Ex# 18

Please add the attached letter from Rema Ecological Services LLC to the official record for the public hearing on Ledyard Inland Wetlands and Watercourses Commission permit application (IWWC#25-19SITE) ("Lambtown Road Ext. culvert replacement with new custom inlet control structure at Ed Lamb Brook")."

November 20, 2025

To: Inland Wetlands and Watercourses Commission
Town of Ledyard
741 Colonel Ledyard Highway
Ledyard, CT 06339

Re: IWWC Application #25-19SITE ("Lambtown Road Ext. culvert replacement with new custom inlet control structure at Ed Lamb Brook").

Dear Commission Members:

Please see the attached ecological review of the environmental impacts.

Sincerely,

Karen Lamb, co-trustee

James C. Lamb Family Trust

Edmund Lamb, co-trustee

James C. Lamb Family Trust

• Soil & Wetland Studies
• Ecology • Application Reviews
• Listed Species Surveys • GPS
• Environmental Planning & Management
• Ecological Restoration & Habitat Mitigation
• Expert Testimony • Permitting

November 20, 2025

VIA E-MAIL

James C. Lamb Family Trust
c/o Edmund Lamb and Karen Lamb, co-trustees
34 Lambtown Road
Ledyard, CT 06339

RE: ECOLOGICAL REVIEW
Culvert Replacement Project
Lambtown Road Extension, Ledyard, CT

REMA Job No.: 25-2848-LED6

Dear Karen Lamb and Edmund Lamb:

At the request of the James C. Lamb Family Trust, REMA Ecological Services, LLC (REMA) was retained to evaluate the potential ecological impacts associated with the proposed culvert replacement and the existing earthen and debris accumulation ("residual beaver dam") located at the upstream face of the current culvert structure (see attached annotated Photo Log).

According to the intervenor's consulting engineer, Seamus Moran, P.E., removal of the this "dam" and installation of the replacement culvert is expected to lower the upstream water surface elevation by approximately three feet. This anticipated drawdown represents a *substantial hydrologic alteration* to the adjacent wetland system and therefore warrants careful assessment of potential effects on wetland hydrology, vegetation communities, wildlife habitat, and overall wetland functions and values.

1.0 SITE OVERVIEW

The ecological resource potentially affected by the proposed hydrologic alteration is a high-value, approximately 38-acre wetland complex composed of open water, emergent marsh, and extensive shrub swamp. The watershed is minimally developed, and water quality within the system is exceptionally high, characterized by very low nutrient concentrations. These oligotrophic conditions support a **poor fen**, recognized by CT DEEP as a **Critical Habitat**, with floating peat "islands" dispersed throughout the open-water portions of the wetland.

The southern segment of the complex is permanently protected as open space under the stewardship of the Groton Open Space Association (GOSA). This portion of the wetland—including what was historically referred to as the **"Candlewood Tract"**—was studied in detail in 2012 to support GOSA's successful OSWA open-space grant application.

Water-quality data collected during the 2012 investigations corroborate the system's low-nutrient status. The southern fen community support a suite of characteristic oligotrophic plant species, including woolly sedge (*Carex lasiocarpa*), spoon-leaved sundew (*Drosera intermedia*), large cranberry (*Vaccinium macrocarpon*), sooty beak-rush (*Rhynchospora fusca*), and water bulrush (*Schoenoplectus subterminalis*). Fen-associated shrubs—such as leatherleaf (*Chamaedaphne calyculata*), sheep laurel (*Kalmia angustifolia*), and maleberry (*Lyonia ligustrina*)—are also well-represented, along with more common wetland shrubs including winterberry (*Ilex verticillata*) and sweet pepperbush (*Clethra alnifolia*).

Faunal observations documented by GOSA include the full suite of vernal-pool-breeding amphibians, as well as **four-toed salamanders** and **spotted turtles**—the latter is now designated as a Connecticut Special Concern species. A letter submitted by Dr. Robert Askins, Professor Emeritus at Connecticut College, further highlights the exceptional bird diversity and abundance associated with this wetland complex, noting both the ecological and educational significance of the area. GOSA's 2012 spotted turtle observations should be updated and formally submitted to the CT DEEP Natural Diversity Database (NDDB).

The Lambtown Road Extension corridor, which borders the scenic pond on the eastern margin of the complex, now functions as a heavily used community walking trail and a popular destination for birdwatchers, further illustrating the natural, recreational, and educational importance of this intact wetland system.

2.0 ANTICIPATED IMPACTS

REMA independently reviewed and corroborated the hydrologic analysis prepared by the intervenor's engineer. On November 15, 2025, REMA scientists George Logan and Sigrun Gadwa conducted an on-site inspection of the culvert system and the associated wetland complex. Based on field observations, plan review, and a conservative estimate of the current water-surface elevation at approximately 199.0 feet, REMA calculates an anticipated water-level reduction of roughly **2.6 feet**. Although slightly less than the intervenor's engineer's projected drawdown of about three feet, REMA's estimate is broadly consistent with their overall assessment.

This estimate incorporates the proposed beaver-management structure, including the planned baffle elevation of 196.4 feet within the concrete weir—equivalent to the invert elevation of the culvert inlet. The submitted engineering plans also show that the previously installed 12-inch corrugated plastic pipe (CPP), part of an earlier "beaver-deceiver" system, had an invert elevation of 196.2 feet. At the time of REMA's field inspection, the measured difference between the observed water surface (~199.0 feet) and the invert of the existing 30-inch CMP culvert was approximately 2.6 feet, confirming that the proposed configuration would result in a substantial lowering of pond and marsh water levels. It should be noted that the water level was somewhat higher at the time of the engineer's earlier analysis—around 3.5 feet above the relevant invert elevations—hence their slightly higher predicted drawdown.

During the November 15 in-field assessment, REMA also documented that the top of the sill supporting the five existing beaver-deceiver intake hoses was roughly level with the then-current water surface. The vertical distance from the sill to the water surface was slightly less than three feet. The sill structure appears to rest on a compacted accumulation of organic, soil-like material with interwoven woody debris, likely representing the remaining core of an older beaver dam. As expected in these systems, seasonal and climatic variation will influence surface-water elevations, with natural declines occurring during summer months and during periods of reduced hydrologic input.

Reduced Productivity

A sustained drop in water level of this magnitude will markedly reduce the aerial extent of shallow-water zones and seasonally saturated mudflats during the summer months. These habitats currently support high densities of aquatic macroinvertebrates and submerged or emergent vegetation, forming the energetic foundation for a highly productive wildlife community. As noted in the letter submitted by Dr. Robert Askins, Professor Emeritus of

Ornithology at Connecticut College, the site presently exhibits unusually high wildlife productivity—likely attributable to the abundance and accessibility of these food resources.

A reduction in shallow-water habitat will disproportionately affect waterfowl and shorebirds that rely on these foraging zones. Dabbling and diving ducks that feed on a combination of aquatic vegetation and invertebrates—including **American black duck, mallard, ring-necked duck, and green-winged teal**—would experience diminished foraging opportunities. Likewise, waterbirds and migratory shorebirds that probe saturated mud and shallow water for invertebrates—such as **Wilson's snipe, solitary sandpiper, and sanderling**—would be adversely affected by the loss of mudflat habitat.

Overall, the anticipated hydrologic drawdown would significantly reduce primary and secondary productivity within the wetland complex, with cascading effects on multiple wildlife guilds.

Inferior fish habitat

If the pond's water level is lowered by more than two feet, overall water depth will be substantially reduced. Shallower conditions will lead to increased water temperatures, reduced thermal refugia, and loss of deeper-water habitat zones. Collectively, these changes will make the pond markedly less suitable for sustaining fish populations.

