and Construction
Broad Brook Millpond (ducks, water fowl)	2	Millpond	Detention Basin	9.66	ac.	$ 2,316.05	$ 22,373.00	9.66	U	105	860	1	0	3	0	NRCS/319	IWWA/DEEP/ USACE	Engineering and Construction
Broad Brook Millpond (ducks, water fowl)	3	Millpond	Stormwater Wetland	9.66	ac.	$ 2,779.25	$ 26,847.60	9.66	146	1,050	4,445	3	2	11	3	319	IWWA/DEEP/ USACE	Engineering and Construction
Broad Brook Millpond (ducks, water fowl)	4	Surrounding Streets	Street Sweeping	-	ac.	-	$ 1,260.00	-	-	-	-	-	-	-	-	319	NA	NA
Broad Brook Millpond (ducks, water fowl)	5	Millpond	Vegetative Buffer	16.7	ac.	$ 1,153.35	$ 19,261.00	16.70	264	1,816	8,519	4	10	53	7	319	NA	Landscaping Design
Broad Brook Millpond (ducks, water fowl)	6	Millpond	Water Fowl Fencing	-	ac.	-	-	-	-	-	-	-	-	-	-	NA	NA	Design
East Windsor Park	1	Reservoir	Riparian Herbaceous Buffer	4.07	ac.	$ 7,581.57	$ 30,857.00	4.07	7	97	397	0	1	2	0	319	NA	Landscaping Design
East Windsor Park	2	Reservoir	Catch Basin Filters	3.18	ac.	$ 3,144.65	$ 10,000.00	3.18	U	14	101	0	0	0	0	NRCS/319	IWWA	Engineering and Construction
East Windsor Park	3	Reservoir	Water Fowl Fencing	-	ac.	-	-	-	-	-	-	-	-	-	-	NA	NA	Design
De Carli LLC Horse farm	1	Wetlands	Vegetative Buffer	29.66	ac.	$ 700.00	$ 20,762.00	29.66	52	508	2,470	1	3	16	3	319	IWWA/DEEP/ USACE	Landscaping Design
De Carli LLC Horse farm	2	Heavy Use Areas	Filter Strips	8.64	ac.	$ 790.28	$ 6,828.00	8.64	25	289	1,384	1	2	7	1	319	NA	Engineering and Construction
De Carli LLC Horse farm	3	Exposed Stock Pile	Vegetative Buffer	2.09	ac.	$ 2,801.91	$ 5,856.00	2.09	3	37	186	0	0	1	0	319	IWWA/DEEP/ USACE	Landscaping Design
Ellington High School	1	Lawn	Fertilizer Efficiency	-	ac.	-	-	-	-	-	-	-	-	-	-	NA	NA	NA
Ellington High School	2	Parking Lot	Bio Swales	11.8	ac.	$ 1,408.31	$ 16,618.00	11.80	U	2,730	8,040	8	10	34	5	319	NA	Engineering and Construction
Ellington High School	3	Parking Lot	Rain Garden	4.5	ac.	$ 4,111.33	$ 18,501.00	4.50	U	1,032	3,030	3	4	14	2	319	NA	Landscaping Design
Ellington High School	4	Roof Surface	Downspout Disconnect	4	ac.	$ 10,594.75	$ 42,379.00	4.00	U	1,347	3,990	4	5	18	3	NRCS/319	IWWA/BP	Engineering and Construction
Ellington airport	1	Stream	Riparian Herbaceous Buffer	4.21	ac.	$ 4,121.14	$ 17,350.00	4.21	1	30	73	0	0	0	0	319	NA	Landscaping Design
