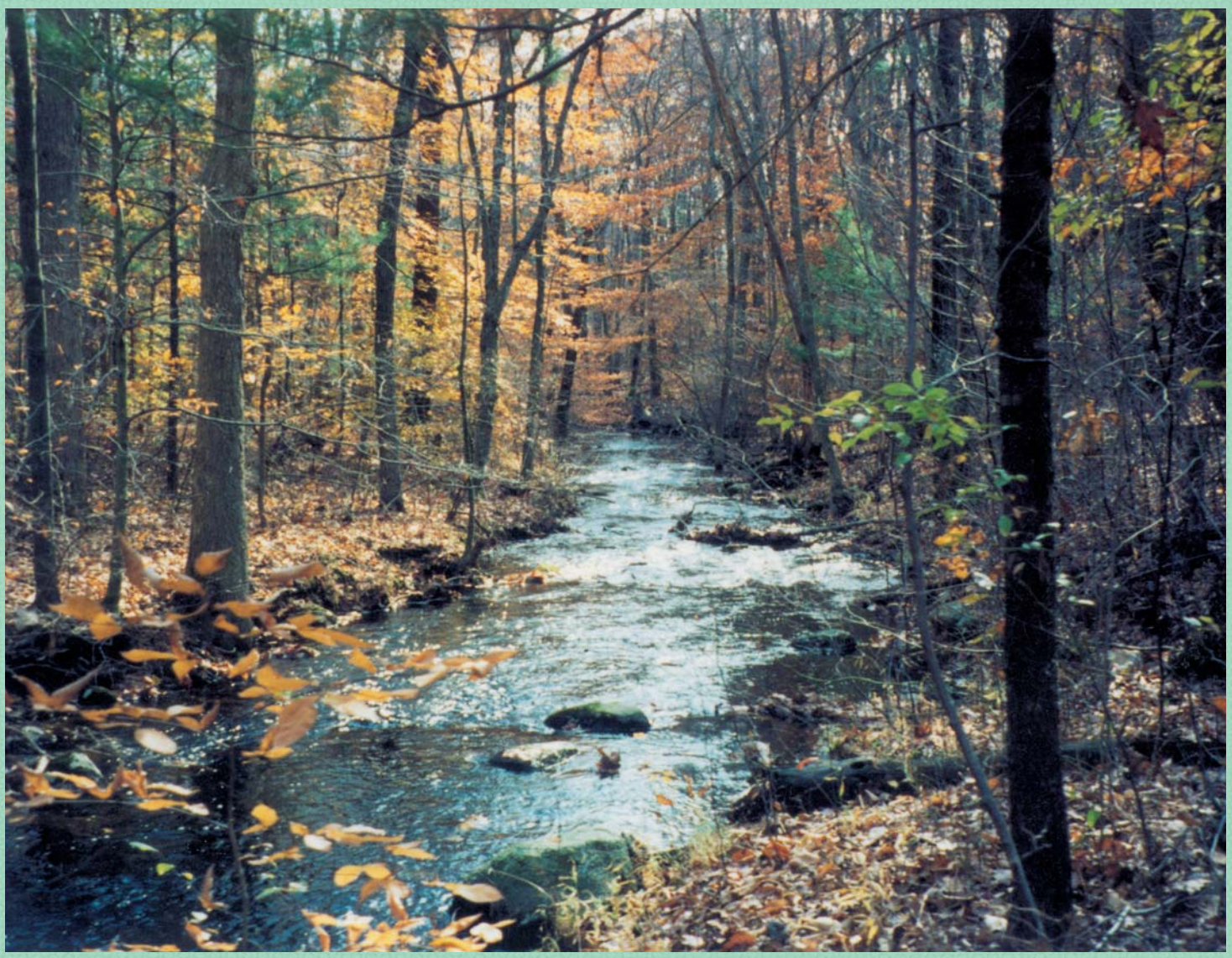
TOWN OF GUILFORD, CONNECTICUT

Natural Resource Inventory and Assessment

January 2005



Neck River, Guilford, CT

Produced by the Natural Resource Inventory Committee
A Subcommittee of the Guilford Conservation Commission

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Natural Resource Inventory and Assessment

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Preface

In accord with its charge to manage the Town's natural resources, the Guilford Conservation Commission is pleased to present this first edition of the Natural Resource Inventory and Assessment (NRIA). In this document the reader will find a broad array of factual information from diverse sources, gathered for the first time in one document. Maps developed from the Town's Geographic Information System and other sources illustrate the locations and inter-relationships of these resources.

The *Plan of Conservation and Development* (2002) and the *Plan for Open Space and Municipal Land Needs* (1999) call for completion of a natural resource inventory, and the Guilford Conservation Commission has been given the responsibility for developing and maintaining such a document. In May 2002, the Conservation Commission (CC) voted unanimously to establish a Natural Resource Inventory Committee (NRIAC) with a Mission Statement as presented on page 4. Three members of the CC and six members of the community at large were appointed to the NRIAC. The group subsequently added to its ranks various individuals in a research and advisory capacity with professional experience in related fields. Each of these in turn consulted with other experts and reference materials, bringing together disparate sources of . information to supplement their own contributions.

The NRIAC carried out its initial work over a two-year period, resulting in this first edition. The NRIA is an effort that goes beyond the publication of this document, and will continue to evolve for as long as questions remain and new data is uncovered. Additional work is being planned by the CC in order to add to and refine existing data and analysis, and to create future editions. We hope that more citizens of Guilford who are skilled in scientific observation and/or presenting and organizing data will want to participate in the process of adding to the body of knowledge presented here.

We hope that the NRIA will serve both as a tool for those Town officials whose responsibility it is to maintain Guilford's quality of life, and as an educational reference for all citizens interested in supporting natural resource conservation. The document is designed to be informative and practical without being excessively technical. Numerous references are given for those seeking technical information.

Questions, comments, or additional information from the general public and natural resource professionals are encouraged. These should be directed to the Conservation Commission Chairperson, Guilford Town Hall, 30 Park Street, Guilford, CT 06437.

Conservation Commission
January 2005

Acknowledgments

The Conservation Commission wishes to express gratitude to the many individuals who in some way contributed to Guilford's first Natural Resource Inventory and Assessment.

The original Natural Resource Inventory Committee consisted of the following people who volunteered their time and expertise in the early phases: Jennifer Allcock, Linda Anderson, Shelley Green, Lisa Herrmann, Malcolm Hill, William Johnson, Charles Magby, James McDougal, Erin O'Hare, Bob Richard and Sally Richards. Thanks also are due to key members of Town Boards and Commissions who provided feedback and advice on early drafts.

During the second year of work, four volunteers became the primary authors and they are to be sincerely thanked for their contribution of professional knowledge and skill and their commitment of many hundreds of hours spent on finalizing this document. The primary authors were: Jennifer Allcock, (landscape designer and Chair, Conservation Commission), Shelley Green, (conservation biologist), William Johnson, (Chair, Land Stewardship Committee) and Erin O'Hare (land use planner).

Special thanks are also due to Leslie Kane, Guilford's Environmental Planner and GIS Administrator. Her knowledge of Guilford has added immeasurably to this effort. Without her patience and technical expertise, the Map Atlas would not have been possible. Mary Repetti provided valuable graphic and design services and Lyrob Graphics provided the typesetting services.

In addition, the following advisers made significant contributions: Kevin Clark, Carolie Evans, Laurie Gianotti, Jim Gibbons, Robert Gordon , Cindy Kobak, Judy Preston, Noble Proctor, Paul Proulx, Bob Scott, Jerry Silbert, Harvey Smith, Veronica Wallace, and Bill Yule.

Thanks are also due to the following organizations who contributed funds to make the publication of this document possible:

Town of Guilford
Protect Our Guilford
Guilford Community Foundation
Guilford Preservation Alliance

This first edition of Guilford's Natural Resource Inventory and Assessment was truly a team effort!

The Natural Resource Inventory and Assessment (NRIA) Committee

Mission Statement

Charge to the Natural Resource Inventory Committee from the Conservation Commission: July 2002

To create a comprehensive Natural Resource Inventory for the Town and to present such document in draft form to the Conservation Commission for approval, with amendments if needed, and subsequent dissemination to the Planning and Zoning Commission, other Town Commissions and other interested organizations and individuals.

The Natural Resource Inventory will be formatted to make it informative and practical for Town Commissions and land-use agencies, and other potential users.

Purpose of the Guilford Natural Resource Inventory

A primary purpose of the Natural Resource Inventory is to establish an information baseline that can enable Guilford's decision makers and land use agencies to make informed decisions regarding development, conservation, and natural resource management issues. This will be accomplished by producing a document that describes qualitatively, and to the extent possible, quantitatively, the diverse natural resources of the Town of Guilford. The Natural Resource Inventory will document the geographical location of these resources, the importance of these resources to the citizens of the Town, the threats to the health and integrity of these resources, and discuss the various strategies that can be used to protect these resources.

Plan of Action and Methodology

1. Assemble a work group (Conservation Commission's NRIA Committee and Advisory Group)
2. Determine the study area (NRIA Committee)
3. Form work teams (to research and assemble information on components of NRIA)
4. Assemble and review existing documents
5. Assemble existing maps related to NRIA components
6. Publicize the NRIA effort and solicit information and needs
7. Compile work team reports and maps and create draft NRIA document
8. Editing team formats and edits draft for approval by Committee
9. Print, publicize, and disseminate final NRIA document

Introduction

What are natural resources?

If we define natural resources in terms of values, in one sense they are the basic components of the environment that sustain the life and health of all creatures. In another, they are the riches of the natural world that sustain human economies and quality of life. Natural resources are the aquifers that provide our families safe drinking water. They are the hilltops, boulder-strewn woods, and tidal marshes where children first learn to explore the great outdoors, and where adults seek renewal and recreation. They are the open spaces and rocky ridges that shape our community's unique character and sense of place, while enhancing property values. Natural resources are fundamental to Guilford's heritage and quality of life.

What is a Natural Resource Inventory and Assessment?

A Natural Resource Inventory and Assessment (NRIA) is a compilation of data, descriptions, and maps to document the natural resources of a given geographic area. An information baseline is established and built upon by continued observation and research. Key functions of the NRIA are:

- documentation of the geographical location of resources
- display and summaries of existing data
- assessment of natural resource functions, health, and their relative importance
- analysis of the inter-relationships between natural resources
- identification of the stresses and threats to their health and integrity
- provision of benchmarks against which future change can be measured
- identification of additional areas for further study
- incorporation of new or revised information.

An NRIA provides an indication of what resources are likely to exist on a particular site, how sensitive they are, and whether or not closer examination is needed. This NRIA can also guide landowners to a fuller understanding of the resources over which they have stewardship.

Why does Guilford need a Natural Resource Inventory?

According to Guilford's *2002 Plan of Conservation and Development* (POCD), the Town is committed to managing its natural resources and protecting them from harm. In order to do so there must be a detailed understanding of what resources exist, where they can be found, and how they relate to one another. An NRIA is a tool to bring about such understanding. Used properly it can enable land use decision makers to protect the integrity of natural resources while providing for compatible residential and commercial growth. The NRIA could also be used to enhance residents' understanding about the environment in which they live.

While the Connecticut Department of Environmental Protection (DEP) continues to be an indispensable source of natural resource information, this data is often lacking in detail useful at a local scale. An NRIA can fill this gap by focusing on the unique array of resources that characterizes Guilford. For the first time, the Town will have data from DEP and many other sources assembled in a single document, so that it can be easily cross-referenced and analyzed. With this information, our land use agencies can make decisions with greater wisdom and accuracy. The Town will also be able to more effectively refine its *Plan of Conservation and Development.*

What are the goals of the NRIA?

This NRIA has been developed in order to:

- disseminate accurate and practical knowledge of our environment to both town officials and the public
- promote conservation of the Town's native plants, animals, and ecosystems

- identify those areas in which knowledge is lacking
- establish a framework and impetus for future study
- facilitate natural resource-based conservation and development planning

The ultimate goal of producing the NRIA is the maintenance of a healthy, functioning environment, and the preservation of Guilford's quality of life. It is the Conservation Commission's role to assist the Town in realizing these goals.

Who should use this document?

Town Staff
Town Boards and Commissions
Non-governmental organizations
Developers
Landowners
Guilford Land Conservation Trust
Shoreline Outdoor Education Center
Teachers and students
Tourists and visitors

How is this document organized?

The NRIA is divided into two documents: descriptive text and a separate Map Atlas (11x17 inches) that illustrates spatial data for each resource and combined data layers to show important relationships among them.

How were the maps compiled?

The software in Guilford's Geographic Information Systems (GIS) assembles, stores, and manipulates spatial data and can help users analyze data for conservation and planning purposes. The GIS is located in the office of the Town Environmental Planner.

What is the Geographic Information System (GIS)?

GIS software assembles, stores, and manipulates spatial data and can help users analyze data for conservation and planning purposes. The GIS located in the office of the Town Environmental Planner was used to produce most of the natural resource maps found in the Atlas. Many of the data layers used here were acquired from agencies (e.g, DEP, NRCS), while others were created specifically for this project.

How will this NRIA be updated and revised?

One of the goals of the NRIAC is to provide a structure around which future investigators can organize incoming data and more detailed studies. This NRIA therefore includes a section in which known gaps in the data are listed on page 11, with suggestions about areas in which future efforts should be focused. The Conservation Commission will be responsible for organizing further studies, verifying information in the field ("ground-truthing"), and describing any changes in the resources over time.

Besides its paper form, this document will be available electronically. As new data is gathered, the GIS can update the maps found in this document. The Town website will be available to provide easy access to the NRIA by both the public and town officials. New or corrected information will promptly be made available to all land use agencies in Guilford.

Part III Map Atlas

See 11" x 17" separate document

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PART III MAP ATLAS

Sources of Data

The maps included in this atlas were developed using ESRI's ArcView 3.3 program. The maps are spatially accurate with varying degrees of on the ground accuracy depending on the data used to create them. The maps should be used for planning purposes only and are for the most part not considered to be accurate to the parcel level. The exception to this is the Aerial photography, which, by its nature, shows accurate photographic information.

Sources of data used in the creation of the NRIA Map Atlas include the following:

- SBC digital Orthophotography 2002 flight and planimetric data from 2002 flight
- Town of Guilford parcel data scanned from assessor's maps, rectified to road lines by Brodie Group and updated to 2002
- FEMA data 2002
- GDT Road data 2000
- CT DOT road data 2000-2001
- CT DEP data (including USGS, EPA, and USDA data) from 2002 and 2003
- Data produced by USDA NRCS in conjunction with their Guilford Community Land Use Project 2003-2004
- Data produced specifically for the Natural Resource Inventory to depict:
    - Coastal Features
    - Natural Scenic Resources
    - Trails and Recreational Areas
    - Wildlife Movement Corridors
    - Significant Wetlands, Rivers and Waterbodies
    - Outstanding Grasslands, Fields and Forests
    - Significant Natural Resource Areas.

All maps for this Atlas were created using the Town of Guilford Geographic Information System (GIS) during 2004.