Fish-eating bird species that are regularly observed within this wetland complex—including **hooded merganser, American black duck, great egret, and belted kingfisher**—would experience diminished prey availability and reduced foraging efficiency under these altered conditions. The pond also supports **river otters** and **northern water snakes**, both of which rely heavily on fish or other aquatic prey and therefore depend on maintaining adequate fish habitat.

Adequate water depth is also critical for maintaining **beaver** occupancy. Beaver lodges require submerged entrances both for predator protection and for winter survival, including under-ice movement between the lodge and food caches. A multi-foot reduction in water level risks exposing lodge entrances, impairing under-ice access, and potentially rendering the site unsuitable for continued beaver use.

More Nutrient Export

Elevated water temperatures resulting from a significant reduction in pond depth will also increase the likelihood of nutrient export to downstream waters, ultimately contributing to nutrient loading in receiving systems, including Long Island Sound. Warmer conditions accelerate the die-off of aquatic vegetation in shallow zones, promoting periods of low dissolved oxygen and causing stress or mortality among benthic invertebrate communities.

As plant and invertebrate biomass decomposes, the resulting nutrient-rich detritus becomes mobilized and is more readily transported downstream during flow events. This accelerated export of organic material and nutrients represents a degradation of current water-quality conditions and could adversely affect downstream aquatic ecosystems.

Secondary Nutrient Impacts

Increases in nitrate and phosphorus concentrations—even if episodic or short-lived—can fertilize wetland soils and stimulate vigorous growth of invasive emergent species such as **Phragmites australis** (common reed), as well as highly competitive native species like **cattail** (*Typha* spp.). Expansion of these species is likely both within the wetland complex itself and in downgradient marsh habitats. Several uncommon or rare plant species associated with the brackish-estuarine transition zone are particularly vulnerable to displacement or shading by the accelerated, taller growth of **Phragmites**.

Elevated nutrient levels also pose a direct threat to the low-nutrient fen habitats within this system, including the floating peat islands. In oligotrophic wetlands, the fibric peat matrix is typically firm and slow to decompose. However, nutrient enrichment destabilizes this condition: nutrients previously sequestered within peat fibers become mobilized, accelerating microbial activity and decomposition. As fibric peat transitions toward nutrient-enriched **sapric muck**, it loses structural integrity and can no longer support Sphagnum mosses or the suite of other characteristic fen species. This represents a fundamental and potentially irreversible alteration of the wetland's ecological character.

A substantial water drop will also diminish the extent of denitrification, a key process by which microbes in wetland soil attenuate nitrogen levels, which requires sol saturation and ample organic matter.

Alteration of wetland plant distributions

Hydrologic conditions are the primary ecological driver governing wetland plant distribution, structure, and long-term community composition. It is well established in wetland science and regulation that significant alterations to a wetland's hydrology will, in turn, significantly alter its vegetation. Such changes are classified as **adverse physical impacts** and are to be avoided or minimized under standard regulatory frameworks.

In an open-water–marsh–shrub-swamp complex, a sustained water-level reduction of more than two feet will trigger pronounced changes in vegetative zonation. Hydrology encompasses not only water depth, but also the amplitude, frequency, and seasonal timing of water-level fluctuations. The hydrologic tolerances of wetland plants vary widely. For example, many native pondweeds (*Potamogeton* spp.) occupy a very narrow band within the littoral zone—often no more than one to two meters wide—because they require specific combinations of depth, light availability, and substrate stability.

While many species can physiologically survive across a broad range of water depths, they can only compete successfully within a much narrower hydrologic window. For instance, floating-leaved species such as water lilies (*Nymphaea* and *Nuphar* spp.) may survive in as little as 6 inches of water, but they are quickly outcompeted if summer water depths drop below approximately 15–18 inches. Under such conditions, emergent taxa such as bur-reeds (*Sparganium* spp.) and rice cutgrass (*Leersia oryzoides*) tend to replace the lilies.

As water levels fall, the pond becomes increasingly vulnerable to **competitive exclusion** by aggressive species with broad hydrologic tolerances—most notably Phragmites australis and reed canary grass (*Phalaris arundinacea*). These invasive species thrive in shallow water and on exposed mudflats, enabling rapid colonization and expansion that can dramatically alter habitat structure and reduce biodiversity.

Woody species' rooting depths develop in response to the hydrology where they became established, which will be unsuitable if there is a substantial, sudden hydrologic change; poor growth and dieback allows establishment of invasives needing ample light.

Missing Information

A critical gap in the available information for evaluating impacts at this site is the lack of **pond-bottom bathymetry,** particularly in the vicinity of the proposed culvert replacement.

Current water depths within areas supporting floating-leaved vegetation—such as water lilies—are unknown. The ecological consequences of a 2.6-foot (or greater) water-level reduction would vary significantly depending on existing depths. A decline of this magnitude would be far more damaging in zones currently only 1–2 feet deep than in areas averaging 3–4 feet. Without bathymetric measurements, the magnitude and spatial extent of hydrologic and vegetation changes cannot be reliably quantified.

Similarly, **the absence of pond-bottom slope information represents another key missing parameter for conducting an accurate impact assessment.** In ponds with steep bathymetric gradients, the littoral zone supporting submerged vegetation (e.g., *Potamogeton* spp.) is typically very narrow. When water levels drop sharply or shorelines retreat substantially, these communities can be eliminated altogether because their suitable hydrologic niche disappears abruptly.

In contrast, ponds with more gradual bottom slopes support broader littoral zones, larger aquatic-plant populations, and a wider hydrologic gradient. Such communities tend to be more resilient, producing more propagules and possessing a greater capacity to recolonize newly exposed substrate. Under declining water levels, species in gently sloped systems are more likely to migrate into the remaining deeper portions of the pond where water depths remain adequate. Without quantitative data on pond depth and slope, it is not possible to determine which of these ecological scenarios is most applicable to the wetland system under review.

Less water for Adjacent Habitats and Vernal Pools

Along its southwestern margin, this flooded open-water wetland is bordered not by a raised roadway embankment used by hikers, but by a **natural wetland fringe** characterized by deep organic soils and several productive **vernal pools**, as mapped by USDA soils data. When the pond's water surface is high—near the elevation of the adjacent bank—substantial lateral seepage infiltrates into these organic soils. This groundwater recharge is critical for maintaining adequate hydroperiods within the vernal pools, allowing obligate amphibians, particularly **Ambystomatid salamanders**, to complete larval development and reach metamorphosis.

These organic soils remain moist even during dry periods and support robust wetland plant communities. To the west of the pond, the soils map indicates permeable, gravelly deposits with irregular pit-and-mound microtopography, associated with historical gravel extraction.

Soil permeability is high enough in this area that the local groundwater table closely tracks the pond's water level. Under current, high-water conditions, this hydrologic connection sustains several viable vernal pools and supports deep-rooted woody vegetation. Functionally, the pond acts as an irrigation trench, maintaining elevated groundwater levels and hydrologic support for adjacent wetlands to the west and southwest.

On the eastern side, pond water likewise infiltrates the wooded buffer, providing a steady source of moisture. This fringe community is presently healthy and diverse. Within the 25-foot area proposed for disturbance, woody species observed include speckled alder (*Alnus incana*), maleberry (*Lyonia ligustrina*), fox grape (*Vitis labrusca*), and buttonbush (*Cephalanthus occidentalis*). Additional species along the nearby bank crest include red maple (*Acer rubrum*), bayberry (*Morella pensylvanica*), and multiflora rose. A substantial lowering of the water table along the shoreline would reduce soil moisture, stressing these hydrophytic species and likely diminishing both vigor and diversity.