Mill Pond Village	2	Roof Surface	Downspout Disconnect	4.4	ac.	$ 10,594.75	$ 46,616.90	4.40	68	942	4,345	3	5	14	2	NRCS/319	IWWA/BP	Engineering and Construction
Mill Pond Village	3	Informal Trails	Fence	-	ac.	-	-	-	-	-	-	-	-	-	-	NRCS	NA	Construction
Powder Hill Sand and Gravel	1	Access Road	Catch Basin	5.5	ac.	$ 2,316.05	$ 12,738.25	5.50	10	U	661	U	U	U	1	319	IWWA/BP/ DEEP	Engineering and Construction
Powder Hill Sand and Gravel	2	Access Road	Out Let / Emergency Overflow	-	ac.	-	-	-	-	-	-	-	-	-	-	319	IWWA/BP/ DEEP	Engineering and Construction
Powder Hill Sand and Gravel	3	Access Entrance	Riprap Construction Entrance	1.8	ac.	$ 2,222.22	$ 4,000.00	1.80	U	344	976	1	2	5	1	NA	IWWA	Engineering and Construction
Powder Hill Sand and Gravel	4	Mining Pit	Critical Area Planting	42.96	ac.	$ 316.02	$ 13,576.22	42.96	U	1,124	5,269	1	4	68	5	NRCS/319	NA	NA
Powder Hill Sand and Gravel	5	Access Road	Flocculants	-	ac.	-	-	-	-	-	-	-	-	-	-	319	NA	NA
Harvest New England	1	Pond	Vegetative Buffer	8	ac.	$ 700.00	$ 5,600.00	8.00	3	53	214	0	0	2	0	319	NA	Landscaping Design
Harvest New England	2	Access Road	Slope Stabilization / Planting	1.1	ac.	$ 1,400.00	$ 1,540.00	1.10	15	208	972	1	1	3	1	319	IWWA/BP/ DEEP/USACE	Engineering and Construction
Rolling Meadows Country Club	1	Lawn	Fertilizer Efficiency	-	ac.	-	-	-	-	-	-	-	-	-	-	NA	NA	NA
Rolling Meadows Country Club	2	North Pond	Vegetative Buffer	2.59	ac.	$ 700.00	$ 1,813.00	2.59	1	16	38	0	0	0	0	319	NA	Landscaping Design
Rolling Meadows Country Club	3	North Pond	Tree Planting	2.59	ac.	$ 1,500.00	$ 3,885.00	2.59	-	-	-	-	-	-	-	319	NA	Landscaping Design
Rolling Meadows Country Club	4	Dirt Parking Lot	Bio Swales	2.05	ac.	$ 1,408.31	$ 2,887.03	2.05	U	510	1,505	2	2	6	1	319	NA	Engineering and Construction
Gale Farms Dairy Farm and Holden Brother Sand, Stone	1	North Property	Riparian Herbaceous Buffer	5.5	ac.	$ 700.00	$ 3,850.00	5.50	25	167	1,262	1	1	8	1	319	NA	Landscaping Design
Gale Farms Dairy Farm and Holden Brother Sand, Stone	2	Stockpile	Obstruction & Planting	2.35	ac.	$ 1,700.00	$ 3,995.00	2.35	21	140	836	1	0	2	1	NRCS/319	IWWA	Engineering and Construction
Brookside Park	1	Lawn	Fertilizer Efficiency	-	ac.	-	-	-	-	-	-	-	-	-	-	NA	NA	NA
Brookside Park	2	Stream	Riparian Herbaceous Buffer	5	ac.	$ 1,750.00	$ 8,750.00	5.00	2	35	170	0	0	1	0	319	NA	Landscaping Design