Acronyms

CT DEP	Department of Environmental Protection
CT DOT	Connecticut Department of Transportation
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GDT	Geographic Data Technology, Inc.
SBC	Southern Bell Company
USGS	United States Geological Survey
USDA	United States Department of Agriculture

ACRONYMS

Acronyms used in this document follow their first usage in the text within each section. Readers are encouraged to use the following alphabetized list to identify acronyms found in the text.

ATVs	All-terrain vehicles
BMPs	Best management practices
CAM	Coastal Area Management
CBA	Coastal Boundary Area
CC	Conservation Commission
CFPA	Connecticut Forest and Park Association
CSF	Cockaponset State Forest
CT DEP	Connecticut Department of Environmental Protection
CWC	Connecticut Water Company
GIS	Geographic Information System
GLCT	Guilford Land Conservation Trust
GMP	Growth Management Plan
GPA	Guilford Preservation Alliance
GSC	Guilford Shellfish Commission
IMBA	International Mountain Biking Association
IWWC	Inland Wetlands and Watercourses Commission
LAC	Land Acquisition Commission
LCRFA	Lower Connecticut River Focus Area
MT	Mattabesett Trail
NRB	Natural resource-based
NRCS	Natural Resource Conservation Service
NRIA	Natural Resource Inventory and Assessment
NRIAC	Natural Resource Inventory and Assessment Committee
PA 490	Public Act 490
POCD	Guilford's *Plan of Conservation and Development* (2002)
PRC	Parks and Recreation Commission
PZC	Planning and Zoning Commission
SBC	Southern Bell Company
SCCRWA	South Central Connecticut Regional Water Authority
SNRA	Significant Natural Resource Areas
TROTS	Trail Riders of the Shoreline
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WWTC	West Woods Trail Committee

Section A. GEOLOGY

See separate Map Atlas for map references

A.1 Introduction

The geology of any area is interesting and important primarily because it constitutes the foundation and context of all other natural resources. The geological resources of Guilford

- offer tangible evidence of cataclysmic events of the distant past
- shape our scenic hillsides, valleys, ridges, outcrops, and coastline
- determine the characteristics of our soils, indirectly determining the flora and fauna that the soil supports
- determine flow of surface and sub-surface water
- determine location of aquifers
- contribute to water chemistry of freshwater ecosystems
- are major determinants of human settlement patterns and development constraints
- form structures that provide specialized habitats

Aside from historic granite extraction and some small sand and gravel operations, Guilford is not known for its mineral wealth and supports no active quarries or mines. There are no gemstones (except isolated occurrences of garnet) and the only semi-precious minerals present are quartz and feldspar.

This section relates the evidence of geologic history to specific sites in Guilford and points out the interrelationships of geological resources with other natural resources. The Town's geology, like Connecticut's as a whole, is varied and complex, mainly because of its location in an ancient collision zone of the earth's tectonic plates. Some understanding of geologic history helps to appreciate both the regional context and the relationships among Guilford's varied landscape features. However, as a detailed natural history is beyond the scope of this document, the reader is encouraged to study one or more of the excellent text references listed at the end of this section.

A.2 Geographic context

The linear distance between the point of Sachem's Head, Guilford's southernmost coastline feature, and the Durham border on the north, measures about 13 miles. East to west, the Town spans six miles at its widest. In terms of actual land area, it contains 47 square miles.

Guilford lies almost entirely in the landscape region of Connecticut called the Coastal Slope, a zone that begins approximately 12 miles north of the coastline. In this zone the plane of hilltop elevation decreases at a slope of about 50 feet per mile, about twice the slope of zones further inland. The typical elevation of hilltops near the Town's northern border is 400 to 500 feet above sea level. The northwest corner of Guilford is exceptional in that it technically lies outside the Coastal Slope and is part of the Central Valley landscape region. The Town's highest hilltop elevation, 720 feet, is located in this zone. This spot is 12 miles north of the coastline, at the northeastern end of Totoket Mountain, in the area of Bluff Head. Here Totoket Mountain presents 420 feet of vertical relief relative to the nearby Coginchaug River valley. The Town center, by comparison, lies just 20 feet above sea level.

The West River valley, Guilford's largest drainage basin, drops from Lake Quonnipaug (elevation 180 feet) to sea level at a slope averaging 25 feet per mile. (See *Section C. Freshwater* for a full description of river basins and other water features.)

A.3 Outstanding Geologic Features

Guilford's rugged topography is obvious to the casual observer, but to appreciate the uniqueness of this landscape beyond scenic value, it is helpful to understand the ancient origins of the Town's plentiful rock outcroppings. *Map A-1* presents a highly simplified locational guide for 11 of our most familiar landscape features, along with a variety of water features, with the bedrock composition of these features. The following table summarizes information found on the map.

Table A.1 Guilford's Outstanding Geologic Features

Map Reference #	FEATURE	LOCATION	Bedrock composition or other description
1	Eastern Border Fault	N. Guilford parallel to Route 77	Divides two rock types
2	Bluff Head & Totoket Mountain	NW corner	Traprock-basalt
3	Quonnipaug Mountain	W of Lake Quonnipaug, north of Town Beach	Traprock-basalt Sandstone-arkose
4	Meetinghouse Hill	Great Hill Rd, Wilburs Lane to West St.	Traprock-basalt Sandstone-arkose
5	Sugarloafs	Between Great Hill Road and West St.	Traprock-diabase
6	Talus slope	Between Bluff Head and Myerhuber Pond in N. Guilford	Basalt fragments from Bluff Head
7	Diabase dike	SW and parallel to Border Fault	Traprock-diabase
8	Pegmatite hills	Broomstick Ledges and Braemore Preserve, E of Rte 77 in N.Guilford,	Schist, gneiss quartz/feldspar/mica
9	Granite ledges	SW corner, Westwoods and coast	Granite, Granite gneiss, quartzite
10	Ancient lake bed	Near Durham border along Route 77, including Braemore meadow	Shale beneath, stratified drift at surface
11	Outwash plain	Downtown and vicinity	Gneiss beneath, sand and gravel at surface

Many other interesting geologic features lie within Guilford on or near the land surface. These are too numerous to mention or identify on the map. The reader is encouraged to explore our Town's many land preserves to experience the remarkable diversity of rock formations. Some are typical of the region, others unique, but all contribute to the Town's natural beauty and our knowledge of its geologic past.

A.4 Bedrock Materials

Bedrock is the mostly invisible structural component of our landscape, resulting from geologic processes beneath the earth's surface. *Map A-2* presents a schematic of Guilford's chief bedrock types. Though simplified for emphasis on the major features, the map conveys the complexity of a mostly hidden resource to which few

of us give much thought. The reason for this complexity is that Connecticut is actually composed of four ancient, distinct land-masses dating from the time of the continental collisions. The borders of Guilford encompass portions of three of these land-masses, each of which corresponds to distinct groups of bedrock types. The lines along which the land masses adjoin each other are known as a contact zone or fault.

Running diagonally across North Guilford is the most significant dividing line, the Eastern Border Fault *(1)*, which divides the two landscape regions of which Guilford is a part: Central Valley on the northwest and Coastal slope on the southeast. The difference in rock types on either side of the Fault can be best observed along Route 77 near the Bluff Head parking area.

The various bedrock types lie in roughly diagonal bands. Remarkably, a walking trip up the west side of Guilford takes one across 12 different bedrock zones. Bedrock maps are generalized, so many borders between rock types are approximate. It is useful to compare *Map A-2* with *Map A-1* to see how it corresponds with Guilford's familiar topographical features. Exposed bedrock plays an important role in formation of soils by weathering, and is often host to pioneer plant communities. Rock surfaces are a preferred habitat for many lichens and mosses. The presence of lichens is a significant indicator of air quality.

Traprock and Related Formations

The Eastern Border Fault offers the best evidence of the continental movements and resulting diversity of bedrock in the Guilford area. After the final collision the land to the west of the fault (and other faults running through central Connecticut) began to sink as the continents pulled apart. Lava oozed up and flowed over the surface three times during this period. Because of the varied origins and extended chronology of the flows, geologists have given several names to the cooled and crystallized lava, the primary ones being basalt and diabase (or dolerite). All rock of this type is generally called traprock, derived from the German word for stone steps, because of the step-like structure of cliff faces formed of traprock. Exposed traprock formations and their associated cliffs are found throughout Connecticut's Central Valley region; as an aggregate they are known as the Metacomet Ridge system. Traprock has been actively quarried for road construction material in many Connecticut towns, but never in Guilford. Examples of this kind of bedrock in Guilford are Bluff Head, Totoket Mountain, Quonnipaug Mountain, Meetinghouse Hill, and the Sugarloafs *(2 through 5)*. A number of smaller, unnamed examples of exposed traprock lie scattered throughout the northwestern part of Town, and some can be seen from roads.

The Metacomet Ridge system is known for its dramatic cliffs, including Bluff Head. Bluff Head is unique in that its cliffs face east, while the other ridges' face west. A study of Bluff Head's ecosystem compared to ecosystems of the other ridges may reveal further unique aspects of this scenic landmark. As a traprock cliff slowly crumbles it creates a talus slope, an apron of rubble extending outward from the foot an escarpment. At the foot of Bluff Head lies a magnificent example of a talus slope *(6)*. The apron extends 200 feet east from the base of the cliffs and into the waters of Myerhuber Pond. (*See Section D. Uplands* for more information on this unique habitat.)

Strangely separated from Guilford's other volcanic features is a long, narrow band of diabase traprock *(7)* that cuts across town just south of, and roughly parallel to, the Border Fault. Here magma was injected through a dike into the surrounding metamorphic rock, then partially exposed by erosion of the surrounding material. The exposed portions form a discontinuous line of small ridges characterized by steep boulder slopes. These are visible in a number of locations: Hoop Pole Road near Our Lady of Grace Monastery, on Guilford Land Conservation Trust (GLCT) land between Hoop Pole Road and Dudley Farm, near Long Hill Road just south of Route 80, near North End Colony, and near Clear Lake at the North Branford line.

Sedimentary Formations

Sedimentary rocks typical of Connecticut's central rift valley are closely associated with the traprock formations abutting or underlying them. During the long process of erosion following the mountain building period of the continental collisions, many layers of material were deposited and the lava flows emerged from beneath these layers. This rock consists of shales, sandstones (especially arkose, or brownstone), and conglomerate. These interesting rocks can contain fossil evidence of ancient life. Conglomerates were formed at the edges of lava flows that mixed with sand and gravel deposits before cooling. All of these rock types are visible to the careful observer in the vicinity of Bluff Head *(2)*, Quonnipaug Mountain *(3)*, and Meetinghouse Hill *(4)*, particularly along Hemlock Avenue.

Gneiss, Schist, and Granite

Metamorphic rocks, considerably older than the traprock and sedimentary formations, are predominant east of Route 77 (and the Fault) and south of Route 80 all the way to the Sound.

To the east of Bluff Head and to the north of Lake Quonnipaug rise the rugged Broomstick Ledges and other highlands extending into Madison and Durham. The bedrock formations here are highly complex, composed of a combination of schist, gneiss, and amphibolite, often shot through with quartz and feldspar pegmatites and micas. These "pegmatite hills" *(8)* are the roots of primeval mountains that rose during the continental collisions, and weathering and erosion has reduced the topography three to five miles in elevation from where the surface originally was. Different rates of erosion within the land-mass itself has resulted in a highly irregular bedrock surface. The pegmatite knobs are exceptionally resistant and help form the highest elevations. In combination with surficial processes (See below), this differential erosion has created the rolling landscape we see today. The northwest-to-southeast elongations of bedrock hills reflect the dominant trends or "grain" of the bedrock structure, which coincidentally matches direction of movement of the glaciers.

Extending from beneath Long Island Sound to U.S. 1 are extensive bands and granitic gneiss, pure granite, and quartzite in various mixtures. These are evident in the rocky uplands, ledges, and old quarry sites contained in the Westwoods area *(9)*. This is also the part of Guilford where upland and coast are in closest contact. The road-cuts on I-95 between Exits 57 and 56 also showcase these rock types, as do our coastal headlands and islands. Quarrying of famous Stony Creek granite in Guilford took place in the nineteenth and early twentieth centuries and is still active.

A.5 Glacial Impact and Surficial Materials

Glaciers began forming in the Northern Hemisphere about three million years ago. Since then the southernmost portions of these glaciers covered Guilford on at least two occasions. At the end of the ice age, the last of the glaciers' mineral holdings were released with the melting ice.

- Evidence of the glacial period abounds in Guilford's uplands:
- northwest-southeast axis of hills: present earlier, but accentuated by glacial movement
- striations: deep scratches in bedrock from material dragged by the ice
- plucked boulders from the south ends of bedrock outcrops
- "erratic" boulders from the far north bearing no relation to the underlying bedrock
- kettles or depressions formed from detached chunks of ice buried by sand, are the sites of many of our present day swamps and vernal pools
- scoured river valleys and outwash plains
- large deposits of till and stratified drift

Many of these items are considered surficial materials, formations born of bedrock while exposed to hydrological, atmospheric, and glacial processes. (See *Map A-3.)*

Glacial Till

Most of Guilford's hilltops (bedrock protrusions) are covered with an average of ten feet of till, a mixture of stones, silt, and clay. Valley floors may be composed of anywhere from 30 to 200 feet of till. Till therefore comprises the majority of the town's land surface, as is evident on *Map A-3.* The many stone walls built in the course of clearing farm and pasture land across our town are composed of rocks originating in these glacial deposits.

Stratified drift

Following the last glacier, streams began to flow freely through the valleys, carrying material picked up by the glacier. The streams were dammed by debris in certain areas. Where the streams flowed into these glacially-created lakes and ponds, the water slowed and finer sediments fell out, creating deltas of gravel and sand at the mouths and filling the lake beds with clays.

The flat expanse on both sides of Route 77 in the vicinity of Bluff Head Farm is a fine example of what was likely to have been a lake bed *(10)*; sand and gravel now under excavation to the north indicates a

former river delta. This material, also known as outwash or alluvium**,** overlays the much older sedimentary bedrock that fills the fault valley. The height-of-land running across the highway just north of the Bluff Head parking area was likely formed by a fringe remnant of melting glacial ice, creating the dam for the glacial lake behind it. This feature has become the divide between the present West River basin to the south and the Coginchaug River basin to the north.

Map A-3 shows the different types of drift and how these deposits are associated with the courses of the East and West Rivers. Because stratified drift usually is porous enough to trap water, these deposits can be valuable sources of drinking water. Aquifers are often found in areas of deep stratified drift. The deeper the deposits, the more water they are likely to contain. (See *Section C. Freshwater.*)

Rivers and Lakes

Our major rivers, the East and the West, generally follow the course of valleys sculpted by the glaciers. None of our present-day named ponds or lakes, including Lake Quonnipaug, is a direct result of glaciation; rather, these are glacial valleys with surface flow that was dammed by humans to produce the bodies of water we see today. (See *Section C. Freshwater.*)

Outwash Plains

The volume of glacial outwash increases closer to the shore. The nearly level surface on which downtown Guilford is built is an outwash plain *(11)* of glacial sand that slopes gently seaward until it disappears under the Sound. Water flowing from the melting ice cut stream valleys into the outwash plain which were later "drowned " by the rising sea, and are the sites of our present-day tidal wetlands. (See *Section B. Coast.*)

Coastal Formations

De-glaciation was an important factor in shaping and creating Guilford's coastline. At the point of the glaciers' maximum advance southward, sea level was 300 feet lower than today and it continues to rise.