Soil-moisture reductions are also expected northeast of the pond in the Lamb family hayfield, which is mapped as Haven silt loam. In fine-textured silty soils, capillary rise transports moisture many feet upward; thus, a lowered pond level and reduced groundwater gradient will result in measurably drier soil conditions within this hayfield.

Plant Diversity losses due to Impeded Plant Seed Dispersal

Waterborne seed dispersal plays a key role in maintaining plant diversity within this wetland system. Many wetland species— including wind-dispersed taxa such as asters—release seeds that settle onto the water surface and are transported to new microsites along the pond margin. Periodic high-water events naturally deposit these seeds on the shoreline, creating a dynamic zone of elevated plant diversity.

Small-scale wind scour along exposed pond edges also generates patches of bare or lightly disturbed substrate, which serve as ideal germination sites for pioneer species dispersed by water. The importance of this process is well documented; in fact, pond shore colonization by waterborne plant propagules was the focus of Sigrun Gadwa's Master's research.

If water levels are significantly reduced, the frequency and extent of these dispersal and deposition processes will decline. Simultaneously, species unable to tolerate the altered hydrologic regime will be lost from the community. Together, these changes will result in a

measurable reduction in overall plant diversity and ecological resilience along the pond shore.

3.0 CONCLUSION

Based on REMA's field observations, review of submitted plans and available data, and ecological analysis, it is clear that a 2–3 foot reduction in water level during the high-water season would produce multiple, cascading, and adverse ecological impacts across this wetland complex—including the GOSA-owned habitats. The affected system is a rare low-nutrient (oligotrophic) wetland supporting a poor fen, floating peat islands, productive vernal pools, extensive shrub swamp, and unusually high wildlife diversity. ***Its ecological integrity is fundamentally tied to its existing hydrology***.

A sustained drop of this magnitude would:

- **Eliminate or severely contract shallow-water and mudflat habitats**, reducing macroinvertebrate and aquatic-plant biomass and diminishing foraging resources for waterfowl, shorebirds, amphibians, reptiles, and mammals.
- **Increase water temperatures** and reduce deeper-water refugia, degrading habitat suitability for fish, fish-eating birds, river otter, water snakes, and beaver (whose lodge entrances require submergence).
- **Accelerate nutrient release and downstream export**, driving die-offs of aquatic vegetation, creating anoxic conditions, and introducing nutrient-rich detritus into downstream waters, ultimately contributing to degradation toward Long Island Sound.
- **Stimulate invasive and aggressive vegetation**, including *Phragmites australis* and cattails, while degrading oligotrophic peat and transforming firm fibric peat into sapric muck—an irreversible loss of fen habitat.
- **Alter shoreline and groundwater hydrology**, reducing soil moisture in vernal pools, wooded fringes, and adjacent uplands and hayfield soils, compromising amphibian breeding success and stressing hydrophytic vegetation.
- **Disrupt natural seed-dispersal and recruitment processes**, diminishing pond shore plant diversity and eliminating species unable to tolerate the new hydrologic regime.

Given these impacts, the wetland would lose many of its defining ecological functions, values, and low-nutrient characteristics—changes that are **substantial, adverse, and likely permanent** without intervention.

Importantly, **feasible and prudent alternatives** that would avoid or greatly reduce these impacts **have not yet been evaluated**, as required under the Town's Inland Wetlands and Watercourses Regulations. Because this road is closed to vehicular traffic, there appears to be no functional requirement to lower water levels below their current elevation. A culvert and beaver-management design that maintains the present high-water surface elevation of approximately 199 feet during "full pond" conditions should be explored. Such an approach would protect the ecological integrity of this regionally significant wetland complex while still addressing infrastructure and flow-management needs.

Finally, it is important to note that the watercourse associated with this wetland complex is perennial, and the proposed project entails both direct (primary) impacts and indirect (secondary) impacts, including substantial hydrologic modification. Consequently, the activity falls under the jurisdiction of Sections 404 and 401 of the U.S. Clean Water Act. Therefore, review and authorization are required from both the U.S. Army Corps of Engineers (USACE) and the Connecticut Department of Energy and Environmental Protection (CT DEEP).

Please feel free to contact us if you have any questions.

Respectfully submitted,

REMA ECOLOGICAL SERVICES, LLC

George T. Logan

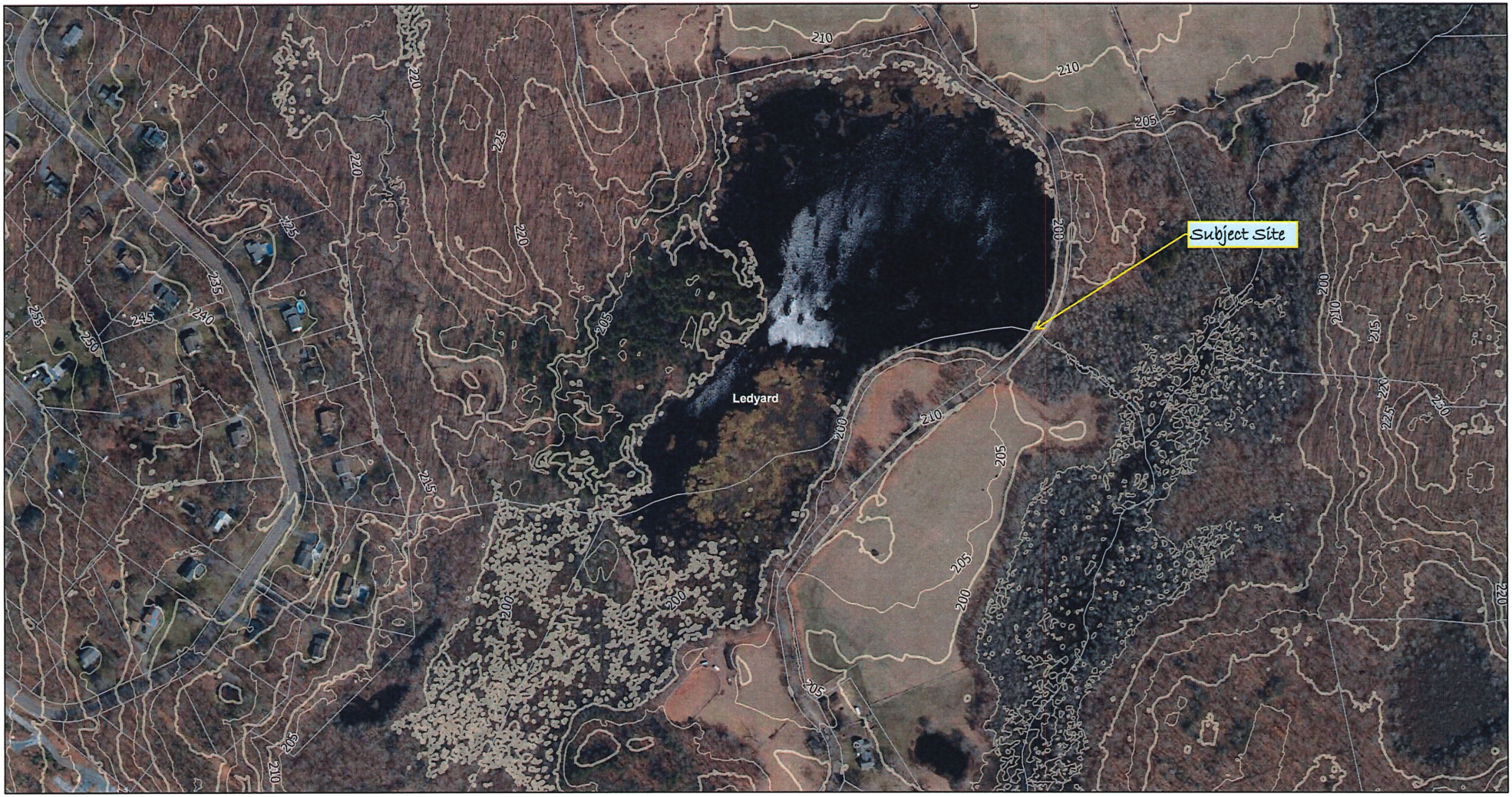
Sigrun N. Gadwa

George T. Logan, MS, PWS, CSE
Professional Wetland Scientist
Registered Soil Scientist, Certified Senior Ecologist