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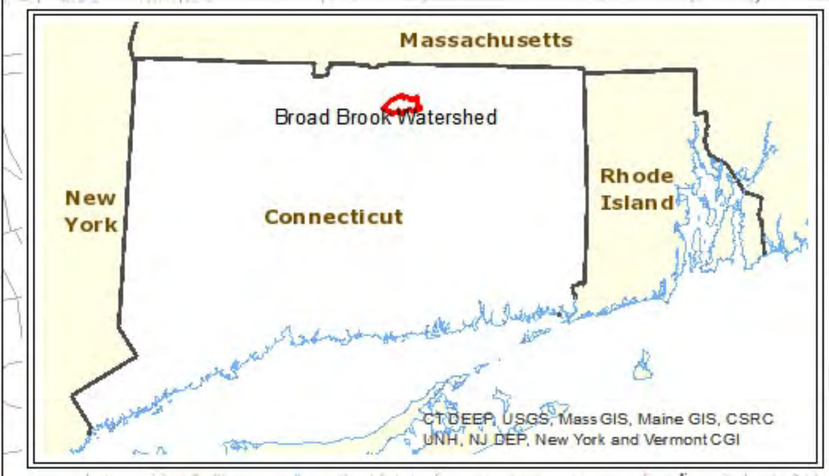
BOD- Biochemical oxygen demand
COD - Chemical oxygen demand
TSS - Total Suspended Solids
NA- Not Applicable