- Drowned coastline occurred in Guilford when rivers flowed over the bed of what is now Long Island Sound, and eventually part of it became a lake. Rising sea levels then flooded the lake, drowning the coast and setting in motion the evolution of our shoreline, which is still in progress. Guilford (along with the rest of New England) lacks the elevated coastal plain sediments typical of coastlines further south; they are submerged here. Our coastal marshes and river estuaries resulted directly from this process.
- Recessional moraines are discontinuous deposits of debris left by relatively brief standstills of the glacier as it receded northward. They are hidden beneath the Sound off our coastline. There are no terminal moraines – deposits where the glaciers began to recede – in Guilford.
- Faulkner's Island is not a moraine but an isolated pile of glacial till. Likewise, most of the small islands off Guilford's shore are bedrock knobs that once crowned hills of the coastal slope.

A.6 Soils

Soil is the matrix of both organic and inorganic materials that are an end product of geologic processes. It is formed primarily from the weathering of parent material, be that till, drift, or bedrock. The parent material determines the textures of soil layers, and texture affects how readily water moves into and through the soil. Water in turn adds materials to soil by depositing eroded sediment from upland areas. These geological and hydrological processes are responsible for creating the vast number of soil types identified and categorized by scientists.

The *General Soil Map of Connecticut* (1978) shows at least nine basic soil types within Guilford. *Map A-4* presents simplified soil data for Guilford, based primarily on the soil's drainage capacity. Certain soil categories are associated with wetlands, and can therefore be used to determine wetland boundaries on a given site. *(See Section C. Freshwater.)*

Lichens, which are commonly found attached to ledge surfaces in Guilford, help speed up rock decay, and can contribute to a succession of higher organisms if the rock surface is relatively flat. As soil is

formed, green plants, then trees, gain a foothold. This in turn helps the soil resist erosion and assists in further breakdown of parent material. The activity of insects and worms, the decay of dead plant and animal matter, and agricultural activity contribute to the subsequent character of the soil's upper layers. Soil is lost at a faster rate that it is created, as the forces of erosion by wind and water reduce soil layers where there is high exposure, steep slope, or a loss of vegetative cover. (See *Section E. Agriculture* for more soil information).

A.7 Steep Slopes

The varied topography of Guilford adds greatly to its scenic attractiveness as well as its recreational appeal. Terrain influenced early settlement and subsequent layout of the Town, as the first areas to be developed are those with the gentlest terrain. The locations of roadways, agriculture, homes, and industry are influenced by slope. Steep slopes present significant challenges to development and, when disturbed, results in risks to natural resources. From a natural resource standpoint, steep slopes provide refuge for wildlife, rapid water recharge for wetland and riparian zones down slope, and zones of localized climatic conditions, called microclimates, that support rare communities of plants and animals.

Map A-5 shows contour lines and slopes 25 percent or greater. A 15 percent slope is defined as a one-foot rise or drop over approximately 6 feet, 8 inches horizontally. A significant portion of Guilford's topography is characterized by terrain with a 15 percent slope or greater. Land with a 25 percent gradient (a one-foot rise or drop over 4 feet horizontally) is found primarily in the northern third of Town and among the rocky knobs in Westwoods; otherwise it is scattered and small in area. Most steep slopes in Guilford are associated with shallow depth-to-bedrock soils and exposed ledge. Such sites are generally unsuitable for septic systems, and historically have been prime candidates for preservation in a natural state.

A.8 Threats and Concerns

Such features as traprock ridges, boulder slopes, narrow valleys, and marshy basins continue to be refuges and travel routes for animal species, and havens for rare or remarkable plants. For example, because of its localized climate conditions, Bluff Head and its surrounds provide the southernmost edge of range for certain plant and animal species.

As part of the Metacomet Ridge system of Connecticut's Central Valley zone, Bluff Head and Totoket Mountain are recognized on a state level as deserving of the utmost conservation measures. See *Appendix H-2* for the Metacomet Ridge Compact, to which Guilford is signatory.

Development of steep slopes increases the risk of environmental degradation downslope, as surficial resources are vulnerable to accelerated erosion. Accelerated erosion is a problem in Guilford, particularly on stream banks where vegetation has been disturbed and is not allowed to recover.

Blasting of bedrock often occurs in conjunction with roadway installation or improvements. The possibility that blasting may have negative effects on nearby aquifers and wells deserves further study.

A.9 Summary

Guilford's geological features and topography are largely responsible for the Town's scale and character. The habitats they support provide shelter and sustenance for plants and animals and their variety provides numerous natural resource based recreational activities. Since Guilford's charm and quality of life are based so clearly on its geological features, it is important that ridges, slopes, valleys and basins be respected when such lands are developed.

References

Bell, M. 1985. *The Face of Connecticut: People, Geology and the Land (Bulletin 10)*. Hartford, CT: State Geological and Natural History Survey of Connecticut

Flint, R. 1971. *The Surficial Geology of the Guilford and Clinton Quadrangles (Bulletin 28)*. Hartford, CT: State Geological and Natural History Survey

Gordon, R. and J. Ague Aug. 2003 (Yale University); e-mail communications

Lee, C. 1985. *West Rock to the Barndoor Hills: The Traprock Ridges of Connecticut*. Hartford, CT: State Geological and Natural History Survey of Connecticut

Lewis, R., Oct. 2002. Connecticut State Geologist; field trip in North Guilford

U.S. Geological Survey: bedrock and topographic maps. http://erg.usgs.gov/

Appendix – none

Maps

A-1 Outstanding Geological Features

A-2 Bedrock Materials

A-3 Surficial Materials

A-4 Wetland and Prime Farmland Soils

A-5 Topography

Section B. COAST

See separate Map Atlas for map references

B.1 Introduction

Guilford is fortunate to be one of 26 coastal Connecticut towns that front on Long Island Sound. Our unique coastline is a major determinant of the Town's character and quality of life. The coastal zone is rich in wildlife habitat, recreational opportunities, and scenic beauty. The views along our coast also serve to remind us of the Town's intimate relationship with Long Island Sound, a resource shared with other communities along the shoreline. This section describes the varied resources of our coast and explains how the Sound, the coast, and the upland areas are interrelated and interdependent.

B.2 Definition and Components

The coastal system is situated where the land meets the sea, and is comprised of marine and upland systems and species and the interactions between them. It is in a constant state of change, responding to a continuum of short- to long-term forces. These include short-term fluctuations from tides and stormwater runoff, seasonal changes in light, temperature, diversity and abundance of marine resources, and long-term changes such as rising sea level. Overlain on these natural changes are human influences.

Several ecosystems comprise Guilford's coast. Tidal wetlands are found in transitional zones between terrestrial and aquatic systems and are characterized by specialized plant species. The Town's tidal wetland complex includes high salt marsh, low salt marsh, salt pannes, and mud flats. Tidal wetlands are found around small embayments, especially in areas where tidal creeks empty into the Sound. These areas are components of estuaries – semi-enclosed coastal waters where fresh water from rivers, creeks, or ground water mixes with salt water. Rocky intertidal habitats, benthic (bottom) habitats, shoals, islands, and pelagic (open-water) habitats are also important components of Guilford's coastal system.

Salinity is an important factor in any coastal region. Salinity gradients characterize and organize vegetation and wildlife in tidal marshes. As freshwater from Guilford's rivers dilutes saltwater in the river estuaries and the Sound, salinity levels range from less than 0.5 parts per thousand (ppt) in freshwater tidal marshes, to 20 to 30 ppt in tidal wetlands and 27 to 32 ppt in Long Island Sound. As salinity decreases, species diversity increases. By the time salinity averages 15 ppt, there is a distinctive brackish marsh community. Where salinities average 5 to 8 ppt, typical salt marsh plants and animals largely disappear. (See *Section C. Freshwater.*)

Open water, shoals and islands, beaches, and rocky headlands are also important components of Guilford's coastal system. The mouths of the Town's rivers and streams can be considered a series of estuaries opening into Long Island Sound. Due to the shelter provided by Long Island, the Sound is itself an estuary of the Atlantic Ocean.

B.3 Location

For the purposes of the NRIA, the inland boundary of Guilford's coastal system is that defined by the 1980 Connecticut Coastal Area Management Act (CAM), namely, the greater of one of three zones: a boundary 1,000 feet inland from the mean high water mark, the 100-year coastal flood zone, and a 1,000 foot setback from tidal wetlands (See *Maps B-1* and *C-2.*) The CAM area includes sections along both sides of the East and West Rivers, as well as most of the downtown area between them south of I–95.

The linear distance on the coast between the Branford Town border and the Madison border at Grass Island is only four miles. However, the Guilford coastline is more than three times as long because of its many

coves and inlets. The dominant feature of the Guilford shoreline is its rocky shorefront; tidal wetlands exist along 17 percent of the shoreline. Guilford's coastal area includes Faulkner's Island and coastal waters to the mid-point of Long Island Sound.

Eight rivers, including the East and West Rivers and Sluice Creek, flow from Guilford into Long Island Sound. Hoadley Creek drains Towner Swamp, a large freshwater wetland near the Branford Town line. Details of the numerous creeks, coves, bays, marshes, and river estuaries which constitute Guilford's coastline can be seen on *Map B-1* and *B-2*. Tides influence the lower two miles of Guilford's West River and the lower 3 to 4 miles of the East River. Saltwater tidal marshes and mud flats occur not only on Guilford's shorefront, they also extend up the West and East Rivers until salt water is diluted by fresh water from upstream.

Approximately 80 percent of Guilford's coastline is in residential ownership. Public owners on the shoreline include Connecticut DEP (294 acres), and the Town of Guilford (94 acres); Guilford Land Conservation Trust and National Audubon each own several small parcels. Beach frontage is primarily privately owned and there are more than ten private beach associations. Jacob's Beach is the only public beach, aside from a half-acre beach at Shell Beach on Leete's Island. (See *Appendix B Coastal Data.*)

According to the 2000 Census, more than 16 percent of Guilford's population (3,297 residents) live in the quadrangle between the East and West Rivers, I-95 and the coast. This area represents less than 3 percent (approximately 700 acres) of Guilford's total land area. Within the Coastal Management Area are four commercial and industrial areas: Boston Post Road East (includes Shoreline Plaza), the shopping area near the Town Green, Lower Whitfield Street (includes the area around the train station and the Town Marina), and the quadrant north of Amtrak bounded by Soundview Road, Route One, and South Union Street.

B.4 Importance

The natural resources of Guilford's coastal area are important for many reasons.

Food source. At the center of the food web that includes lobsters, clams, and oysters are one-celled plants called phytoplankton. These plants depend on a complex dynamic among mud, silt, tides, wind, currents, and sun. Eaten by animals such as mussels, snails, crabs, and minnows (which are themselves subsequently eaten by fish), phytoplankton could be considered the single most important element of any coastal system. Most of the fish that we eat start their lives in tidal wetlands. Tidal wetlands are one of the most biologically productive natural systems known, second only to rain forests. As twice-daily tides carry nutrients back and forth between the marshes and Long Island Sound, they also carry fresh water from upland areas and rivers into the Sound.

Wildlife habitat. Because of its abundant food supply, Guilford's coastal system serves as an important food source, breeding ground, nursery for raising young, and resting stop for thousands of migratory birds along the Atlantic Flyway, a major eastern migration route also used by monarch butterflies.

Ecosystem services. Through filtration, tidal wetlands improve water quality by reducing turbidity and restricting the passage of toxins. Tidal wetland vegetation stabilizes the shoreline and buffers erosion. Because of their capacity to absorb water, tidal marshes protect human property by dissipating waves during storms. Bivalves such as hard and softshelled clams also provide a cleansing effect by virtue of their filter feeding habit.

Commercial fishing. Historically, the coastal marshes and the Sound were primary sources of food for Native Americans and Europeans who settled in Guilford. Today lobsters, shellfish, blue and black fish provide activity for commercial fishermen in Guilford. The Guilford Shellfish Commission (GSC) issues annual leases for commercial fishing from clam and oyster beds off the coast and in the East and West Rivers. Shellfish from restricted areas are also trucked into Island Creek by commercial fishermen for a six-to-eight-week period of "cleansing" before being removed and relocated for harvesting from other locations. Oyster beds are managed by the Shellfish Commission on the East River and the West River. At another boatyard on the West River,

oysters and clams are raised in upwellers (docks) before they are planted in the Sound in an area rented from the Town off Joshua Point, where they grow to saleable size in three years.

Recreation. In seven Guilford coves, recreational shellfishing is permitted by the GSC, which sells recreational licenses to an average of over 700 persons per year, 17 percent of whom are from other towns. (See *Appendix B-2.)* GSC seeds shellfish from others areas into Guilford waters three times a year to supplement the recreational yield from the seven local shellfish beds.

Fishing, crabbing, boating, sailing, wind-surfing, paddling, kayaking and bird-watching are increasingly popular sports that attract many residents and others from out of Town. About 300 recreational vessels are accommodated in the Harbor's two rivers and the Town Marina. Winter storage is available at three locations in the West River, as are fuel and services. There are two launch ramps in the East River serving smaller boats on trailers, one at the Town Marina and the other at the State boat launch on Grass Island, accessed via Madison. Due to sediment from natural coastal erosion and upstream human developments, regular dredging is required to keep boating channels open for commercial boats and larger recreational craft. There is also a put-in ramp at Jacob's Beach. Public swimming areas are located at Jacob's Beach (which requires regular maintenance to remain a sand beach) and a small area of Shell Beach. Town-owned Grass Island is accessible from Guilford primarily by boat. For further information regarding recreational uses of Guilford's coast, see *Section I. Natural Resource-Based Recreation* and *Appendix I-1 Recreational Activities on Municipal Land.*

B.5 What makes a healthy coastal system?

There are a number of key factors that sustain any species, natural community, or ecosystem and maintain its integrity over the long term. A significant disruption in any of these factors will degrade the integrity of that system. These key factors include connectivity with adjacent systems (watersheds, uplands, Sound), water circulation and exchange with surface and ground water, storm events, movement of sediments, bathymetry (shape of the bottom), species interactions, and patterns of feeding, dispersal, and migration.

B.6 Characteristic Plants and Animals

Plants: The typical pattern of vegetation in salt marshes is related to elevation and tidal flooding. Portions of marsh covered by tides for prolonged periods are called low marsh. High marsh is the area covered by only very high (spring) tides, which occur during new and full moons or storms. Given the specialized nature of life in a salt marsh, many of Guilford's rare plants are found therein.