Sigrun N. Gadwa, MS, PWS
Ecologist, Registered Soil Scientist
Professional Wetland Scientist

Attachments: Figures 1 to 3, USDA-NRCS Web Soil Survey soils map, Photolog (1 and 2), Professional Resumes, photos of fen from 2012 OSWA grant application

FIGURE 1: LOCUS; CULVERT REPLACEMENT PROJECT
LAMBTOWN ROAD EXT., LEDYARD, CT



ANNOTATED BY: REMA ECOLOGICAL SERVICES, LLC
DATE: 11/24/2025
BASE MAPPING: 2023 AERIAL WITH 2023 TOPOGRAPHY

1:4,200

0 215 430 860 ft
0 65 130 260 m

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Sources: Esri, Maxar, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland,

Map created with the CT ECO Advanced Viewer. Visit CT ECO at

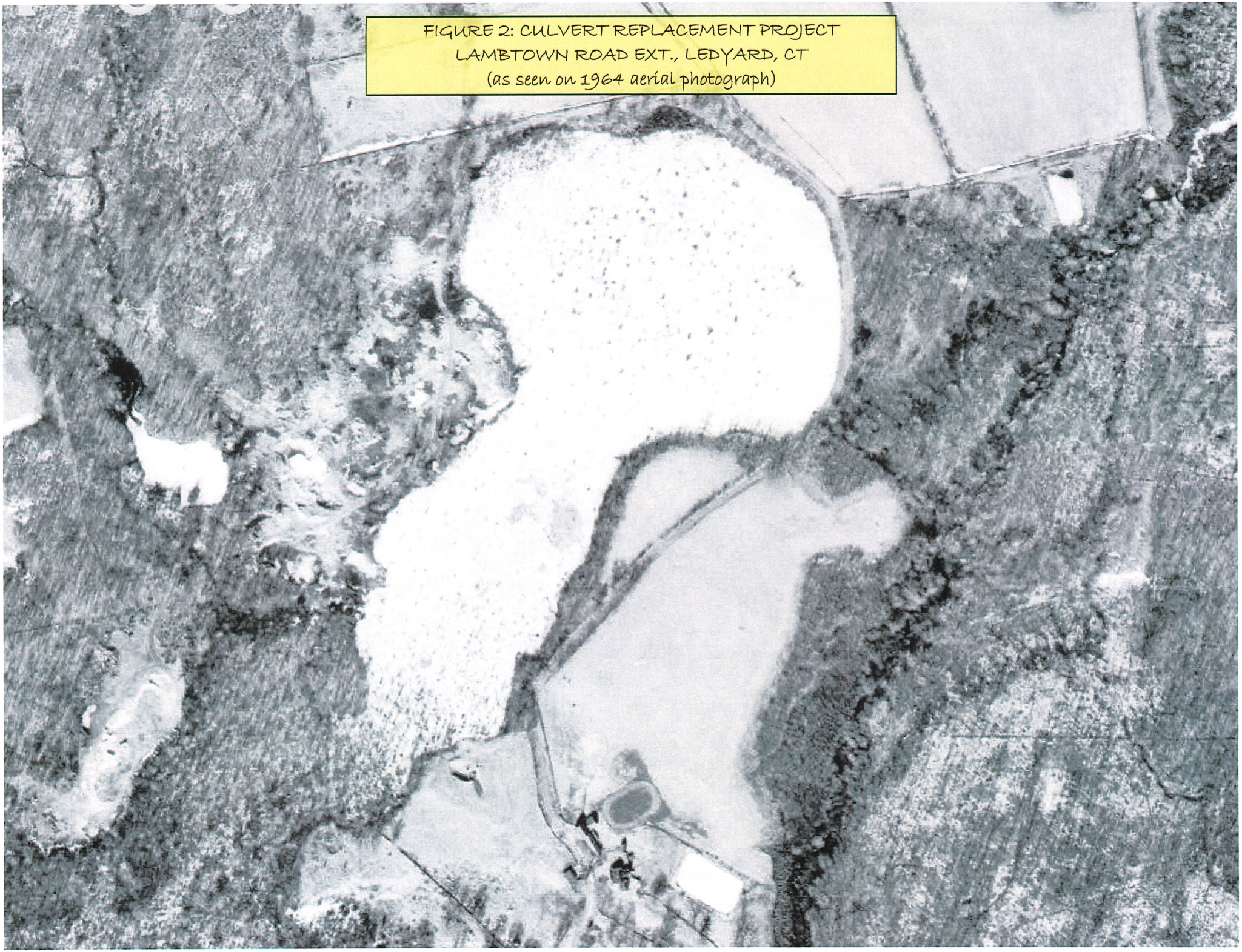
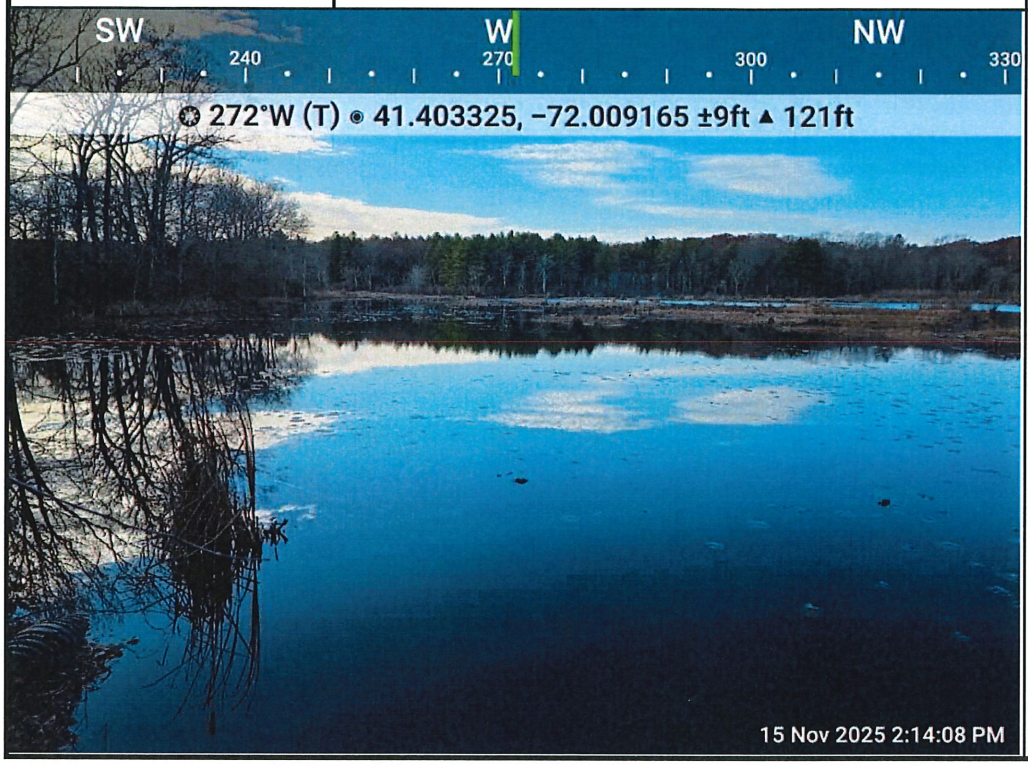