Broad Brook Watershed Location



The Broad Brook is located in the north central section of Connecticut and is a tributary of the Scantic River. This map displays the topography and boundaries of Broad Brook Watershed

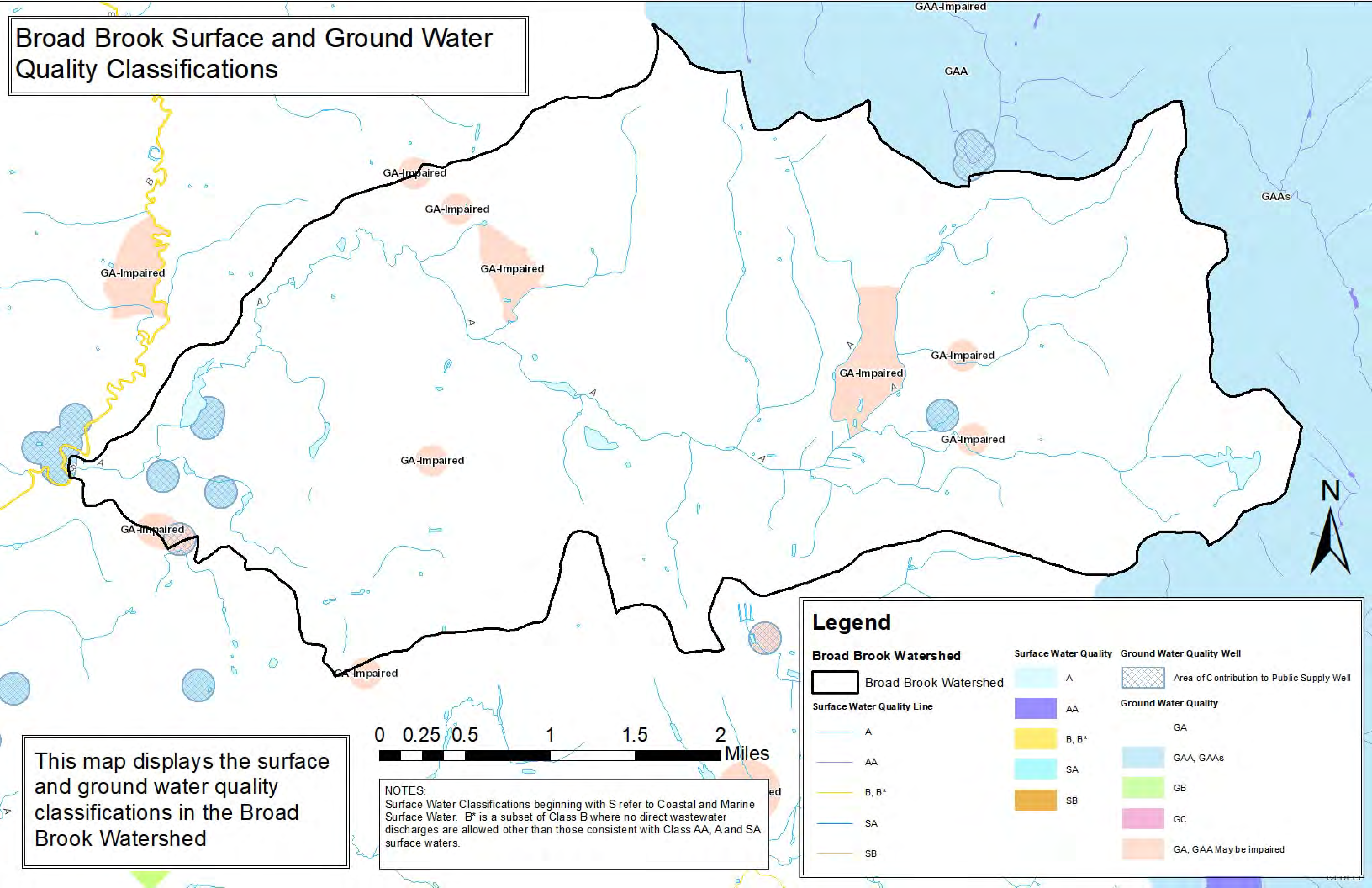
0 0.375 0.75 1.5 2.25 3 Miles

Legend

Broad Brook Watershed

N

USGS, CT DEEP, CT DEEP, USGS, UCONN CLEAR, CT DEEP


Broad Brook Surface and Ground Water Quality Classifications
GAA-Impaired
GAA
GAAs
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
GA-Impaired
A
B
N
0 0.25 0.5 1 1.5 2 Miles
This map displays the surface and ground water quality classifications in the Broad Brook Watershed
NOTES:
Surface Water Classifications beginning with S refer to Coastal and Marine Surface Water. B* is a subset of Class B where no direct wastewater discharges are allowed other than those consistent with Class AA, A and SA surface waters.
Legend
Broad Brook Watershed
Broad Brook Watershed
Surface Water Quality Line
A
AA
B, B*
SA
SB
Surface Water Quality
A
AA
B, B*
SA
SB
Ground Water Quality Well
Area of Contribution to Public Supply Well
Ground Water Quality
GA
GAA, GAAs
GB
GC
GA, GAA May be impaired

Broad Brook Connecticut Inland Wetland Soils

This map displays Connecticut inland wetland soils for the Broad Brook Watershed

0 0.25 0.5 1 1.5 2 Miles

Legend

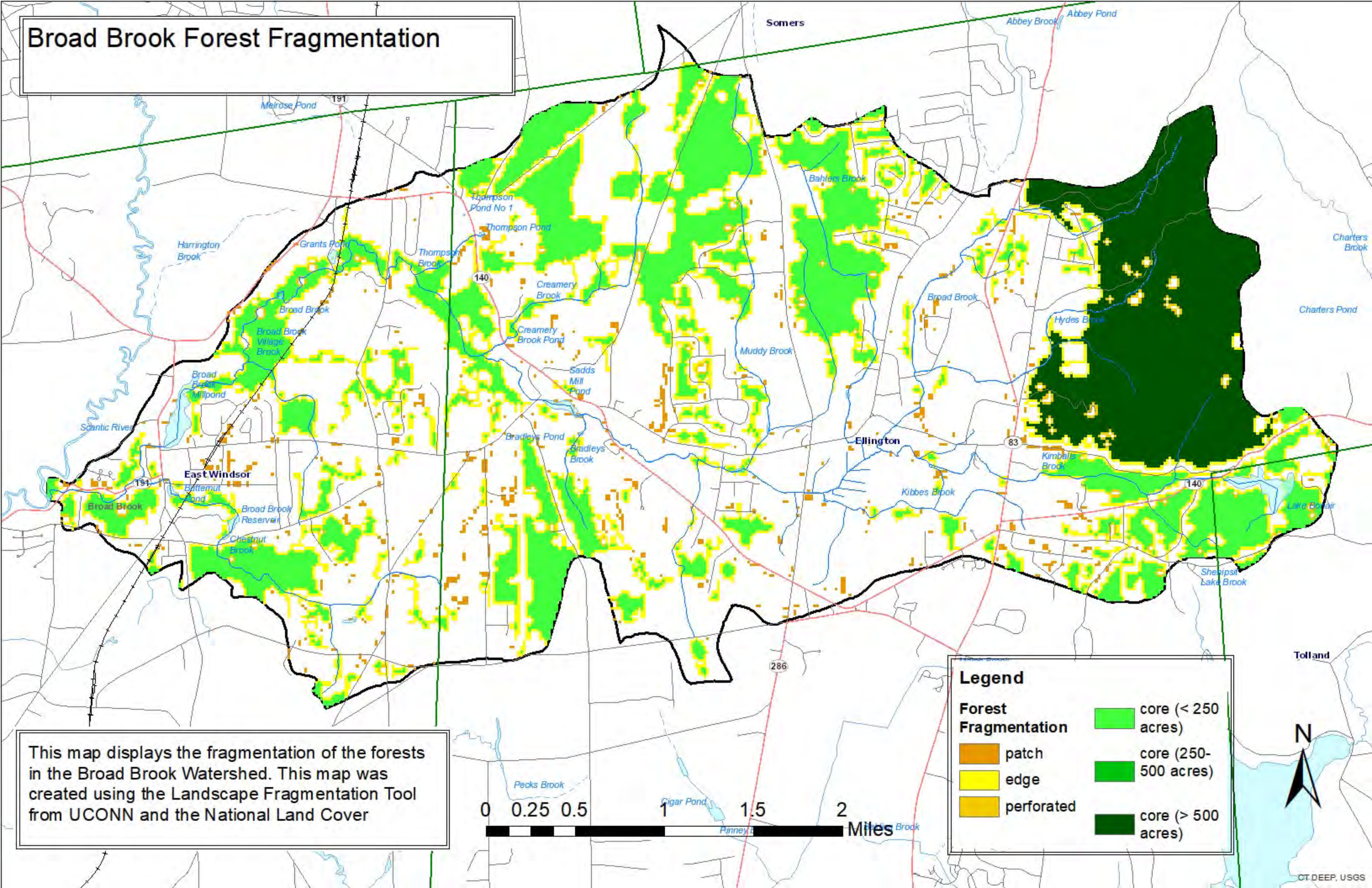
- Poorly Drained and Very Poorly Drained Soils
- Alluvial and Floodplain Soils