Low salt marsh is dominated by salt marsh cordgrass (also called smooth cordgrass or saltwater cordgrass (*Spartina alterniflora*), interspersed with mats of algae. Snails, crabs, a variety of insects, and some birds feed directly on salt marsh cordgrass. During high tides, pelagic finfish and benthic invertebrates such as crabs are found in salt marsh habitat feeding on both living and detrital (decomposing) matter.

High salt marsh is usually dominated by salt meadow grass (also called salt hay grass *Spartina patens*), which tends to create protective mats that provide shelter for numerous small animals. Other plants found growing in or near the low and high marsh are black grass (*Juncus gerardii*), spike grass (*Distichlis spicata*), salt marsh aster (*Aster tenuifolius*), sea lavender (*Limonium carolinianum*), salt marsh bulrush (*Scirpus robustus*), glassworts (*Salicornia* spp.), groundsel bush (sea myrtle, *Baccharis halimifolia*), black grass or black rush (*Juncus gerardii*), and marsh elder (*Iva frutescens*).

Specialized plant communities are also found in salt pannes - shallow, salty depressions found in salt marshes where the marsh is poorly drained. Typical plant species found in salt pannes include dwarf forms of salt marsh cordgrass, glassworts, marsh fleabane (*Pluchea odorata*), and salt marsh sand spurry (*Spergularia marina*).

Meadows of eelgrass once flourished in the shallow waters of the West and East River estuaries from just below mean high tide to a depth of about eleven feet. However, eelgrass, which requires sufficient light and low nitrogen levels, no longer grows in the Sound west of Clinton as a result of pollution. Seaweed beds continue to provide habitat for marine wildlife on Guilford's rocky coastline.

Fish and invertebrates: The many tidal creeks that run through Guilford's coastal marshes provide nurseries for crabs, snails, and shrimp. Common mummichog, striped killifish, sheepshead minnow, Atlantic silverside, eels and cunners, and winter flounder also thrive in our coastal marshes and coves. Crabs, oysters, mussels, clams, and worms are found in rocky reefs and mudflats along with bluefish, fluke, and striped bass.

Crustaceans and molluscs found in Guilford's coastal area include blue, red, green, spider, lady, hermit and fiddler crabs. Sand shrimp and American lobster are also present along with snails, periwinkles, mussels and Eastern oyster. Bivalve creatures such as hardshell clams (aka quahog, little neck or cherrystone) and softshell clams (aka steamers) are also found in Guilford's coastal waters.

Guilford Harbor supports a wide variety of fish, such as killifish, flounder, tautogs, blackfish, stripers and bluefish. Migratory fish such as menhaden, alewives, shad, striped bass, bluefish and eels join the flounder in spring in the West and East Rivers. These anadromous fish, born and spawned in fresh water, spend their adult lives in salt water. Because dams resulted in a dramatic drop in anadromous fish populations, a fish ladder was installed on the West River just above I-95. To increase the spawning area for migratory species, in 2003, the Connecticut DEP also installed a fish ladder at the Guilford Lakes lower dam.

Birds: Birds are the most conspicuous animals of coastal habitats and range from shorebirds to waterfowl and wading birds. (See *Appendix D-1 Birds of Guilford, Connecticut; Noble S. Proctor.)* Some birds are residents only in summer, spring, or winter. Most summer residents breed on the coast, which includes many species which do not breed elsewhere in the State. Some characteristic marsh breeders found on Guilford's coast are seaside sparrow, sharp-tailed sparrow, clapper rail, mallard and black duck. Beach nesters include the least tern and piping plover. Upland species include hooded warbler, white-eyed vireo and Carolina wren. Coastal migrants (transients) which feed on Guilford's marshes and mudflats include include plovers, turnstones, sandpipers, yellowlegs that nest in the Arctic tundra and winter as far south as South America. Birds of prey congregate along the East Coast primarily during autumnal migration, when large congregations of species such as sharp-shinned hawks can be observed.

A variety of waterfowl consists of dabbling ducks, diving ducks, and sea ducks, which can be found overwintering in and around Guilford's coast, particularly in the large bay between Hoadley Neck and Sachem's Head. Dabbling ducks are found in shallow waters such as tidal creeks, feeding along the waters' edge. Dabbling ducks feed on vegetation such as *Spartina* and invertebrates such as earthworms and snails found in the salt marsh. The most common dabbling ducks on Guilford's shore are black ducks, mallards and gadwall. Diving ducks such as red-breasted mergansers, buffleheads, and common goldeneyes occur in deeper (6 to 60 foot) water, feeding on submerged aquatic vegetation and bivalves such as hard and soft clams. In December hundreds of greater scaup and lesser scaup appear in tightly formed groups that remain separate from the other species. They are also found close to the rocks off Mulberry Point on the east side of Sachem Head. They remain in these tightly formed groups, often with heads tucked under wings, and occasionally break off to swim to the rocky shore to eat seaweed or to dive for food on the bottom. Sea ducks live in deep (20 to 60 foot) waters, except when they are breeding. Sea ducks use their diving abilities to feed on crustaceans and mollusks, particularly on blue mussels. The most abundant sea duck found in Guilford is the white-winged scoter. Other sea ducks include oldsquaw and common eider.

Guilford's salt marshes are favorite habitats for long-legged wading birds such as herons and egrets, and nesting sites for willets, rails, marsh wren, and seaside sparrow. Ospreys nest on platforms along and between the East and West Rivers.

Mammals: Mink, deer, raccoon, otter and red fox can be found in the coastal uplands and marshes. Seals have been seen in winter. Small rodents (such as the meadow vole and white-footed mouse), masked, short-tailed and least shrew varieties as well as muskrats and coyotes forage and nest within the marshes. The least shrew is listed as one of Connecticut's endangered species.

Amphibians and reptiles: the diamondback terrapin, a turtle, is the only species in the world limited to estuarine waters along the Atlantic and Gulf coasts. Terrapins feed on a variety of crustaceans, mollusks, and other invertebrates. Terrapins hibernate in the winter by burrowing in the mud of tidal creeks. They lay eggs in nests dug in unshaded, sandy areas above the high tide line. Until the late 1920s, diamondback terrapin meat was regarded as a delicacy. It was over harvested and became rare in Long Island waters until about the 1960s. Today, there are healthy, robust populations throughout Long Island waters. Highest densities of terrapins are found in Guilford's largest expanses of salt marsh and associated tidal creeks and channels. Turtles and snakes, frogs and toads can also be found in the coastal area.

B.7 Notable Coastal Areas

Notable areas within Guilford's coastal system include the following:

The Audubon Guilford Salt Meadows Sanctuary includes 235 acres that support specialized salt marsh vegetation and animal life along the East River. The saltmarsh sharp-tailed sparrow, a Species of Global Concern breeds in the Sanctuary, currently under consideration as a Site of Global Significance by National Audubon Society. The Anne Conover Nature Education Trail (an interpretive trail) is in the Sanctuary that can be reached via Clapboard Hill Road from Meadowlands just east of the bridge over the East River. This area is listed as a potential site along the Coastal Birding Trail planned by Connecticut DEP.

East River Marshes. A portion of the East River marshes was degraded by ditching in the 1920's and is now being restored by Connecticut DEP. Newly created ponds provide foraging habitat for wetland dependent species of birds and fish. Since the restoration project began in 1999 (within wetlands owned by the State), follow up studies reveal greatly increased numbers and types of species returning to the area. (See *Appendix B-3* for information on this restoration effort.) In 2004, National Audubon designated the East/West River Complex as a globally important bird area. This complex includes the salt marshes of the East and West Rivers and Long Cove. (The latter can be viewed from the junction of Rt. 146 and Sachem's Head Road.)

Faulkner's Island. Situated approximately 4 miles off the Guilford coastline, the island is owned by the U.S. Fish and Wildlife Service, as part of the Stewart B. McKinney National Wildlife Refuge. Recognizing that habitat loss and fragmentation are the most serious threats to birds, National Audubon identifies sites that provide critical habitat for birds under its Important Bird Area Program (IBA)[1]. Faulkner's has recently been designated a state Important Bird Area for nesting Common Tern and the federally-endangered Roseate Tern. It is likely that this site will soon be identified as a continentally significant site. The American Bird Conservancy designated Faulkner's Island as a nationally important site in its independent IBA program.

Long Island Sound was identified as an Estuary of National Significance and became part of the National Estuary program in 1988. Long Island Sound is one of Guilford's most important open spaces where recreation is freely enjoyed. With 15 miles across to Long Island's north shore, visually it is open and expansive. Oysters, clams, bluefish, blackfish, and scup, which once abounded in Long Island Sound but underwent sharp decline, are now returning as a result of numerous efforts to clean up the Sound. (See *Appendix B-4.)*

B.8 Threats and Concerns

Given the intricate relationships between the elements of any coastal system, it is no surprise that many factors can upset this dynamic. Land use practices within upland areas have an especially direct effect on Long Island Sound because in Connecticut little buffer lies between uplands and the aquatic system. The coastal plain created by the glaciers was obliterated by melting ice and Connecticut's relatively steep

coastline now consists of rocky outcroppings left behind when the glaciers retreated. Without a coastal plain to serve as a buffer (the coastal plain lies beneath Long Island Sound), Guilford's coastal edge is relatively permeable. Loss of coastal habitat places greater pressure on the natural ability of remaining coastal wetlands and organisms to help purify these waters.

Pollutants, nutrient loading/toxins/contaminants

In upland areas, especially those with a high proportion of impervious surfaces (See *Section C. 5 Freshwater* and *Map C-4.)* and during spring snowmelt and summer storms, stormwater laden with sediment, pollutants (e.g., *E. coli*), and dissolved nitrogen washes into rivers and streams, then into the Sound. If the natural filtering ability of coastal wetlands and filter feeders is exceeded, nutrients cause blooms of algae, which in turn lower the Sound's oxygen levels (hypoxia). Hypoxia can kill sedentary benthic organisms like shellfish and cause mobile species like finfish to relocate.

Connecticut DEP ranks the waters of Guilford Harbor, Island Bay, and Joshua Bay as impaired, based on pathogen and pollutant content. EPA includes the mouth of the West River in its priority nitrogen management areas in the Long Island Sound Study Program. After rainfall of more than 0.75 to 2 inches (depending on location), groundwater rises and can become contaminated by pathogens from septic fields and stormwater runoff. According to reports by Guilford's Water Pollution Control Authority, septic systems in Sachem's Head, Indian Cove and the Mulberry Point are of particular concern. Under such circumstances, such locations can be closed to shellfishing for up to eight days; the two most often closed are Guilford Harbor and the area off Tuttle's Point.

Pesticides used in or adjacent to coastal wetlands to control mosquitoes also impacts non-target insects and their predators, such as birds.

Sources of stress: incompatible development; faulty septic systems; petroleum products; sand and heavy metals from roads; leaking underground oil tanks; excess fertilizers and pesticides for lawns and farm fields; boat septage; dredging; discharge from seven leachate sites in Guilford (See *Map C-3);* mosquito control products

Permanent flooding

Over the past 8,000 years and until 100 years ago, the ocean rose an average of four inches per century along the Connecticut coast. Over the last century, the rise in sea level has accelerated resulting in destabilized coastal features such as beaches, salt marshes, and mudflats and their wildlife communities. Erosion is occurring in coastal wetlands exposed to wave action and winter icing, for example, on Chaffinch Island and Chittenden Park. As sea level rises, tidal wetlands may not be able to migrate landward as is their usual progression, either due to the developed shoreline landward of the marsh or the inability of deposition rates to keep up with the rate of sea level rise. Also, in some areas shoreline topography may affect the ability of marsh to migrate. If marshes cannot move they will be drowned out and disappear, resulting in a decline in biodiversity.

Sources of stress: sea level rise, development of uplands adjacent to tidal wetlands.

Habitat alteration, altered tidal flow, habitat fragmentation, altered sediment deposition

Historic ditching of tidal marshes for mosquito control in Guilford's tidal wetlands disrupted the flow of water through the wetlands, reducing biological diversity by creating more low marsh at the expense of high marsh, particularly salt pannes. Structures that restrict flow of tidal creeks separate tidal wetlands from estuaries, reduce salt water exchange, decrease sediment inputs and depress elevations, encourage encroachment of freshwater and brackish invasive species, and disrupt migratory routes for fish and other organisms. Obstructions and disruptions in movement of sediment along the shoreline can erode marshes, flats, and beaches.

Development that diverts runoff from roads and other impervious surfaces into tidal wetlands has decreased salinity, altering vegetation (See Invasive Species below.*)*

Sources of stress: mosquito ditching (historic), road/railroad crossings over tidal creeks (historic), tide gate closures and dredging, dams, shoreline armouring and stabilization, incompatible development

Habitat destruction

Before passage of the Connecticut Tidal Wetlands Act in 1969, 35 percent of the State's tidal wetlands had been lost to filling. Today, coastal habitat destruction is less likely to occur. Activities that persistently scour and churn up sediments in creeks and embayments can reduce water clarity, alter currents, and smother or remove benthic (bottom-dwelling) organisms and habitat. Coastal erosion can be considered a natural process resulting from wave action, which can be exacerbated by boat wakes that erode marsh edges and prevent new establishment of salt marsh grasses. Non-native mute swans graze heavily (about eight pounds per day) and uproot aquatic vegetation, an important habitat for fish and crabs and food source for native waterfowl. Marsh plants are particularly vulnerable to surface disturbance during low tide, because the breathing apparatus in their stalks is easily crushed.

Sources of stress: wetland filling, historic mosquito ditching, dredging (to keep Guilford Harbor operative for keel boats), pipeline/utility installation, boating activities (propeller scarring, boat wakes), trampling, storage of seasonal docks, overpopulation of mute swans

Wildlife harassment

Birds and other animals that feed or breed along Guilford's coast are vulnerable to inadvertent disturbance by recreationists and dogs, particularly during breeding seasons. Paddlers can now access once remote reaches of tidal wetlands that harbor willets and other reclusive species. Non-native mute swans, one of the world's most aggressive species of waterfowl, also displace native birds from nesting and feeding habitats.

Sources of stress: incompatible recreation, domestic pets, over population of mute swans

Invasive species

Opportunistic species such as gulls, red fox, and raccoon thrive in suburban landscapes. Introduced plants and animals such as green crab often out-compete other species. An increase in nutrients and sediments, especially when combined with a decrease in salinity may encourage encroachment of *Phragmites*, particularly in the upper margins of marshes, where dense stands of *Phragmites* displace *Spartina* and other native vegetation along with those species that depend on these plants. Green crabs are voracious predators that devour scallops and other native species.

Sources of stress: incompatible development, altered salinity, species introductions

B.9 Summary

Guilford's coastal system provides a rich environment for wildlife and public enjoyment. Numerous impacts to its natural resources present the challenge of maintaining an ecosystem which is naturally fragile and dynamic while supporting human activities.