FIGURE 2: CULVERT REPLACEMENT PROJECT
LAMBTOWN ROAD EXT., LEDYARD, CT
(as seen on 1964 aerial photograph)

FIGURE 3: CULVERT REPLACEMENT PROJECT
LAMBTOWN ROAD EXT., LEDYARD, CT
(as seen on 1934 aerial photograph)

REMA	**SITE/LOCATION:** Proposed Culvert Replacement Lambtown Road Ext. Ledyard, CT	REMA JOB NO.: 24-2848-LED6	**ANNOTATED PHOTO LOG**
	INVESTIGATOR(S): G.T. Logan, MS; S.N. Gadwa, MS		

DATE: November 15, 2025	**FACING:** (see photo)	**1**



Comments: *View across wetland from culvert replacement site showing floating fen islands in distance.*

DATE: November 15, 2025	**FACING:** (see photo)	**PHOTO NO.:** **2**

Comments: *View of conditions in front of the culvert to be replaced. The pond water level is that of the sill (+/- 199.0'). Culvert opening is hidden, and several feet lower down. This appears to be a residual portion of a former beaver dam, perhaps reinforced with soil when the black, corrugated beaver deceiver hoses were installed.*

Soil Map—State of Connecticut, Eastern Part
(Lambtown Road Extention vicinity, Ledyard, CT)

Map Scale: 1:6,010 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut, Eastern Part
Survey Area Data: Version 6, Sep 16, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	1.2	0.9%
12	Raypol silt loam, 0 to 3 percent slopes	4.4	3.3%
15	Scarboro muck, 0 to 3 percent slopes	0.3	0.2%
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	1.6	1.2%
18	Catden and Freetown soils, 0 to 2 percent slopes	25.9	19.3%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	2.0	1.5%
34B	Merrimac fine sandy loam, 3 to 8 percent slopes	13.0	9.6%
38C	Hinckley loamy sand, 3 to 15 percent slopes	8.8	6.5%
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	3.0	2.2%
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	6.8	5.0%
67B	Narragansett silt loam, 3 to 8 percent slopes, very stony	0.6	0.4%
68C	Narragansett silt loam, 3 to 15 percent slopes, extremely stony	5.1	3.8%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	0.6	0.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	2.6	1.9%
305	Udorthents-Pits complex, gravelly	13.1	9.8%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	1.1	0.9%
703A	Haven silt loam, 0 to 3 percent slopes	8.7	6.5%
703B	Haven silt loam, 3 to 8 percent slopes	14.1	10.5%
W	Water	21.6	16.1%
Totals for Area of Interest		**134.5**	**100.0%**

Set 3: Open Tussock Sedge Peatland, Lambtown Rd, Groton; by Carya Ecological Services, LLC, Spring, 2012

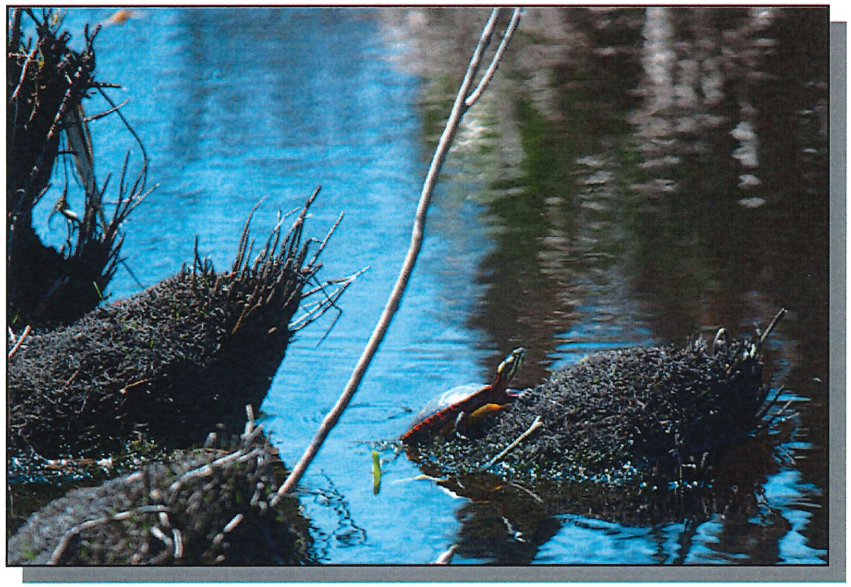


Photo 1. Painted turtle basking on a dead tussock mound in a deep water area. This wetland supports a very large population.

Photo 2. Close-up of channel and graminaceous vegetation. Ditches were dug in this former commercial cranberry bog.

Photo 3. Northeasterly view from beaver dam of large tussock sedge peatland. Water level dropped >1' foot after beavers fixed dam in May. Periodic flooding kills saplings, prevents succession to wooded swamp.

Photo 4. Spotted turtles were observed several times in the tussock peatland, and also use vernal pools at the base of the ridge.

Set 4: Lambtown Road, Groton, Fen Along Lambtown Brook; by Carya Ecological Services, LLC, 6-15-12

Photo 1. Exploring and botanizing by kayak; wild bean vine approaching the fen perimeter. Poor fen is a CT DEEP critical habitat.

Photo 2. Westerly view down Lambtown Brook; tussock sedge clumps show a current water level about 14 inches lower than in the past.

Photo 3. Sheep laurel is in bloom on the banks of the brook. A characteristic ericaceous species of poor fens.

Photo 4. Lichens on a snag.

Set 4: Lambtown Road, Groton, Fen Along Lambtown Brook; by Carya Ecological Services, LLC, 6-15-12

Photo 5: Lyonia ligustrina or maleberry, in bud along the southern edge of the meadow. This species is often found in glacial outwash soils with a sandy substratum.

Photo 6: Wet habitat dominated by a fine-bladed rhizomotous sedge. Westerly view, showing the broad extent of the community. Red maple saplings in this area die naturally due to the high water table.

Photo 7: Shimmering in wind; fen's aesthetic value would be rated very high in a formal functions and values assessment. Buttonbush, an aquatic shrub, is scattered in the fen.

Photo 8: Wet meadow with firm, deep peat abuts a zone of tall shrubs and then bottomland deciduous forest, with sandy outwash soils. Dominant sedge is a sterile close of wooly sedge, *carex lasiocarpa.*

Set 4: Lambtown Road, Groton, Fen Along Lambtown Brook; by Carya Ecological Services, LLC, 6-15-12

Photo 9: Nuphar (yellow pond lily) on mud in low water conditions.

Photo 10: Close-up of brookside vegetation: large cranberry and a flowering nightshade vine.

Photo 11: The brook flowing through fen; southwesterly view. Of grave concern is a small new patch of invasive Phragmites, which GOSA will control with CT DEEP permit before in spreads across the fen.

Photo 12: Leatherleaf shrub. GOSA botanist Whitney Adams is examining the scales on the underside of the leaf.

CARYA ECOLOGICAL SERVICES, LLC, 183 GUINEVERE RIDGE, CHESHIRE, CONNECTICUT, 06410
& 164 EAST CENTER STREET, SUITE 9, MANCHESTER, CT 06040 • 203 537.1869
SIGRUN.N.GADWA@GMAIL.COM WWW.CARYAECOLOGICAL.COM

Curriculum vitae

Sigrun N. Gadwa, MS, PWS
Ecologist/Botanist/Wetland Scientist

EDUCATION:

M.S., Plant Ecology, University of Connecticut, Storrs, CT, 1997.

B.A., Biology, Brown University, Providence, R.I., 1975.