N

USGS, CT DEEP, CT DEEP, USGS, USDA - NRCS

Broad Brook Forest Fragmentation

This map displays the fragmentation of the forests in the Broad Brook Watershed. This map was created using the Landscape Fragmentation Tool from UCONN and the National Land Cover



Broad Brook Potentially Impaired Buffer

Somers

East Windsor

Ellington

Tolland

This map displays buffer of potentially impaired streams and waterbodies were waters intersect with agricultural and developed areas

0 0.25 0.5 1 1.5 2 Miles

Legend

- Broad Brook Watershed

Potentially Impaired Buffers

- Extent

Landuse Classification

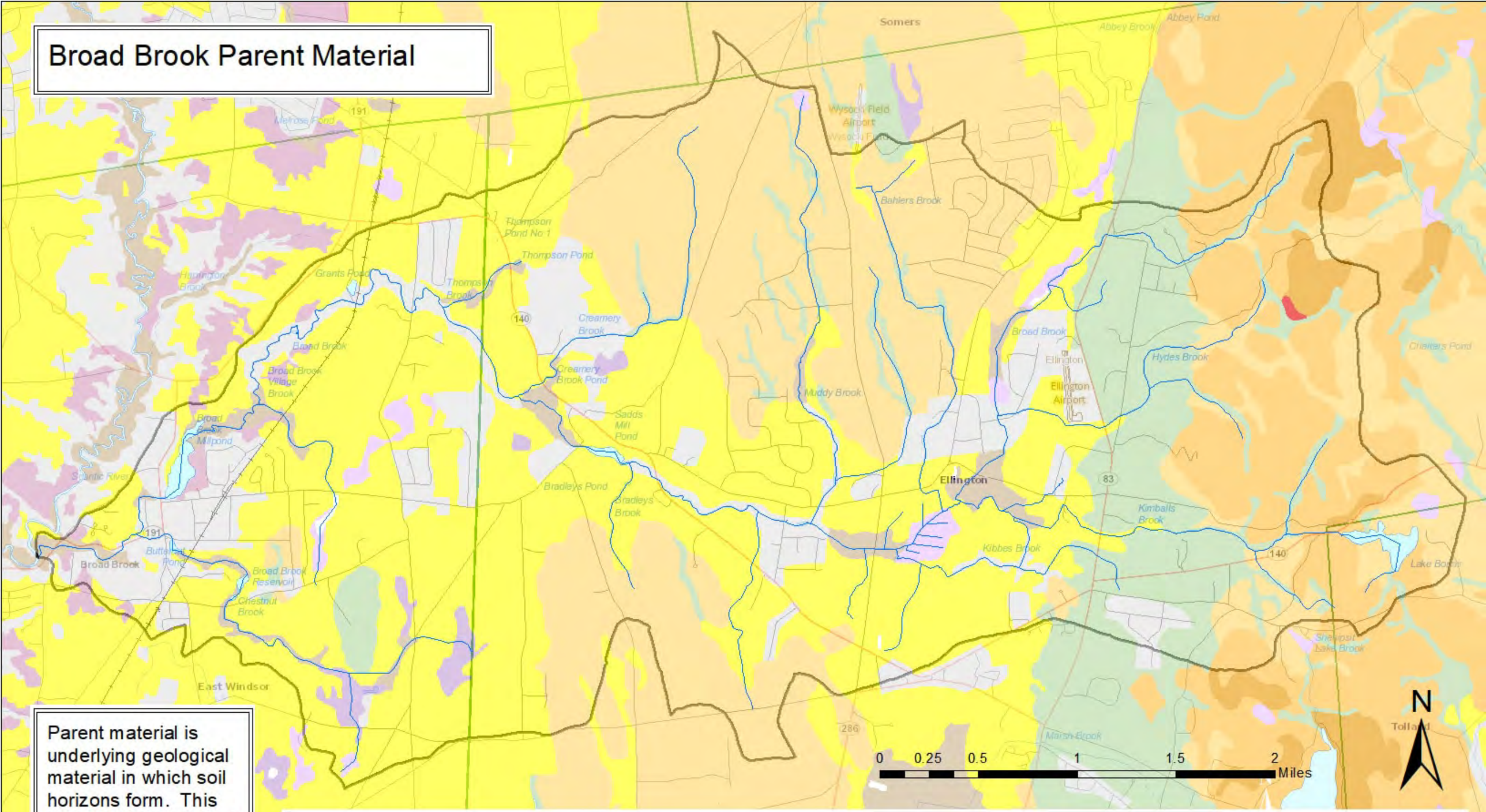
- Developed
- Agriculture

N

USGS, CT DEEP

Broad Brook Parent Material

Parent material is underlying geological material in which soil horizons form. This map displays different categories of parent material present in the Broad Brook Watershed.



Legend

- Moderate to Bedrock
- Moderate - Shallow to Bedrock
- Shallow to Bedrock
- Glaciofluvial - Shallow to Bedrock
- Glaciofluvial
- Melt-out Till
- Melt-out Till - Moderate to Bedrock
- Melt-out Till - Shallow to Bedrock
- Deep Organic - Inland
- Shallow Organic - Inland
- Deep Organic - Tidal
- Shallow Organic - Tidal
- Alluvial/Floodplain
- Glaciolacustrine
- Lodgement Till
- Urban Influenced
- Broad Brook Watershed

Broad Brook Potential For Infiltration Based On Soil Properties

This map displays the soil potential for infiltration in the Broad Brook Watershed. The lower the value the higher the risk for runoff and the greater the need for better management practices

Legend

- Broad Brook Watershed
- **Potential For Infiltration**
  - High Potential
  - Medium Potential
  - Low Potential
  - Very Low Potential
  - Extremely Low Potential
  - Not Rated

0 0.25 0.5 1 1.5 2 Miles

N

USGS, CT DEEP, CT DEEP, USGS

Broad Brook Potential For Runoff Based On A Combination Of Soil Drainage & Land Use

Somers
Abbey Brook
Abbey Pond
Wysocki Field Airport
Wysocki Field
Bahler Brook
Thompson Pond No 1
Thompson Pond
Grants Pond
Harrington Brook
Thompson Brook
Creamery Brook
Broad Brook
Broad Brook Village Brook
Creamery Brook Pond
Muddy Brook
Broad Brook Millpond
Sadds Mill Pond
Scantic River
Bradleys Pond
Bradleys Brook
East Windsor
Broad Brook Reservoir
Ellington
Ellington Airport
Hydes Brook
Charters Pond
Kibbes Brook
Kimballs Brook
Shenipsit Lake Brook
Tolland
Pecks Brook
Cigar Pond
Pinney Brook
Belding Brook
191
140
83
286

This map displays the potential for runoff based on combination of soil drainage & land use classification data