References

Bell, M. 1985. *The Face of Connecticut: People, Geology and the Land (Bulletin 10)*. Hartford, CT: State Geological and Natural History Survey of Connecticut

Bortman, M.L. and N. Niedowski. 1998. *Characterization Report of the Living Resources of the Peconic Estruary.* Natural Resources Subcommittee, Peconic Estuary Program

Connecticut College Arboretum. 1995. *Tidal Marshes of Long Island Sound: Ecology, History and Restoration.* Bulletin No. 34. New London, CT

Connecticut College Arboretum. 2001. *Living Resources and Habitats of the Lower Connecticut River.* Bulletin No. 37. New London, CT

Connecticut Department of Environmental Protection, Office of Long Island Sound Programs *Environmental Program Fact Sheets.* www.dep.state.ct.us/ourenviron.htm

Connecticut Department of Environmental Protection. 1977. *Long Island Sound: An Atlas of Natural Resources.* Coastal Area Management Program

Connecticut Department of Environmental Protection. December 2002

South Central Coast Major Basin Overview. http://dep.state.ct.us/wtr/watershed/Overviews/sccmbo.pdf

Long Island Sound Study (LISS). *Hypoxia in Long Island Sound.* Fact Sheet #1. University of Connecticut Sea Grant Marine Advisory Program

National Audubon Society, Inc. 2004. *Important Bird Areas.* http://www.audubon.org/bird/iba/index.html

New Haven County's Endangered Species and Species of Concern, www:dep.state.ct.us

Town of Guilford. 1982. *Municipal Coastal Plan*

U.S. Environmental Protection Agency (EPA): *Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters.* http://www.epa.gov/owow/nps/MMGI/

Appendix

B-1 Guilford Coastal Area Data

B-2 Guilford Recreational Shellfish Beds

B-3 Connecticut Wildlife magazine article Sept/Oct edition 2003 *"Restoring "New Life" to East River Marsh"*

B-4 Quick Facts about Long Island Sound (OLISP)

Maps

B-1 Coastal Features

B-2 Nautical Chart

Endnotes

1 See www.audubon.org for more information

Section C. FRESHWATER

See separate Map Atlas for map references

C.1 Introduction

Guilford is well endowed with freshwater resources. Streams, lakes, ponds and wetlands contribute to plant and animal life, our water supply, flood mitigation, recreational opportunities and the Town's natural beauty. Cumulatively, these areas make a major contribution to the character and quality of life in Guilford. Vegetated areas along stream banks called riparian zones filter pollutants, regulate water temperature and runoff, store floodwater, and serve as important habitat. Freshwater wetlands are numerous and freshwater tidal marshes extend far into Guilford's interior. Below the transitional zone between fresh and salt water in the East and West Rivers, salt marshes mark the final course of Guilford's rivers discharging to Long Island Sound.

C.2 Watersheds and Waterbodies

Rivers and Watersheds

Watersheds are land areas that collect rainwater or snowmelt and then drain that water to a common outlet along a body of freshwater and, in Guilford, ultimately to Long Island Sound. Streams and rivers (general terms for flowing waters) form drainage networks across a watershed. Wetland waters and tiny streams, many unnamed, high in a watershed gather above and below ground to form small streams, which join to form progressively larger rivers. Physical, chemical, and biological changes occur in flowing waters as they move downstream; and the quality of freshwater systems and the Sound are intimately connected to use of the land area that feeds them. Watersheds:

- Maintain water quality and quantity of public water supplies
- Moderate downstream flood levels, especially in those drainage basins with likely increased stormwater runoff from development
- Help to filter non-point source pollutants before they reach downstream resources, including rivers and the Sound
- Provide significant habitats
- Serve as a framework for land use planning

A reach is a length of a river or stream and its associated watershed with a distinct combination of features and habitats. The diversity among reaches contributes significantly to the stream's overall biological diversity. Riparian ecosystems – the ecosystems of streamside lands, especially those subject to flooding – serve as transitions between streams, rivers, and uplands, providing key habitat (e.g., floodplains as fish nurseries), material inputs (e.g., woody debris for structure and nutrients), and other ecological services (e.g., temperature control from shading). Rivers and streams are so closely linked to their adjacent floodplain riparian corridors, it often makes sense to treat the river and floodplain as a single ecosystem.

Guilford is comprised of eight sub-regional watersheds. (See *Map C-1* and *Appendix C-1* for details of all the rivers and streams that flow into them.) Of these, Sluice Creek watershed is entirely within the Town and the East and West Rivers' watersheds are mostly contained with Town boundaries. As *Map C-1* shows, seven watersheds partially lie in neighboring towns and all flow from Guilford into adjoining towns. Four of the sub-regional watersheds in Guilford contain areas that are surface water watersheds for public drinking water supply managed by the SCCRWA and the Wallingford Water Company.

According to a 2002 DEP report, water quality in Guilford's East and West Rivers is fully supportive of aquatic life. West River has historically hosted runs of alewife, blueback herring, and sea-run brown trout (non-native). East River hosts runs of alewife, blueback herring, sea-run brown trout, and sea lamprey. All pass through a fishway installed on Capello Pond Dam off Suzanne Circle. A bypass fishway was installed on the second dam at Lower Guilford Lake: reports of fish passage are pending. Another fishway was installed at the Landon Dam on the West River.

Characteristic Plants and Animals:[1] diatoms (microscopic flora), algae, rich array of insects, snails, clams, worms, crayfish; caddisflies, stoneflies (indicate high water quality); brook trout, brown trout (non-native), chain pickerel, shiners, American eel, two-lined salamander, dusky salamander, green frog, painted turtle, wood turtle, northern water snake, abundant waterfowl, wading birds, river otter, water shrew, bats

Lakes and Ponds

Guilford's lakes are inland depressions containing standing water from river drainage, surface water runoff, or groundwater seepage, and they vary in size. The difference between lakes and ponds is depth, not size. Lakes vary from season to season, particularly during summer months, when three distinct layers of water temperature form with warming of upper portions. Most animal life occurs in the top, warmest layer in the summer. Ponds are shallower than lakes, and therefore sunlight filters to their bottom, whereas in lakes it does not.

As shown on *Map C-2*, Guilford has four large stream-fed lakes: Lake Quonnipaug (West River watershed), West Lake and Clear Lake (Branford River watershed), and Guilford Lakes (East River watershed). Guilford has numerous ponds, including Old Scroggie Pond, Bartlett's Pond Lane's Pond, Bishop Dudley Pond, and several farm ponds (mostly man-made). Lake Quonnipaug is Guilford's largest water body at 112 acres. Its average depth is 10 feet, with a maximum depth of 50 feet, and it is bordered by steep slopes to the east and west. It is known as a trophy trout lake, and is stocked by the State. A State-managed boat ramp exists at its northern end and a Town-owned beach and swim area is located on the western shore. Route 77 parallels the western shore, often coming within 50 feet of the lake edge. The land bordering the eastern and western shoreline contains thickly settled residential neighborhoods.

Lake Quonnipaug's size, scenic beauty, and significance as a public recreation area have made it the subject of intensive scientific study. The waters of the lake technically fall under the jurisdiction of the DEP. However, the Town has traditionally taken responsibility for monitoring the lake and taking corrective action when needed. The Conservation Commission has had direct responsibility for the lake for the past decade. Quonnipaug's Lake Manager operates under the direction of the Conservation Commission and coordinates State, Town, and local resident interests while monitoring the ecological health of the Lake. In addition, Guilford's Director of Health monitors the Lake's water quality and closes the Lake's swim area when pollutants exceed allowable limits due to septic system effluent impacts during heavy rainfall and/or excessive aquatic bird excrement.

Several recent inventories of aquatic vegetation and water quality tests reveal that the Lake is slightly eutrophic, or mesotrophic, meaning there is a fairly high level of excess nutrients present. This has led to accelerated growth of aquatic weeds. In recent years several invasive species have become established, particularly Eurasian milfoil, and fanwort. In 2001 and 2002, the Connecticut Agricultural Experiment Station studied the effectiveness of spot-treating fanwort and Eurasian milfoil with chemical herbicides. This treatment is limited and complicated due to the co-existence of a State-endangered plant, the water marigold. Some control has been achieved with no negative effects on water quality. In addition a program of hydro-raking and herbicide treatments in the weedy south channel of the Lake has been undertaken, with results yet to be determined. Research on weed control in the Lake continues, but since lakes naturally fill in and become wetlands over time, changes in vegetation must be expected. Land use activities on lakefront properties directly affect the level of nutrients in adjacent and downstream water bodies.

Characteristic Plants: Floating or submerged plants include duckweeds, water lilies, water-shield, pondweeds, and algae. Among emergent and shoreline plants are arrowhead, sedges, spikerush, pickerelweed, and cattail.

Characteristic Animals:

Invertebrates: springtails, water striders, whirligig beetles, water boatmen, backswimmers, backswimmers, freshwater mussels, fingernail clams, dragonflies, damselflies, mayflies

Fishes: largemouth bass (non-native), smallmouth bass (non-native), bluegill (non-native), pumpkinseed, black crappie (non-native), golden shiner, yellow perch, chain pickerel, alewife, blueback herring, sea-run brown trout, and sea lamprey

Reptiles and amphibians: eastern newt, pickerel frog, green frog, bullfrog, snapping turtle, painted turtle (often seen basking on logs), spotted turtles, water snake, musk turtle

Mammals: muskrat, mink, otter, various bat species (feed on insects)

C.3 Ground Water

Ground water is water that fills the spaces between soil particles and fractures in rocks below the ground. It flows from points of recharge (where water infiltrates the ground) to points of discharge to surface water ecosystems and generally flows downward with gravity. Certain types of soils and rock formations hold ground water and therefore are effective aquifers. Aquifers, soil or rock formations that hold a substantial amount of ground water and are permeable enough for water to be extracted, provide most of the Town's drinking water. Aquifers also exchange water with surface water resources, including wetlands. With an annual average rainfall of 43 inches in Connecticut and generous areas for groundwater storage in Guilford's aquifers, water shortage or drought conditions are rare. Guilford supports two types of aquifers: stratified drift and bedrock aquifers.

Stratified Drift Aquifers

As a result of glacial activity in New England, stratified drift deposits of deep, well-sorted and stratified sands and gravel were deposited in what are now (or once were) significant watercourses. These deposits serve as aquifers from which wells can draw ground water. Soil surveys describe stratified drift deposits as glacial outwash or glaciofluvial deposits which usually parallel the course of the rivers, as is the case in Guilford. Because surficial geology maps can be used to delineate stratified drift deposits, they can also be used to predict likely sources of drinking water for community wells. See *Section A. Geology* for related information and maps.

A recent hydrologic study commissioned by the Town in an effort to protect present and future sources of water supply, recommended that aquifer recharge areas should be designated for protection in locations where the depth of surficial material deposits exceeds 40 feet. As a result, in July, 2004, the Planning and Zoning Commission approved revised groundwater protection regulations with two areas demarcated as Groundwater Protection Districts (GPDs) - a new area in North Guilford suitable for possible future water supply and an area in south Guilford currently used for public supply by the CT Water Company. The latter District incorporates two former, smaller groundwater protection districts within its boundaries. The GPDs are illustrated on *Map C-3*.

Newly published DEP regulations affect two previously defined aquifer protection areas (APA). See *Map C-3*. The most northerly is already mapped as a Level A APA and the southerly area (not yet mapped and approved by the DEP) is known as a Level B preliminary wellhead recharge area.

The Connecticut Water Company (CWC) services six residential areas with public water for approximately 6,000 Guilford customers, or 25 percent of the population in 2000. Guilford has a total of 11 community and public wells, three of which are owned by the CWC. (See *Map C-3* for the location of their two active wells) and eight others are owned by small private communities. Because drawdown from the CWC Town Well in Guilford has already reached its limit, the CWC also relies on water from sources in other towns, particularly the Killingworth Reservoir.

Bedrock aquifers

Bedrock aquifers provide water that flows through a complex network of fractures in the bedrock. They are recharged primarily from rainwater and recharge wetlands and watercourses. Bedrock aquifers are an important source of ground water in Guilford where 75 percent of residents (i.e., approximately 17,000 people) depend upon them for their individual household well water supply.

C.4 Freshwater Wetlands

As shown on *Map A-4,* wetland soil types are abundant in Guilford**.** Once considered noxious places and derelict wastelands, wetlands are now known to be vital parts of the landscape and to perform many services:

- filter out pollutants and excess nutrients and sediments from water that passes through them ("nature's kidneys")
- act as water storage sites, holding back floods in the wet season and releasing water in times of drought
- serve as critical habitat for numerous species, including ducks, wading birds, and shorebirds that breed in wetlands or use them as stop-over sites during migration
- are critical habitat for amphibian populations, which are declining rapidly worldwide
- host a suite of specialized rare plants, and have unusually high species diversity
- provide aesthetic, recreational, and commercial opportunities, such as paddling, fishing, hunting, and nature study

The State of Connecticut defines inland wetlands as lands (including submerged lands) not regulated by the Tidal Wetlands Act, which consist of soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey. See *Map A-4* for wet soils distribution in Guilford and *Appendix C-2* for further details. The State's Inland Wetlands and Watercourses Act, passed in 1972, halted historic destruction and alteration of wetlands without consideration. Guilford's Inland Wetland and Watercourses Regulations regulate activities within 100 feet of designated wetlands and watercourses. Watercourses include rivers, streams, bodies of water, and intermittent watercourses, which statutorily includes vernal pools. Wetland boundaries and the presence and extent of vernal pools must be verified by a certified soil scientist and land use activities approved by permit from the IWWC before development can occur.

Freshwater Wetland Habitats

Descriptive terms for wetland habitats are most often classified based on the plant community they support. In reality these listed types often occur in combination and are in a state of transition from one type to another. Guilford supports examples of these freshwater wetland types, listed from wettest to driest:

Marshes are characterized by shallow standing water year round, with floating or emergent non-woody plants such as sedges, reeds, cattails, arrowhead, pickerel weed, blue flag, skunk cabbage, and sensitive fern.

Wet meadows, which are not as wet as marshes, typically are covered by grasses, sedges, rushes, and other vegetation (e.g., Joe-Pye-weed, ironweed, New England aster, boneset, goldenrod) and are in full bloom in late summer. Hummocks formed by tussock sedges create dry sites are readily colonized by shrubs. Invertebrates can be particularly diverse and include freshwater sponges, clams, snails, and a variety of insects, which serve as food for other animals. Some moths and butterflies require marsh and wet meadow plants. Typical amphibians and reptiles include snapping turtle, painted turtle, spotted turtle, northern water snake, ribbon snake, common garter snake, spring peeper, gray treefrog, bullfrog, green frog, and pickerel frog. Marshes provide nesting habitat for waterfowl such as ducks (particularly mallards), geese, and herons, as well as various songbirds, like marsh wren and red-winged blackbird. Many other birds nest in adjacent thickets, and marshes with standing dead trees attract yet another group of nesting birds, such as wood ducks, tree swallows, and bluebirds. Typical mammals include star-nosed mole, muskrat, raccoon, and mink. Most of Guilford's wet meadows occur on former or active agricultural land that has been cleared of trees, often on floodplains.