Continuing Education

16 credit hours in Soil Science and Geology, 1993 – 2001
University of Connecticut, Storrs
Five Plant Pathology courses, Cook College, Rutgers University, New Brunswick, N. J. 1978 - 1979
Graduate Phycology course. Pan American U. Brownsville, Texas, 1982
Arboriculture course, Quinnipiac College, Hamden, CT, 1984
CT DEEP training workshop Series: Rapid Bioassessment Techniques, & Stream Ecology Workshops. Bethany.1996 & 7.
Marking, Measuring & Planning Turtle Surveys. H. Gruner, CT Science Museum, workshop for QRWA Turtle Crossing Program. 1998.
Riparian Buffer Function, Performance & Limitations. Urban Riparian Buffers Conference & Technical Training Session. April 1999.
Sedimentation and Erosion Control Review Session. USDA Natural Resource Conservation Service and CPESC (Certified Professionals in Erosion Control), Concord, NH, September, 2001.
Freshwater Mussel Workshop. New Hampshire Department of Environmental Conservation. August 2004.
Moss Identification & Ecology,1-week course; Eagle Hill Institute. 2019

CERTIFICATIONS:

Registered Soil Scientist,
Society of Soil Scientists of Southern New England
Certified Professional Wetland Scientist
Society of Wetland Scientists
Organic land care professional. NOFA (NE Organic Farming Assoc)

EXPERIENCE:

As a plant ecologist Ms. Gadwa inventories, assesses, photographs, and monitors ecological communities, often in support of open space acquisition initiatives. She plans & guides control programs for invasive plants, and searches for listed plant and turtle populations and assesses their habitat. Botanical specialties include vascular plant identification and winter botany. She is experienced with third party reviews of development projects, assessments of functions & values, delineation of wetland and watercourse jurisdictional boundaries (CT and U.S. Army Corps of Engineers), planning wetland mitigation and restoration, vernal pools studies, water quality testing and data analysis, and in-stream bio-assessments.

Curriculum vitae: *(continued)*

Sigrun N. Gadwa, MS, PWS
Ecologist/Botanist/Wetland Scientist

EMPLOYMENT HISTORY:

1999 to present	**Carya Ecological Services, LLC, Principal** Ecological and wetland assessments, botany & habitat inventories, Vegetation planning. CTDEEP surveys for rare plants and turtles. Recent **Carya** clients include the Berlin Land Trust, Hamden Land Conservation Trust, Avalonia Land Conservancy, East Lyme Land Trust, Brookfield North, LLC, Black & Veatch for the Town of West Haven, Mumford Cove Association, Town of Colebrook, SCS-Bethmour Rd., and private landowners.
1999 to present	**Carya Ecological Services, LLC, Principal,** *subcontractor* to **Rema Ecological Services**, LLC, Vernon, CT, an environmental science collaborative; Ecological fieldwork, planning, and reporting.
2015 to 2022	**Post University, Waterbury Campus** Adjunct Professor of Botany & Ecology.
2013 to 2018	**K & W Construction,** Southbury, CT, *subcontractor* Erosion & Sediment Control Inspections, Turbidity testing for CT DEEP
2014 to 2019	**South Central CT Regional Water Authority**, New Haven, CT Responsible for long term vegetation monitoring each fall, and reporting for compliance with CT DEEP Wellfield Diversion Permit.
2001 to 2004	**CT DEEP Wildlife Division,** *subcontractor* Vegetation and wetland inventories & mapping of large Wildlife Management Areas (WMAs).
2003 to May 2016	**Ships' Hole Farm Partnership,** Smithtown, Long Island, NY Responsible for vegetation management & invasive control; growing seed of native species on family farm, advised turtle monitors.
1995 to 2000	**Quinnipiac River Watershed Association Meriden, CT** Executive Director/Staff Scientist Led botany hikes and a volunteer monitoring program, including stream bio-assessments, turbidity testing, and bird/turtle surveys; site plan reviews of projects impacting the watershed; wrote testimony, grants, publicity, and educational materials; liaison with officials. Chair of Habitat Work Group of the **Watershed Partnership**, which identified and documented Quinnipiac watershed habitats in need of protection or restoration until 2003.

Curriculum vitae: *(continued)*

Sigrun N. Gadwa, MS, PWS
Ecologist/Botanist/Wetland Scientist

EMPLOYMENT HISTORY:
(continued)

Coordinator for **QRWA Turtle Crossing** monitoring program for Eastern box & wood turtles, which continued until 2018. Instructed citizens on preparing detailed accurate record forms for the Natural Diversity Database. Outreach on turtle behavior through the seasons, habitat usage, & conservation needs. > 50 records.

1991 to 1995 — **De Leuw-Cather, Inc.,** East Hartford, CT
Environmental Planner/Field Ecologist
Field data collection, analysis, and report preparation, mostly for high-way projects; specialties included listed plant searches, assessment of wetland functions, mitigation design, & wetland delineation (ACOE method).

1987 to 1991 — **Univ. of Connecticut Department of Civil Engineering,** Storrs, CT
Wetlands Researcher
Part of an interdisciplinary team, studying man-made replication wetlands and natural reference wetlands. Took part in research design; collected vegetation, soils, & hydrologic data; literature searches; data analysis. Research used for wetlands mitigation-related manual for the Connecticut Department of Transportation and for master's thesis.

1974 to 1975 — **Brown University,** Providence, RI
Teaching Assistant, Plant Systematics

1968 to 1975 — **Long Island Nature Conservancy,** Stewardship Volunteer
Nature trail development & maintenance, botanical inventories, wrote preserve descriptions & self-guided nature trail brochures.

Carya E.S. clients have included Berlin Land Trust, Avalonia Land

PROFESSIONAL AFFILIATIONS:

Connecticut Botanical Soc. (Board Member, Chair of Ecology & Conservation Committee)
Connecticut Invasive Plant Working Group (CIPWG)
Connecticut Association of Wetland Scientists
Society of Soil Scientists of Southern New England
Connecticut Ornithological Society
Connecticut Entomological Society
Ecological Society of America
Native Plant Trust (PCV - Plant Conservation Volunteer Program)

Curriculum vitae: *(continued)*

Sigrun N. Gadwa, MS, PWS
Ecologist/Botanist/Wetland Scientist

PUBLICATIONS:

Lefor, M.W. Barklay, J.S. Cooke, R.S. Craig, S.N. Gadwa, T.S. Murray, April 1990. *Annotated Bibliography for Wetland Mitigation.*

August 1990. *Patterns of Herb Layer Species Association.* In Lefor, M.W. et al *Wetland Mitigation: Interim Report* No. CT-RD-JHR-90-8, The Transportation Institute, Storrs, Conn. 97 pp.

1994. *Forests.* In Chesanow et al. *Trails.* The Cheshire Land Trust and the Cheshire Environment Commission, Cheshire, CT 96 pp.

May 1995. *Wetland Mitigation: Botany.* Volume 1 of 6. Lefor, M.W. and S.N. Gadwa. Report No. JR95-241. Dept. Civil Engineering, Joint Highway Research Council, Transportation Institute, Storrs, Conn. 259 pp.

December 1997. *Plant Colonization Processes and Patterns along Shorelines of Man-made Mitigation Basins in Relation to Reproductive and Life History Traits.* MS Thesis. Dept. Ecology & Evolutionary Biology. Univ. of Connecticut, Storrs, CT. 181 pp.