0 0.25 0.5 1 1.5 2 Miles

Legend

- Broad Brook Watershed

Runoff Potential For Soils & Landuse

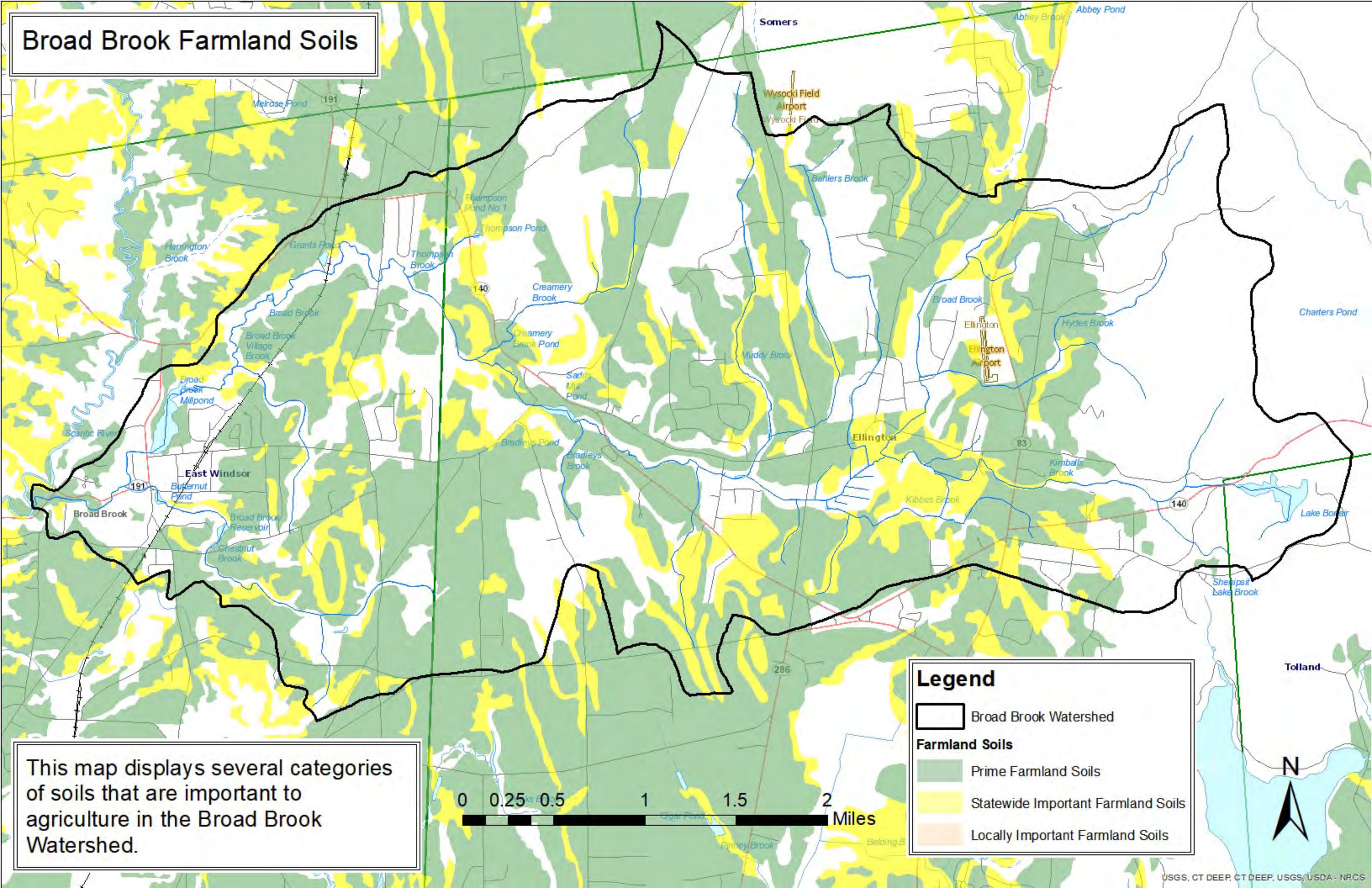
Value

- 1 Least
- 2
- 3
- 4 Most

N

USGS, CT DEEP, CT DEEP, USGS

Broad Brook Farmland Soils



This map displays several categories of soils that are important to agriculture in the Broad Brook Watershed.

Legend

- Broad Brook Watershed

Farmland Soils

- Prime Farmland Soils
- Statewide Important Farmland Soils
- Locally Important Farmland Soils

Broad Brook Land Use / Land Cover

National Land Cover Database 2011

0 0.375 0.75 1.5 2.25 3 Miles

Legend

- Broad Brook Watershed

Land Use / Landcover

- Developed
- Turf & Grass
- Other Grasses
- Agricultural Field
- Deciduous Forest
- Coniferous Forest
- Water
- Non-forested Wetland
- Forested Wetland
- Barren
- Utility Rights-of-way (Forest)

N

USGS, CT DEEP, CT DEEP, USGS

Broad Brook Potentially Impaired Areas by Severity

Somers

East Windsor

Ellington

Tolland

This map displays areas from least to most suitable for the implementation of best management practices within the watershed. The map was created using data on land use, elevation, hydrology and roads.