Examples: upper East River (freshwater marsh), Braemore Preserve (wet meadow)

Swamps are dominated by dense shrubs (spicebush, highbush blueberry, speckled alder and briars) or trees, most often red maple. They are often located along watercourses and on floodplains, and vary with local water levels. Other plants include ferns, skunk cabbage, sedges, cattails, marsh-marigold, and water-willow. Invertebrates and mammals resemble those found in other wetland habitats. Bird life in shrub swamps differs from that of forested swamps. In general the more diverse the vegetation, the more diverse the animal species.

Examples: Great Swamp in Westwoods, Beaver Head Swamp, Wolf Swamp, Towner Swamp

Floodplains are low-lying areas that become inundated when rivers overflow their banks (typically in late winter and spring), and can extend more than 10-20 times the width of the rivers themselves. Flooding, a natural event, scours debris from stream channels, allows fish passage, and deposits rich, fine sediments to create new soils and habitat. Floodplain plants have evolved to survive periods of both immersion and dryness. Because of their nutrient-rich content, these soils have the potential to produce the greatest crop yields. Examples: along West and East Rivers. (See *Map C-2* for flood prone areas.*)*

Bogs and fens are perpetually wet peatlands with well-developed moss carpets. Bogs generally have a dominant cover of dwarf shrubs such as leatherleaf and stunted trees such as black spruce. Fens are dominated by carpets of sedges intermixed with other grass-like plants. Examples: Westwoods, West Lake shoreline.

Ephemeral wetlands or vernal pools are usually small, temporary, relatively isolated bodies of water in a depression. They lack a fish population and may support the breeding or development of certain animal species unique to such wetlands. Such species includes several salamander species, wood frog, and fairy shrimp. These animals are regarded as direct indicators of vernal pools because they require vernal pools to trigger their life cycle stages. Vernal pools in Guilford are included as wetlands on Guilford maps.

Freshwater tidal marshes are affected by twice-daily tidal movement of water, which circulates nutrients and oxygen throughout the system. Salt and fresh water do not mix readily, but where they do brackish water results. Upstream from brackish river water, tidal freshwater marshes provide habitat for particular species of plants and animals. Tidal freshwater marsh communities in Connecticut support over 100 different kinds of plants, compared with about 36 in brackish marsh and 17 in salt marshes.

Plants that thrive in freshwater tidal marshes include: wild rice (a tall annual grass); perennials such as pickerel weed, water arum, bullhead-lily; annuals such as jewel weed, common bur-marigold, smartweeds; river bulrush, a distinctive sedge found between the high and mid-marsh zones.

Above the level of brackish water, animals such as snails, slugs, crabs, spiders and insects can be found along with fish such as banded killifish, pumpkin seed and spottail shiner. Birds studies along the Atlantic coast reveal that 280 species frequent tidal freshwater wetlands. This group includes 44 species of waterfowl, 35 rails and shore birds, 23 birds of prey and 15 species of waders. Red-winged blackbird, sora rail, swamp sparrow, belted kingfisher, and wood duck are also attracted to freshwater and brackish marshes. (See *Appendix D-1, Birds of Guilford; Noble S. Proctor.)*

What makes a healthy freshwater system?

There are a number of key factors that sustain any species, natural community, or ecosystem and maintain its integrity over the long term. A significant disruption of any of these factors will degrade the integrity of that system. Conserving freshwater systems therefore means conserving these key ecological factors in as natural a state as possible. For freshwater systems these key factors include:

- amount and timing of water movement (e.g., surface flow, ground water, soil moisture)
- water chemistry variation over time (e.g., salinity, temperature, ph)
- physical habitat conditions (e.g., woody debris, riparian canopy, sediment regime, shape of bottom)
- connectivity (e.g., up- and down-stream continuity, water-wetland-land connectivity, and the extent to which they allow or impede movement of organisms)
- biological composition and interactions (e.g., feeding, competition, reproduction)

C.5 Threats and Concerns

Pollutants, nutrient loading/toxins/contaminants: Nearly all contaminants that alter the water chemistry of Guilford's freshwater systems derive from nonpoint sources (e.g., surface runoff), rather than point sources (e.g., pipe discharge). Rainfall or snowmelt that cannot filter directly into the ground picks up an array of contaminants as it washes over the ground and before it enters ground- or surface-waterbodies. Stratified drift deposits are quite vulnerable to pollution, given their extreme permeability.

Map C-3 illustrates the locations of public water supply wells, groundwater protection districts, aquifer protection areas and various threats to water quality. Among the latter are DEP leachate wastewater sites, EPA identified waste sites, the Town's Transfer Station and Stump Dump and Areas of Concern as identified by the Guilford Water Pollution Control Authority - WPCA. In spite of its title, Guilford's WPCA only has jurisdiction over implementation of Guilford's sewer avoidance program. The WPCA works closely with other Town Commissions and departments to carry out its mandates but it does not have responsibility for dealing with pollution from any source other than septic systems. The IWWC only has jurisdiction over inland wetlands and watercourses. The Conservation Commission has no regulatory power. Preservation of water resources requires on-going monitoring, sensitive land use regulations, and planning to guarantee the quality of our surface water resources and the quantity and quality of groundwater supplies as drinking water for future generations of Guilford residents. (See *Appendix C-3* for water-related agencies with jurisdiction in Guilford.)

An impervious surface is any material that resists infiltration. Roads, parking lots, and rooftops all contribute to the total impervious surface cover of a land area. National studies show that residential development can generate 15 to 65 percent impervious surface, varying with lot size. Commercial and industrial development can generate 70 to 95 percent impervious surface coverage.

Scientific studies have shown that as impervious surface coverage within a watershed approaches 10 percent, the health of rivers that drain that area has declined. A recent USGS study on New England coastal basins shows that aquatic ecosystems begin to decline when 4 to 5 percent of the watershed is urbanized. Studies in other states confirm a direct inverse relationship between impervious surface and biological health, starting with impervious surface areas as low as 4 to 6 percent. Where impervious surface area exceeds 25 percent, significant damage to water quality occurs and few kinds of fish can survive.

Of the 103 local watersheds in Guilford, 47 have impervious surface coverage of less than 4 percent, 39 have between 4 and 10 percent, and 17 between 10 and 25 percent. (See *Map C-4.)* Local basins with impervious cover in the 10 to 25 percent range are located on the coast (including the four local basins that comprise the Sluice Creek sub-watershed), in the lower West River sub-watershed, and north of West Lake. Together these local watersheds with high impervious cover comprise roughly 20 percent of the Town's total land area.

Most of the watersheds in central and southern Guilford contain 4 to 10 percent impervious surface cover, and therefore are approaching the critical threshold above which water quality and freshwater wildlife habitats decline rapidly. Areas of Guilford comprised of watersheds with under 4 percent impervious cover are dominated by forested land: north of Route 80, the lower East River drainage basin, and the Westwoods/Cockaponset State Forest area.

Although nutrients like nitrogen and phosphorous are necessary for plant and animal life, elevated concentrations of these nutrients degrade freshwater ecosystems. Contamination of ground water by septic effluent or salt water intrusion (on the coast) is also a concern in Guilford. Since 1981, the Town's Department of Health routinely evaluates fifteen designated areas for water quality deterioration and frequency of septic system failure. (See *Map C-3.)* Failure frequency has decreased markedly over the past 23 years due to numerous repairs and careful construction of new septic systems. Non-performing septic systems are either self-reported or reported by neighbors. Connecticut DEP has recommended a re-

evaluation of current designated areas of septic systems in Guilford. In developed areas, lakes, which are surface expressions of ground water, are also susceptible to contamination. Swimming at Lake Quonnipaug is periodically closed due to unacceptably high bacterial levels.

Sources of stress: faulty septic systems, landscape fertilizers, pesticides, herbicides, leachate from waste sites and contaminated wastewater discharge sites (See *Map C-4),* oil spills, road salt, heavy metals from motor vehicles, household chemicals, hormones and pharmaceuticals, atmospheric deposition from car exhaust and coal-fired power plants.

Altered sedimentation: Sediments are the primary contaminant found in stormwater runoff, particularly in watersheds where development occurs on steep slopes. Construction activities can double the pre-construction sediment loss of a site. Eroded soils transported to rivers are deposited on stream bottoms, reducing habitat diversity (e.g., pools and riffles) and eliminating spawning areas and shelter used by aquatic life. Suspended sediment also injures and clogs gills of fish and sensitive invertebrates. According to the Marina Commission, excess silt in the West River is creating the need for more frequent dredging of Guilford Harbor. In lakes and ponds murky water reduces light penetration and can kill aquatic plants, interfere with feeding of vision-dependent fishes, and smother fish eggs.

Sources of stress: stormwater runoff from development and associated construction, road sanding, removal of riparian vegetation

Loss of habitat: Freshwater systems are embedded within, and greatly influenced by, surrounding uplands. (See *Section D.)* Many animal species, particularly amphibians and some reptiles, require these uplands to complete their life cycles. Habitat loss therefore encompasses clearing or alteration of nearby uplands, as well as outright removal or alteration of aquatic and wetland systems themselves.

Sources of stress: incompatible development

Altered hydrology (water movement and storage): The hydrologic regime is the primary driver of river systems. As impervious surface increases or vegetation is eliminated, the amount of water that infiltrates into the soil decreases, and stormwater moves through a watershed and into a freshwater body more rapidly. This increased surface flow, coupled with traditional methods of stormwater management, result in altered timing, duration, frequency, and magnitude of flood flows in rivers. The increased volume of water results in unstable banks, channel widening, and channel bed lowering, promoting further flooding. Many engineered structures are created to retain and delay delivery in order to mitigate flood impacts. This can lead to the reduction of peak flows, water fluctuations, and periodic over-bank flooding, all necessary to maintain instream and riparian health.

Sources of stress: incompatible development, excessive ground water withdrawal

Habitat fragmentation is the breaking up of a connected landscape into progressively smaller and more isolated areas. Fragmentation within a river system, between wetlands, or between freshwater systems and their uplands creates barriers to many species that must move within or among habitat types to complete their life cycles, such as migratory fish, turtles, and salamanders.

Sources of stress: incompatible development, dams, incompatibly designed road-stream crossings, increased traffic volume, bank stabilization materials and rip-rap, road curbing in areas with frequent amphibian and reptile crossings

Invasive/non-native species directly replace native species through predation, competition, or other means, and become dominant, reducing species diversity and the health of the system as a whole. These effects vary significantly based on the invading species, the extent of the invasion, and the vulnerability of the system being invaded. Invasive plants in Guilford's freshwater systems include Phragmites, purple loosestrife, Eurasian water-milfoil, and other plants can choke wetlands and shallow lake waters, interfering with recreational use and sometimes causing oxygen depletion when the plants die and decompose. Bass and other introduced sport fish have greatly altered fish communities. The highly invasive, quick-spreading zebra mussel recently appeared in Connecticut waters and threatens to alter the state's aquatic systems.

Sources of stress: release of organisms for sport (e.g, tadpoles, game fish), release of bait fish, release of aquarium fish, horticultural introduction of non-native plants, boats (via attached plant seeds and larvae)

C.6 Summary

Guilford's freshwater resources are abundant, invaluable to maintaining natural ecosystems and providing clean drinking waters, and they are quite vulnerable to human activities.

References

Environmental Law Institute. 2003. *Conservation Thresholds for Land Use Planners.* Washington, D.C.

Gadwa, S.N. 2004. *The Scientific Basis for Wetland and Watercourse Setbacks.* Quinnipiac River Watershed Association: Meriden, CT

Gibbons, J. 1998. *Addressing Imperviousness in Plans, Site Design and Land UseRegulations (Technical Paper #1).* Non-point Education for Municipal Officials (NEMO). Storrs, CT: University of Connecticut, College of Agriculture and Natural Resources

Hammerson, G.A. 2004. *Connecticut Wildlife: Biodiversity, Natural History, and Conservation.* Hanover, NH: University Press of New England

Jorgensen, N. 1978. *A Sierra Club Naturalist's Guide: Southern New England.* San Francisco: Sierra Club Books

MacBroom, J.G. 1998. *The River Book.* Hartford, CT: Connecticut Department of Environmental Protection

Schueler, T. 2004. *The Importance of Imperviousness - Watershed Protection Techniques.* Center for Watershed Protection, MD

Silk, N. and Ciruna, K., editors. 2004. *A Practitioner's Guide to Freshwater Biodiversity Conservation.* Arlington, VA: The Nature Conservancy

Appendix

C-1 Listing of Guilford's water resources by drainage basin

C-2 Wetland soil categories

C-3 Water-related Agencies with Jurisdiction in Guilford

Maps

C-1 Drainage basins, Rivers and Waterbodies

C-2 Floodplains, Named Rivers and Lakes

C-3 Public Groundwater Protection and Threats to Water Quality

C-4 Impervious Surface Area Estimates by Local Drainage Basins

Endnotes

1 Species lists derived primarily from Hammerson 2004

Section D. Uplands

See separate Map Atlas for map references

D.1 Definition and Importance

With its forests, trap-rock ridges, and grasslands, Guilford is rich in upland resources – areas where the ground is rarely saturated with water. Forests produce the oxygen we breathe and their porous soil soaks up rainwater and releases it gradually, so downstream flooding is lessened and our ground water is replenished. Their roots transform bedrock into soil, then hold it. Their branches and leaves slow the wind, soften the rain, and provide shade from the sun's glare. Forests serve as storehouses of energy and nutrients; their slow decay nourishes the earth. Forests also sustain countless creatures by providing food and shelter and support the Town's healthiest wetland systems. Portions of forest in Guilford are harvested to provide wood products such as saw logs, mulch, and witch hazel. (See *Section E. Agriculture.)* Grasslands, shrublands, and trap-rock ridges, and other upland systems also provide essential habitat for many species, including some that are rare or endangered. Grasslands also can provide benefits that range from economic (e.g., hayfields), to aesthetic (e.g., scenic views), to cultural (reminding us of the Town's agricultural past).

Land Use History

The history of Guilford's uplands mirrors the land-use history of southern New England. The first European settlers along the New England coast removed large white pines for shipbuilding, followed by colonists who cleared forests to establish fields and pastures. Forests returned as farms were abandoned in the early 1800s, then were again cleared to feed the iron industry in northwestern Connecticut. The Civil War brought another period of agricultural abandonment. From the late 1800s to early 1900s wood again was in demand for charcoal to fuel cities, and was shipped by steamship to New York City. (Charcoal pits still can be found in Guilford.) Orchards and pastures have been abandoned sporadically since the 1920s and 30s. As a result of these repeated cuttings, most of Guilford is comprised of third- and fourth-growth forest stands. See Growth Stages below.

D.2 Types of Upland Resources

Descriptions of Guilford's terrestrial habitats follow. Each habitat is comprised of several typical plant and animal species, each with its own unique life history and lore. *Section J. Significant Natural Resource Areas* and accompanying maps show the locations of some of the most significant examples of these systems.

Forests

Among the ways to describe Guilford's forests are by their structure, growth stage, and type.

***Forest Structure*:** Forests are structured in vertical layers: the canopy, the understory, and the ground or herbaceous layer. The canopy is the uppermost layer – the umbrella formed by trees spread overhead. Guilford's canopies consist primarily of oaks, hickories, beech, and maple. As the survivors in the race for light, these trees are either fast growing and therefore have shaded out their competition, or able to thrive in shade and have outlived other nearby trees. Most of Guilford's canopies average about 50 to 60 feet high; some trees grew much taller before the first-growth (old growth) forests were cut.