River Resources Education Series, Quinnipiac River Watershed Association, Meriden, CT. May 1995 *New Haven Oysters;* June 1996 *What Good are Streamside Woods?* August 1996 *Taking a Close Look at Streamside Woods;* June 1997 *Foraging in the Quinnipiac Estuary;* March 1998 *Stream Biosurveys* (G.T. Logan & S. Gadwa) ; September 2000 *Muddy Waters.*

Logan, G.T. & S.N. Gadwa. *Quinnipiac River Watershed Assoc. Stream Study.* Water Quality in the Quinnipiac River. Proceedings of a Symposium on the Impact of Nonpoint Source Pollution in the Quinnipiac River Watershed, pp. 66-70.

October 2000. *A Report on the Water Quality of the Quinnipiac River.* M. Tyrell, C. Cappannari, D. Galt, S. Gadwa, L. MacMillan, R. Walters. Report to the Steering Committee of the Quinnipiac River Watershed Partnership. Q.R.W.P. Water Quality Workgroup, New Haven, CT. 19 pp.

Winter 2003. *Management of Invasive Plants: On-Site Open Space Management.* The Habitat 15(2):3-4 Connecticut Association of Conservation and Inland Wetland Commissions, Inc.

Spring 2003. *Management of Invasive Plants: Protecting Open Space and Wetlands, Tools for Land Use Boards and Town Staff.* The Habitat 15(3):4-5. Connecticut Association of Conservation and Inland Wetland Commissions, Inc.

July 2003. Interpreting Quinnipiac Songbird Surveys: Effects of Landscape Setting on Avian Community Composition. *The Connecticut Warbler.* 23(3): 81-114.

Curriculum vitae: *(continued)*

Sigrun N. Gadwa, MS, PWS
Ecologist/Botanist/Wetland Scientist

PUBLICATIONS, cont. :

June 2004. *Connecticut Turtles of Special Concern.* Quinnipiac River Watershed Association. 4 page pamphlet. (illustrations by Tony Ianello)
Fall 2005. S. N. Gadwa. *Preliminary Assessment of the Habitat & Historic Resources in North Cheshire, West of Route 10 & Recommended Protection Measures.* Cheshire Land Trust & Quinnipiac Watershed Partnership.

October 2011 S. N. Gadwa & G.T. Logan. *The Scientific Basis for Wetland & Watercourse Buffer Zones*. 23 pp. White Paper. Rema Ecological Services, LLC.

Spring 2014. Sigrun N. Gadwa. *The Invasive Threat to Connecticut's Upland Critical Habitats*. 3pp. Connecticut Botanical Society Newsletter 41: 1.

Spring 2020. Sigrun N. Gadwa. *Gabbro Habitats in Southeastern Connecticut.* Connecticut Botanical Society Newsletter 47: 1.

Fall 2020. Connecticut Botanical Society Ecology and Conservation Committee. *Recommendations for Electrical Utility Right-of-Way Vegetation Management* . See also website: www.caryaecological.com

WORKSHOPS & CONFERENCES

SA Mid-Atlantic Chapter Symposium, Blacksburg Virginia
Lessons for Mitigation Design from Shoreline Seedling Colonization ***(selected):***
Patterns April 12-14. 2012. *(Poster presentation based on MS thesis)*

New England Invasive Plant Summit, Framingham Massachusetts: Wetlands permitting – a potentially powerful tool to control invasive plants. September 19-20. 2003. (*Poster Presentation)*.

Environmentally Sensitive Development along the Ten Mile River. Riverside Landscaping Conference. June 1998. Rivers Alliance of CT. (*Guest Lecturer*)

Water Quality in the Quinnipiac River: A Symposium on the Impact of Non-Point Source Pollution in the Quinnipiac River Watershed. Nov. 1998. *(Presenter)*

October, 2014. Documenting and Conserving Eastern Box Turtles in Central Connecticut: 19 years of Citizen Monitoring. Berlin Land Trust and Nature Center. Evening Membership Program. (*Guest Lecturer)*

2011 to 2119. For CT Botanical Society, have led 1-3 guided botany field trips and/or field botany workshops each year.

October 2016 Sigrun Gadwa, MS & Todd Mervosch, PHD. Connecticut Invasive Plant Working Group (CIPWG) Symposium, UConn College of Agriculture, Health, & Natural Resources. *Artemisia vulgaris (Mugwort): Overlooked Infiltrator of Meadow Habitats. (Poster Presentation).*

PROFESSIONAL RESUME

George T. Logan, MS, PWS, CSE

Principal Environmental Scientist/Senior Ecologist

EDUCATION:

M.S. Natural Resources, *Wildlife Management & Conservation Biology,* University of Rhode Island, Kingston, R.I., 1989.

B.S. Natural Resources, *Wildlife Management & Wetlands Ecology,* University of Rhode Island, Kingston, R.I., 1986.

Continuing Education

The Transportation Project Development Process: Training in the PennDOT Environmental Impact Statement Handbook, Harrisburg, PA, January 1994

Rapid Bioassessment Protocols of Aquatic Systems (EPA Protocols), Wetland Training Institute, Williamsport, PA, August 3-6, 1993

CERTIFICICATIONS:

Certified Senior Ecologist *(2005, 2014)* - Ecological Society of America

Certified Professional Wetland Scientist (No. 581) *(1994)* - Society of Wetland Scientists

Registered Soil Scientist *(1989)* - Society of Soil Scientists of Southern New England

Certified Associate Wildlife Biologist *(1989)* – The Wildlife Society

EXPERIENCE:

Mr. Logan is the Co-Owner, *Principal Environmental Scientist,* and *Senior Ecologist* for Rema Ecological Services, LLC. He specializes in tidal and inland wetland delineations and evaluation, permitting, wetland mitigation design, implementation and monitoring, and the preparation of environmental compliance documents in accordance with national (NEPA), state (e.g., CEPA, MEPA), and local criteria and guidelines. He also provides design, construction supervision and implementation for a wide variety of habitat restoration and enhancement projects and performs watershed-wide and surface water quality evaluations and provides guidance in the design of stormwater Best Management Practices (BMPs), including stormwater wetlands and bioretention basins, as well as for LID (low impact development) practices.

Mr. Logan has over 37 years of experience as a wildlife biologist/ecologist conducting wildlife habitat evaluations and focused avian, mammalian, invertebrate, and herpetofaunal surveys using both active and passive methods. He frequently conducts targeted surveys for sensitive, rare, and "listed" species (i.e., endangered, threatened, special concern), and aquatic biosurveys to assess the biodiversity and biotic health of ponds, lakes, vernal pools, rivers, and streams. Mr. Logan has extensive experience in performing herpetological surveys, including nearly 300 vernal pool surveys and evaluations.

Mr. Logan provides 3rd party reviews for municipal land use boards and has participated in nearly 3,400 individual projects in New England and the Mid-Atlantic States and in 164 of 169 municipalities in Connecticut.

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

PROFESSIONAL AFFILIATIONS:

Society of Soil Scientists of Southern New England
Society of Wetland Scientists
Ecological Society of America
The American Birding Association
The Wildlife Society
Soil & Water Conservation Society
Connecticut Association of Wetland Scientists (CAWS) *(Past-President, Charter member)*

PUBLICATIONS: *(selected)*

Logan, G.T. & S.N. Gadwa. 1999. Quinnipiac River Watershed Association Stream Study. Water Quality in the Quinnipiac River. Proceedings of a Symposium on the Impact of Nonpoint Source Pollution in the Quinnipiac River Watershed, pp. 66-70.

Logan, G.T. & S.N. Gadwa. 1998. Stream Biosurveys: *A Primer.* Quinnipiac River Watershed Association Educational Series for the Adopt-the-River Programs.

Pawlak, E.M. & G.T. Logan. 1996. Town of Cromwell Wetland Evaluation Project. Connecticut Association of Conservation and Inland Wetlands Commissions. The Habitat, Vol. 10:1

Logan, G.T., F.B. Titlow & D.G. Schall. 1995. The Scientific Basis for Protecting Buffer Zones. Proceedings of the 16th Annual Meeting of the Society of Wetland Scientists.