0 0.25 0.5 1 1.5 2 Miles

Legend

- Broad Brook Watershed

Impairment Rank Severity

- 1 Least
- 2
- 3
- 4
- 5 Most

N

USGS, CT DEEP

Broad Brook Watershed
Agricultural Parcels of Concern

Somers

Ellington

East Windsor

Tolland

This map displays agricultural parcels in close proximity to the Broad Brook Watershed that are most susceptible to nonpoint pollution

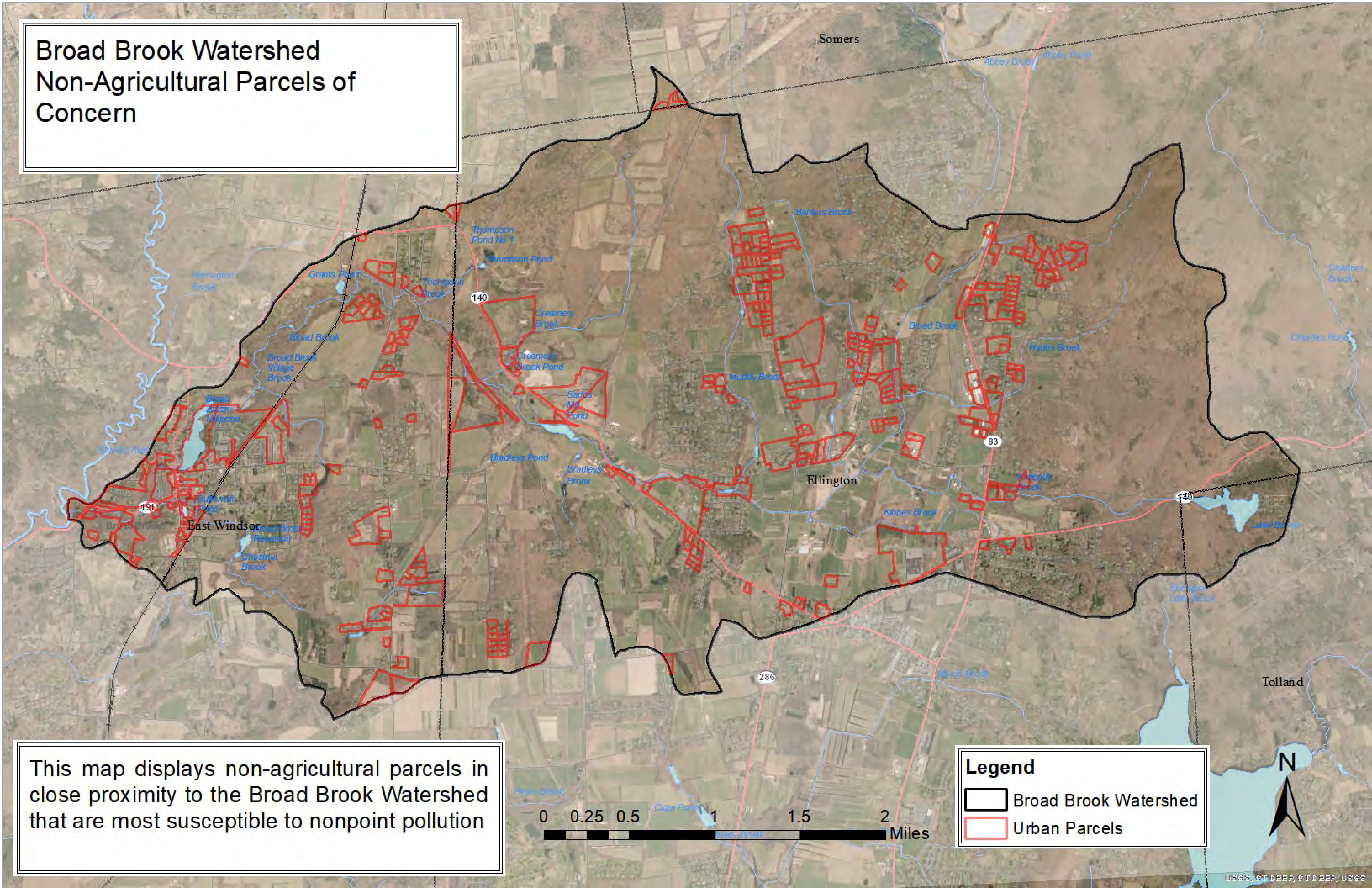
0 0.25 0.5 1 1.5 2 Miles

Legend

- Broad Brook Watershed
- Agricultural Parcels

N

Broad Brook Watershed Non-Agricultural Parcels of Concern



This map displays non-agricultural parcels in close proximity to the Broad Brook Watershed that are most susceptible to nonpoint pollution