The middle level of the forest's structure is an understory of saplings, shrubs, and shade-tolerant trees like sugar maple and American beech. The understory also contains shorter-lived trees (like chokecherry, American dogwood, and witch hazel) and earlier-successional trees (e.g., gray birch) that eventually will be shaded out. The understory provides crucial cover and "ladders" that wildlife can use to travel between the ground and the canopy.

Ground cover includes the low ferns, wildflowers, mosses, grasses, and sedges that cover the forest floor. Most are herbaceous, that is, not woody like shrubs or trees. Although not as conspicuous as the tree canopy, ground cover plays an important role in the forest. Flowers provide nectar for migratory pollinators, the low layer of vegetation provides cover for many creatures, and rotting leaves and logs break down to renew soil and provide nutrients. Guilford's forest floors reveal generations of trees that have died long ago. Shallow pits and mounds indicate places where trees once fell, ripping up the roots and clinging soil. Eventually the roots decayed, leaving behind mounds of earth next to the depression.

Forest Growth Stages: Forests vary in age, depending on when they last experienced a major disturbance such as a powerful storm, disease outbreak, or clearing for timber or agriculture. In addition to layers, a forest can be described as a series of growth stages. Guilford's oldest forest stands are found in places like ravines that were less accessible to clearing. Forest that grows after the first clearing is termed second growth; much of Guilford is comprised of third- and fourth-growth forest. Over time, forests develop and accumulate several "legacy" features that enhance their health and contribute to biological diversity. These include the presence of fallen logs and rotting wood, a well-developed understory, complex structure, many of which take hundreds of years to develop.

All components of forest vegetation – living trees and shrubs, dead and downed trunks and limbs, standing snags (dead trees), microflora, lichens, mosses, and herbaceous plants –contribute to the diversity of Guilford's forests. In Connecticut tree cavities alone provide homes to treefrogs, 15 species of mammals, 20 species of birds, and many insects.

Like all of nature, Guilford's forests are continually changing. Disturbance, which can cause rapid changes, includes weather events like winter storms, hurricanes, windthrow (wind-toppled trees), and drought, and logging, fire from lightning or human activity, and tree death from blights or pests like gypsy moth caterpillar and wooly adelgid). Disturbances often create opportunities for plants to establish themselves, because the soil has been exposed or sunny gaps have been created. In Westwoods, for example, beech and black birch have colonized patches where hemlocks have died. Invasive species especially thrive in disturbed soil, and often can outcompete native plants after a disturbance (See Threats subsection below.)

Guilford's forests provide clues to past land use. Miles of crisscrossing stone walls reveal the extent to which the land was once cleared for farming, pasture, and charcoal. Thick-trunked, spreading trees in the middle of the forest ("wolf trees") suggest trees that once stood alone in the open without crowding by adjacent trees. An excellent example stands in Timberlands at the intersection of the Red and Yellow Trails. Red cedars also serve as a clue that an area was once cleared (See *Grasslands section.)*

Although backyard woodlots have trees, they are not equivalent to intact forests. Forest edges are closer to human activities and so impacted by associated threats. For example, certain animals can survive only in the interior of large, intact forests, which are becoming increasingly rare in Connecticut, particularly in coastal towns such as Guilford. Some of them are vulnerable to predators (e.g., raccoons, skunks, blue jays, domestic cats) and nest parasites (e.g., cowbirds) that thrive in forest edges along clearings, but avoid deep forest. Others require large, unfragmented forests to hunt and disperse, like fisher and bobcat, or closed a canopy, like scarlet tanagers (because they hunt insects in the canopy) and worm-eating warblers (because they need unbroken stretches of forest).

Forest Types: Guilford supports a variety of forest types, groups of plants and animals that tend to be found together and named after their dominant plants. Forest types concentrate in certain areas, depending on terrain, soil type, land-use history, and other factors, and grade into each other across the landscape. A description of each type follows.

Oak/Hickory Forest

Guilford is primarily comprised of oak/hickory forest. American chestnut dominated Guilford and the rest of southern New England's forests following the earliest cuttings by European settlers. When chestnuts were effectively eliminated by a fungal blight in the early 1900s (See *Threats subsection*), oaks and hickories replaced them in the canopy and today dominate the landscape.

Black oak, red oak, and white oak dominate this forest type, along with various hickories and often dogwood. At a local scale, soil characteristics such as moisture, temperature, acidity, and nutrients strongly influence the type and abundance of plants within the oak forest. Historic land use (e.g., agriculture, timber harvest) and disturbance (e.g., weather events) also influence forest vegetation, which in turn influences the soil characteristics over time. (See *Section A. Geology.)* Native Americans who routinely set fires to clear underbrush, increase visibility for hunting, and attract wildlife that fed on new growth helped to maintain Guilford's oak forests for thousands of years.

Dry sites: These include ridges and south-facing slopes, where soils are shallow, acidic, and dry (water flows downhill). Trees are widely spaced, so the canopy is sparse, allowing plenty of sunlight to filter through to the dense understory and to and further dry the forest floor.

Characteristic plants:
Canopy: chestnut oak, bear oak, dwarf chestnut oak
Understory: huckleberry, lowbush blueberry, smaller individuals of canopy species
Ground cover: little bluestem, Pennsylvania sedge, bracken fern
Example: Bluff Head

Moderately moist sites: Most of Guilford's forests are situated on mid-slopes, where moderately moist and acidic soils support many of the plants found in moist sites, as well as some found in drier soils. These forests have a densely closed canopy and a crowded understory. The ground cover is diverse but sparse, due to the deep shade.

Characteristic plants:
Canopy: black oak, scarlet oak, white oak, hickory species, red maple, black birch
Understory: mountain laurel (often in dense thickets), flowering dogwood, maple-leaved viburnum; some white pine, huckleberry, and lowbush blueberry
Ground cover: false Solomon's seal, partridgeberry, poison ivy, Virginia creeper, hayscented fern, marginal woodfern, ground cedar clubmoss
Example: Bittner/Baldwin complex

Moist sites: Moist sites, such as those at the base of slopes and in riparian areas and rock ravines tend to support richer soils, distinct vertical layers, and a wide variety of plants. Northern hardwoods and hemlock-beech forest also are found on moist sites. (See *Section C.* for a description of vegetation found on streamsides and floodplains.)

Characteristic plants:
Canopy: red oak, tulip tree
Understory: flowering dogwood, hornbeam, hop hornbeam, sassafras, white ash, hickories, mountain laurel, highbush blueberry, witch hazel, arrowwood
Ground cover: wintergreen, Solomon's seal, partridgeberry, lady fern, Christmas fern, ground cedar clubmoss
Example: northern portion of Green Trail and southern portion of Red Trail, Westwoods; Myer-Huber Pond area

Coastal sites: Closest to the Sound, these forests are adapted to the harsh conditions of wind, salt spray, and periodic storms. Especially important stopover points for migratory songbirds to refuel. Sparsely vegetated. Only vestiges remain in Guilford, given extensive development of the rocky headlands. Similar to dry, rocky sites.

Characteristic plants:
Canopy: white oak, red cedar, hickory, black cherry
Understory: blueberry, huckleberry
Ground cover: bastard toad flax, smooth false foxglove, prickly pear (in openings)
Example: Chaffinch Island Park

Northern-hardwood Forest

This forest type is found on soils slightly less acid than those of the oak forest, usually on cool, steep slopes and moist soils at lower elevations in Guilford. Rich organic layer on forest floor. Acid-loving shrubs such as mountain laurel are noticeably missing. Instead, a diverse array of showy wildflowers.

Characteristic plants:

Canopy: sugar maple, American beech, yellow birch; some paper birch, white ash, eastern hemlock

Understory: sugar maple, elderberry, dogwood, witch hazel, spicebush, hornbeam, hop hornbeam

Ground cover: Christmas fern, maidenhair fern

Examples: Shoreline Outdoor Education Center trail to Melissa Jones School

Characteristic animals of deciduous forests

Amphibians and reptiles: eastern newt, spotted salamander, marbled salamander, redback salamander, American toad, gray treefrog, spring peeper, wood frog, eastern box turtle, racer, northern ringneck snake, black rat snake, eastern milk snake, common garter snake

Birds: ruffed grouse, wild turkey, barred owl, eastern screech-owl, downy woodpecker, red-bellied woodpecker, eastern wood-pewee, great crested flycatcher, ovenbird, blue jay, black-capped chickadee, tufted titmouse, white-breasted nuthatch, veery, wood thrush, red-eyed vireo, black-and-white warbler, ovenbird, scarlet tanager, rose-breasted grosbeak, and many others. (See *Appendix D-1* for list of 315 bird species seen in Guilford in the past 40 years.)

Birds restricted to interior forests: hermit thrush, yellow-throated vireo, cerulean warbler, worm-eating warbler, brown creeper, blue-gray gnatcatcher

Mammals: shrews, bats, eastern chipmunk, gray squirrel, southern flying squirrel, white-footed mouse, red-backed vole, woodland vole, weasel, gray fox, white-tailed deer, black bear

Mammals restricted to interior forest: fisher, bobcat

Hemlock/Beech Forest

The best examples of this forest type are found in rock ravines and other areas with a cool, moist microclimate. In 1985 the wooly adelgid, which originated in Asia, infested hemlocks in Guilford and coastal Connecticut. This aphid sucks the sap of young twigs, nearly defoliating a plant within a few years. Currently no known control of the aphid exists. Example: Towner Swamp, Westwoods

Characteristic plants:

Canopy: Eastern hemlock, American beech, black birch, red oak, tulip tree, red maple, shagbark hickory, mockernut hickory, bitternut hickory, pignut hickory, white oak

Understory: sassafras, mountain laurel, witchhazel, dogwood, American hornbeam, arrowwood, red maple, black birch, raspberries

Ground cover: false Solomon's seal, Canada mayflower, wood aster, path rush, goldenrod, Christmas fern, hayscented fern, lady fern

Characteristic animals: red squirrel, red-tailed hawk, great horned owl, red-breasted nuthatch, blue-headed vireo, block-throated green warbler, pine warbler, eastern pine elfin (butterfly)

Examples: Green Triangle Nature Trail, Westwoods; Timberlands

Rocky Outcrops

Guilford's rock outcrops are a hallmark of the landscape and reveal how plants once gradually colonized exposed bedrock (See *Section A, Geological Resources.)* Lichens and moss appear first, gradually trapping soil particles until plants can take hold/root and expand to eventually blanket the ledge.

Example: northern portion of White Trail, Westwoods

Traprock Ridges

This ecosystem is represented in the Metacomet Range, which extends from central Massachusetts through to Guilford to East Haven. (See *Section A. Geology.)* Steep topography and unique bedrock geology have shaped its vegetation and created remarkable diversity in a concentrated area called Totoket Mountain, which includes Bluff Head, and Pistapaug Mountain.

In contrast to cooling patterns atop mountains, air blowing in from the west is actually warmed by the basalt rock at the summit. In contrast, air on the leeward northeast face and foot of Bluff Head is distinctly cool and moist. At the summit stunted oaks, hickories, ash, and a ground cover of Pennsylvania sedge form "grassy," park-like glades that are recognized as one of Connecticut's most species-rich and imperiled ecosystems. Forming a skirt below the northeast face, a talus slope of rocks dislodged from the cliff serves as a cold refuge for plants such as mountain maple and mountain ash, which typically are found much further north. This talus slope supports an extremely diverse variety of plants and is well-known for its uncommon butterflies that rely on particular rare plants for feeding.

Characteristic plants:
Canopy: red cedar, oaks, hickories, white ash
Understory: sassafras, mountain laurel, witch hazel, dogwood, American hornbeam, arrowwood, red maple, black birch
Ground cover: Pennsylvania sedge (summit); oak fern, large-leaved sandwort

Characteristic animals: hawks, vultures (Bluff Head supports an important colony), diverse butterflies, northern copperhead
Example: Totoket Mountain/Bluff Head

Grasslands and Shrublands

Following European settlement most of Guilford's forests were cleared for fields and pastures, to the benefit of species such as grassland birds. Although some agricultural land remains in Guilford, particularly in North Guilford, most of those open lands have been developed or allowed to revert to forest (See *Section E. Agriculture*), and the species that require them have become increasingly uncommon – many rare or endangered. Furthermore, as remaining farmland has become fragmented, or smaller and more isolated, most has become unsuitable for animals such as upland sandpiper that need large expanses of grassland.

When agricultural land is abandoned, a sequence of plant communities develops before culminating in mature forest. The first plants to take hold are called "pioneers," which require full sun (e.g., many grasses and shrubs, red cedar, black cherry). Gradually shade-tolerant species associated with forests, such as oaks and sugar maple, become established in the shade of the pioneers, eventually shading out their predecessors. These areas are prone to invasive plants, which tend to be specialized in quickly taking advantage of disturbed habitat by colonizing it and growing more quickly than native species.

Fields that have recently been abandoned are dominated by low-stature herbaceous plants and vines. Species diversity in these fields is very high and several pioneering species can be found surviving. Many butterflies and birds of prey rely on grasslands for feeding on wildflower nectar or hunting small mammals.

Characteristic plants:
Grasses: foxtail, redtop, fescue, and species of *Panicum*, *Poa*, *Eragrostic*, and *Aristida Non-grasses*: dandelions, clover, plantains, asters, cinquefoil, buttercups, St. Johnswort, goldenrods, yarrow, smartweeds

Characteristic animals:
crickets, katydids, butterflies, eastern box turtle, bobolink, eastern meadowlark, horned lark, grasshopper sparrow, red-tailed hawk, killdeer, wild turkey, eastern mole, woodchuck, meadow vole, red fox, coyote, white-tailed deer
Examples: Water Company property viewed from Great Hill Rd.; pastures east of Route 77 south of Lake Quonnipuag; Braemore Meadow (wet meadow)

As old fields revert back to forest, shrubs, small trees, and herbaceous plants take hold. Shrubs and vines provide plentiful food (insects, fruits) and cover for many birds and mammals. Power line rights of ways exacerbated fragmentation of the Town's forests (See Threats below), but today are one of the few places actively managed to exclude large trees, and therefore serve as important shrubland habitat.

Characteristic plants:

Trees: white and gray birch, red cedar, black cherry, choke cherry, young oaks

Shrubs: red stemmed and gray dogwoods, sumac, pussy willow, alder buckthorn, maple leaf viburnum, autumn olive (invasive), multiflora rose (invasive)

Vines: poison ivy, Virginia creeper, grape, raspberries, currant, greenbrier, morning glories, honeysuckle

Herbaceous plants: ragweed, goldenrods, Queen Anne's lace, beggar's ticks, asters, sunflower, thoroughworts, thistle, various grasses

Characteristic animals:

prairie warbler, field sparrow, eastern box turtle, racers, milk snake, common garter snake, hawks, red fox.