Pawlak, E.M. & G.T. Logan. 1995. Town of Cromwell Wetland Buffer Zone Designation Methodology. Proceedings of the 16th Annual Meeting of the Society of Wetland Scientists.

Logan, G.T., J.H. Brown, Jr., T.P. Husband & M.C. Nicholson. 1994. Conservation Biology of the Cretan Agrimi (*Capra aegagrus cretensis*). Biologia Gallo-Hellenica, Vol. 21, pp. 51-57.

Nicholson, M.C., T.P. Husband, J.H. Brown, Jr. and G.T. Logan. 1994. Implications of behavior on the management of the Cretan Agrimi (*Capra aegagrus cretensis*). Biologia Gallo-Hellenica, Vol. 21, pp. 45-50.

WORKSHOPS & CONFERENCES: *(selected)*

Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Corps Training Workshop. May 2011. *(sponsor & participant)*

Vernal Pools: *The Jewels of the Forest.* Technical Workshop for the Town of Southwick Conservation Commission. January 2005. *(Guest Lecturer)*

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

WORKSHOPS & CONFERENCES: *(selected)*

The Importance of Habitat Edges. Riverside Landscaping Conference. The Rivers Alliance of Connecticut. June 1998. (*Guest Lecturer*)

Riparian Buffer Function, Performance & Limitations. Urban Riparian Buffers Conference & Technical Training Session. April 1999. *(Guest Lecturer)*

Sedimentation and Erosion Control Review Session. USDA. Natural Resource Conservation Service and CPESC (Certified Professionals in Erosion Control), Concord, NH. September 2001.

Buffer Strips as Storm Water Quality Controls. EnviroExpo, Boston. May 1999. *(Guest Speaker)*

Identifying Wetland Soils, Fauna and Flora. Municipal Inland Wetland Staff Technical Workshops. June 1999. *(Guest Speaker)*

Water Quality in the Quinnipiac River: A Symposium on the Impact of Non Point Source Pollution in the Quinnipiac River Watershed. November 1998. *(Presenter)*

Our Hidden Wetlands: Vernal Pools in Connecticut. Co-sponsored by CT DEP and the Center for Coastal and Watershed Systems. November 1997 and January 1998 *(Workshop Leader)*

Aquatic Invertebrate & Stream Ecology Workshop. Quinnipiac River Watershed Association Workshop Series. September 1997, May 1998, June 1999, January 2000 (*Workshop Leader*)

The Massachusetts Association of Conservation Commissions Third Annual Conference: Wetland Buffer Zones, March 1996 (*Guest Lecturer*)

16th Annual Conference of the Society of Wetland Scientists: Wetland Understanding, Wetland Education, May 1995 (*Presenter*)

Quinnipiac River Watershed Association Forum on Non-Point Pollution: Significance of Wetlands and Wetland Buffers, October 1992 (*Guest Lecturer*)

The Massachusetts Association of Conservation Commissions Second Annual Conference, April 1995 (*Guest Lecturer*)

The Society of Soil Scientists of Southern New England Riparian Buffer Zone Conference, November 1994 (*Presenter*)

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

SUPPLEMENTARY INFORMATION:

1996 to present

Rema Ecological Services, LLC
Principal Environmental Scientist/Ecologist, Co-Owner

- Founded the company to provide natural resources management, environmental planning, compliance and permitting services, and client advocacy throughout the Northeast.
- Has participated in nearly 2,900 individual projects since the company's inception, including six gas-fired, combined-cycle power plant projects, 18 utility-scale solar projects, over 100 bridge projects, numerous municipal projects, including over 30 school projects, several higher education projects, numerous wetland replacement projects, several new golf courses, and many large residential, industrial and commercial endeavors, including several distribution centers.
- Was the Interim Environmental Planner/Wetlands Agent for the Town of Waterford, Connecticut, during a ten-month tenure. Responsibilities included providing procedural and technical support to the town's Conservation Commission (a.k.a. Inland Wetlands and Watercourses Agency) and working closely with Planning Department staff.

1994 to 1996

Fugro East, Inc. *(Currently AECOM)*
Senior Project Manager/Environmental Scientist

- Office Manager for the firm's Connecticut office, responsible for day-to-day operations, marketing, and business development.
- Wetland delineations in accordance with state and federal criteria.
- Natural resource inventories of upland, wetland and aquatic ecosystems, specializing in wildlife habitat assessments.
- Preparation of environmental compliance documentation for over 100 projects including large-scale commercial development.

1993 to 1994

A.D. Marble & Company, Inc.
Senior Environmental Planner/Wildlife Biologist

- Participated in the management of major transportation improvement projects and in the preparation of environmental documents in accordance with the National Environmental Policy Act (NEPA) while continuing involvement in the collection of baseline field data.
- Application of the Pennsylvania Department of Environmental Resources (PADER) hierarchical methodology for the selection of suitable wetland replacement sites.
- Field verification of Threatened, Endangered or Special Concern species listed by the Pennsylvania Game Commission.
- Wetland boundary identification in accordance with the unified PADER and U.S. Army Corps of Engineers (USACOE) methodology.
- Participated in nearly 30 projects, mostly for major transportation corridors, such as the rehabilitation of the I-95 corridor in PA.

Professional Resume: *(continued)*

George T. Logan, MS, PWS, CSE

SUPPLEMENTARY INFORMATION *(continued)*:

1989 to 1993

Soil Science & Environmental Services, Inc.
Wildlife Biologist-Ecologist & Soil Scientist

- Project Manager responsible for field operations and report preparation for nearly 300 individual projects in over 75 towns in New England, including one town-wide wetland mapping, inventory and evaluation project (Town of Cromwell).
- Wetland boundary delineation according to state and federal criteria (e.g., Connecticut and Massachusetts Statutes, U.S. Army Corps of Engineers methodologies).
- Ecosystem analyses and biological inventories of upland areas, tidal and inland wetlands, estuaries, streams, rivers, ponds and lakes.
- Environmental impact evaluations, including site plan review, analyses of proposed impacts and design of mitigation strategies.
- Local, state and federal permitting for impacts to natural resources, including wetlands.
- Implementation of water quality monitoring programs for streams and rivers.
- Design, construction supervision, and monitoring of wetland enhancement, restoration and creation.
- Aquatic biosurveys of streams and rivers utilizing standardized methods (e.g., EPA Rapid Bioassessment Protocols).
- Detailed faunal surveys and censuses using both active and passive methods (e.g., direct and indirect observation, live-trapping, point count avian censuses, pellet counts, etc.).
- Expert witness testimony for court and administrative proceedings.

1988 to 1989

Independent Contracts
Soil & Wetland Scientist

- *Summer of 1988*: Was hired by the Town of Canton, CT, to identify, inventory, and evaluate wetlands and watercourses within the entire municipality. Was responsible for amending the municipality's *Official Wetland and Watercourses Map*.
- *Spring of 1988*: Was hired by the Connecticut Chapter of the Nature Conservancy to determine and report on the historic expansion of invasive plants (*Phragmites australis, Lythrum salicaria*) on eight TNC preserves. Scope included site visits, remote sensing using archived aerial photographs, and report.

TECHNICAL REPORTS:

Mr. Logan has completed over seventeen hundred comprehensive studies (e.g., Wetlands Assessments, Ecological Evaluations, Environmental Impact Analyses/Statements, Vernal Pool Investigations, Listed-Species Surveys & Management Plans, Aquatic Vegetation Surveys), and a variety of other specialized studies. A representative list, or examples of these technical reports can be provided upon request.