Examples: field in Braemore Preserve; Bittner Park; area behind Medad Stone Tavern

Suburban Yards

Yards have become a dominant element of Guilford's landscape. Unlike manicured lawns, mature trees and shrubs enhance wildlife habitat in yards.

Characteristic animals: Eastern mole, little brown bat, gray squirrel, raccoon, mourning dove, blue jay, American crow, black-capped chickadee, tufted titmouse, northern cardinal, northern mockingbird, American robin, and several non-native birds, such as European starling, house finch, and house sparrow. Yards near natural areas receive visiting animals that are characteristic of those habitats, as well.

D.3 Threats and Concerns

Guilford's zoning and subdivision regulations address activities conducted in the uplands, however they do not address the integrity of the uplands themselves.

Loss of habitat that species depend upon for their survival is one of the greatest threats. For example, agricultural lands and associated grasslands have disappeared, and with them many of the birds and butterflies that once were familiar inhabitants of the region. Clearing of forests for development also creates loss of forest habitat.

Old hayfields that traditionally were harvested late in the season provided ideal breeding habitat for birds. Today, hayfields are mowed earlier and more often in the summer. If timed appropriately, various agricultural practices including grazing can be effective tools to maintain some of these habitats. For example, grasslands where nectar-producing plants are allowed to flower before cutting typically support a diversity of butterflies.

Sources of stress: residential development, lack of grassland management, incompatible agricultural practices

Habitat fragmentation is the breaking up of a contiguous landscape into progressively smaller patches by roads, development, roads and increased traffic volume. Fragmentation increases the amount of edge habitat at the expense of forest-interior habitat, creates barriers to many species that must move between different habitats to complete their life cycles, promotes the invasion of invasive plants and parasites, and causes various other ecological problems. Direct road mortality may significantly affect reptile and amphibian populations, in particular.

Sources of stress: residential development, roads, incompatible recreation

Invasive and overabundant species, whether native or introduced, are those that tend to replace other species and become dominant, reducing species diversity and sometimes forming almost pure stands.

Invasive plants in Guilford's uplands include Japanese barberry, Asiatic bittersweet, autumn olive, winged euonymus, honeysuckle, multiflora rose, and Norway maple, among others. (See list in *Appendix D-2.)* Overabundant species are native species that have thrived in response to changes in land use to the point that they threaten populations of other native species. For example, raccoons and opossums, which thrive in a suburban landscape, prey on ground-nesting birds. Also, overpopulation of deer has actually altered the structure and composition of Guilford's forests. Deer eat acorns and oak seedlings and may hamper regeneration of oaks. At the same time they tend to avoid beech, birch, black cherry, which tend to increase in heavily browsed areas. Deer browse has nearly eliminated forest herbs such as orchids, resulting in ground cover dominated by ferns, mosses, and grasses.

Sources of stress: horticultural introduction; spread of seeds via vehicles, animals, clothing, etc

Wildlife disturbance can be a significant threat to reclusive animals or those such as nesting or feeding birds that are particularly sensitive at times during their life cycles. Forests close to developed land are subjected to human influence, including domestic pets that prey on wildlife.

Sources of stress: habitat fragmentation, incompatible recreation, domestic pets, incompatible agricultural practices (See Loss of habitat.*)*

Pests/pathogens: Tree blights have caused huge losses, even of entire species of trees. Major tree blights have all but eliminated two native species of trees from Guilford's forests. One, a fungal blight imported in wood products from Europe eliminated the chestnut in the early 1900s. Another, Dutch elm disease, a fungal disease carried by both native and non-native bark beetles, arrived on this continent in contaminated elm veneer in the 1930s. Today few American elms survive. The gypsy moth has repeatedly stripped local forests of their leaves. The hemlock wooly adelgid, which is an insect, has wiped out nearly all eastern hemlocks in Guilford. Others pests and blights include ash blight, dogwood decline, and others.

Sources of stress: wind-blown, transported materials

Over-harvest/over-collection of a species can lead to its decline, particularly if it requires a long time to mature and produces few offspring. For example, spotted turtles and wood turtles are extremely susceptible to even relatively low levels of casual collecting if it persists over time.

Sources of stress: collectors, poacher for pet trade

References

Anderson, M. 2001. *Multiple Scale Conservation of Matrix Forest: Thinking Inside the Blocks.* Draft unpublished paper for The Nature Conservancy

Connecticut Department of Environmental Protection, Aquifer Protection Program http://dep.state.ct.us/wtr/aquiferprotection/index.htm

Connecticut Department of Environmental Protection. 2004. *Connecticut Vegetation Organized by Natural Community Types.* Hartford, CT

Cronon, W. 1983. *Changes in theLland.* New York: Hill and Wang

Farnsworth, E. 2004. The Natural World of the Traprock Ridges: Dry and Warm Alternates with Cool and Moist. *Connecticut Woodlands.* Middlefield, CT: Connecticut Forest and Park Association

Hammerson, G.A. 2004. *Connecticut Wildlife: Biodiversity, Natural History, and Conservation.* Hanover, NH: University Press of New England

Jorgenson, N. 1978. *A Sierra Club Naturalist's Guide: Southern New England.* San Francisco: Sierra Club Books

LaBarbera, L., T. Rumpf, P. Sharp and H. Woolsey. 1978. *Ecological Reconnaissance Survey of Town-owned Properties.* Guilford, CT: Guilford Conservation Commission

Massachusetts Audubon Society. 2004. *Grassland Birds* http://www.massaudubon.org/Birds_&_Beyond/grassland/index.php

Meyer, J.L. et al. 2003. *Where Rivers are Born: The Scientific Imperative for Defending Small Streams and Wetlands.* American Rivers and Sierra Club

National Audubon Society, Inc. 2004. *Important Bird Areas.* http://www.audubon.org/bird/iba/index.html

The Nature Conservancy. 2001. *Seeing the Forest: A New Attitude Toward Your Landscape.* Sheffield, MA: Berkshire Taconic Landscape Program

The Town of Washington, Connecticut. November 2000. *Natural Resource Inventory and Recommendations.* Ad Hoc Conservation Committee

Wharton, E.H., R.H. Widmann, C.L. Alerich, C.J. Barnett, A.J. Lister, T.W. Lister, D. Smith, F. Borman 2004. *The Forests of Connecticut.* Newtown Square, PA: USDA Forest Service

Appendix

D-1 Birds of Guilford; Noble S. Proctor, PhD

D-2 Non-native Invasive Species and Potentially Invasive Plants in Connecticut

Maps

See Map Series J

Section E. AGRICULTURE

See separate Map Atlas for map references

E.1 Introduction

For the purposes of the Natural Resources Inventory (NRIA), agricultural resources embrace the marketable, habitat, scenic and cultural resources of the agricultural landscape within the Town of Guilford. The value of our agricultural heritage, celebrated annually at our Guilford Fair, goes beyond economic measure, as illustrated in this section. Because the statutory definition of agriculture includes forestry, forestry resources are addressed in this chapter.[1] The harvesting and cultivation of shellfish (oysters, mussels, clams), termed aquaculture, is also an agricultural industry. (Not many know that Connecticut is second only to Louisiana in production of oysters.)

The many corollary benefits accruing from agricultural use of the land, while less quantifiable, add significantly to the character of Guilford. The excerpt below, from the Working Lands Alliance, a state-wide agricultural advocacy organization, summarizes these benefits:

"Connecticut is losing 9,000 acres of farmland (approximately 80 farms) every year… Connecticut's remaining 380,000 acres of farmland contribute to our health and well being in the following ways:

- A $2.2 billion annual contribution to the state's economy
- A source of wholesome nutritious foods that strengthen our food security
- Habitat for many species of wildlife
- Natural purification systems for our water supply
- Protection against flooding
- Scenic vistas and open space
- A beautiful working landscape that also pays taxes, provides jobs, and contributes to the social vitality of our small towns
- A buffer against suburban sprawl
- The source of agricultural products (from tomatoes to turf) used at one time or another by every Connecticut resident."

E.2 Agricultural History

Guilford's farming heritage is set against the background of its Colonial history and its geology. To quote the Reverend Thomas Ruggles, from *The History of Guilford From Its First Settlement*, dated 1769, referring to the original settlement in 1639:

> The first planters Wheither Gentlemen or Yeomen were almost all of them Husbandmen (farmers) by profession few Tradesmen, not one Black:Smith among them". While the settlers of New Haven were "…Londoners bred to Merchandise and fixt upon a place proper for Tradeing which was their Design: But Mr. Whitfield's people were Quite the Reverse, Country people; and there: fore chose their land for different ends.

Soils are fertile and productive in the area geologists term the coastal slope, the area that begins about 12 miles inland from the Connecticut coast and slopes toward the Sound (See *Section A. Geology.)* "Always on the lookout for fertile land, the colonists settled the Coastal Slope early on. Saybrook, New Haven, Guilford, Milford, Stratford, Fairfield, Greenwich, and Stamford were all settled within ten years of Connecticut's first town, Wethersfield."[2]

Anecdotal accounts tell us agricultural uses once dominated the Guilford landscape, but hard evidence is difficult to find. Data on the decline of farm size and farming activity for Connecticut may indicate the situation in Guilford.[3] Since early times, a number of old farms in Guilford were worked by their owners

with little hired labor. According to Joel E. Helander, Town Historian, there are no discrete records in Guilford of the number of farms over time. In 1925 the Department of Agriculture proclaimed that it was impossible to take a Census enumeration of the farms.[4] There are still a few areas in Town that have been in documented production continuously for over 300 years — a distinction that deserves recognition.

E.3 Current Agriculture

The disappearance of farms is a statewide concern. The Working Lands Alliance indicates that in 1947, 22,000 people worked in agriculture in Connecticut and in 1980, roughly 3,000 people worked in agriculture. From 1997 to 2002, Connecticut lost 12 percent of its farmland, the largest percentage loss of any state, according to the USDA 2002 Census of Agriculture. The 2000 Census indicates that one-fifth of a percent of Guilford's residents are in "farming, fishing, and forestry" occupations, in contrast to, for example, 53 percent in management/professional occupations. This figure does not account for those whom farming is not their primary vocation or those with backyard gardens.

Farming in Guilford is characterized by three commercial-scale farming operations and numerous small-scale farms and backyard gardens. In recent times there were several dairy farm operations in Guilford; today, there are none. Concern over the disappearance of farmland spurred the Town to purchase the development rights of the Wimler farm on the Durham border in 2001. The concept of creating a Community Land Trust to preserve working farmland as used in communities around the nation is gaining interest locally. In 2004 the Shoreline Housing Partnership successfully purchased the first property for this purpose in Guilford.

According to the Town Assessor 2,838 acres, or 10 percent of the Town's land area, are enrolled in the Public Act 490 Program (P.A. 490) classified as farmland. This preferential tax assessment program, passed by the Connecticut General Assembly in 1963, reduces the tax burden of parcels that meet certain criteria, so that they are less likely to be sold for development. (See *Appendix H-3.)* A modest fiscal surplus for the Town results from P.A. 490 land because this unbuilt land requires no Town services and produces no school enrollments. Many local farmers lease the land they farm, which allows property owners who, due to age or other reasons, do not farm the land themselves to keep the tax advantages offered under the P.A. 490 program. Most of this land is hayed. Many farmers grow hay and cow corn to feed as silage to help keep expenses of cattle-raising down.

Current agricultural products and producers in Guilford are discussed in *Section E.5* and listed in *Appendix E-1.*

E.4 Farmland Soils

Guilford has significant acreage of prime farmland, defined by Natural Resource Conservation Service (NRCS) as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and fiber and also is available for these uses. It also has significant acreage of statewide important farmland soils, defined as land that is nearly prime farmland and that economically produce high yields of crops when treated and managed according to modern farming methods. Much of these fertile soils that attracted the colonists now support housing developments. (See *Map A-4.)*

When identifying appropriate locations for farmland protection, designated farmland soil type is one factor to consider for potential future productivity of the site for agriculture. It also is a criterion for eligibility in the State of Connecticut Department of Agricultural Lands Preservation Program. However, Guilford's farms are not likely to compete well against farms in other communities applying to this State program due to small size of our farms, limited program funding, and other factors.

E.5 Marketable Resources: Products and Tourism

Guilford's agricultural economy includes farm products and agri-tourism, as described here, as well as forestry products (See *Section E.9*), and aquaculture products (See *Section B. Coast.)*

Products

Around Town, one notices the Connecticut Grown logo proudly pointing the way to local produce.[5] Guilford has a small agricultural economy based on goods grown and marketed (retail and wholesale) for the Town and out-of-town market. Guilford's agricultural products and producers are listed in *Appendix E-1.* Produce and hay production predominate, along with small production of maple syrup, honey, livestock, nursery stock, roses and other flowers, and Christmas trees. (See *Map E-1.)*

In a state that depends significantly on imported produce and whose farmland fell from 50 percent of the land area in 1950 to 11 percent today with a doubling of the population, locally-grown products take on an even greater importance. An advantage to local produce is that we know the farmers and how their products were raised and marketed. Because produce does not have to be raised with an eye toward transportation issues, it is fresher and not bred for traits of longevity. Although some local produce is likely grown organically, no organic growers in Town are registered with the Northeast Organic Farming Association of Connecticut, an organization of organic farmers in the region. (Farmers selling more than $5,000 of organic produce must be certified as organic growers.)

Tourism

Guilford derives additional economic benefit from its agricultural economy in the form of tourism. Heritage tourism, or touring in a rural setting, bed and breakfast facilities, and agricultural tourism, or agri-tourism, all benefit from the continuation of our agricultural uses and the agrarian landscape.

Agri-tourism, defined as tourism with direct contact with agriculture, encompasses petting farms, cornfield or hay mazes, hayrides, and "Pick Your Own" farms. In Guilford we are fortunate to have Bishop's "Pick Your Own" berries, fruits, pumpkins, flowers, and maze and several "Cut Your Own" Christmas tree farms. These opportunities are not common in southern Connecticut and so there is a regional draw with associated economic benefits to the Town. The Guilford Agricultural Fair, described in *Section E.6*, can attract about 30,000 people over three days on a sunny weekend in September, ranking as Guilford's premier tourist attraction.[6] The Dudley Farm Historical Museum, described below, is also a tourist attraction.

E.6 Cultural Considerations

Agriculture speaks to our heritage, no matter our origins. It offers us a connection to the land and the seasons. Local produce enriches our table. For those in the farming business, it offers a rewarding lifestyle. Many tourists seek out pastoral areas for vacation spots to reconnect with the land on a sensory level.

Guilford Agricultural Fair

Guilford celebrates the agricultural way of life every year with the Guilford Fair, designated a Local Legacy.[7] Held annually on the Guilford Fairgrounds on Lover's Lane, the Fair is owned and operated by the Guilford Agricultural Society, a private, non-profit organization. Its purpose is "to promote the preservation of the agricultural heritage of Guilford and Connecticut." Professional farmers, hobbyists, 4-H members, and families enter farm products and livestock competitively

As Connecticut's only shoreline fair, the Fair is the State's second oldest agricultural fair. Established in 1859 by four Guilford farmers whose "cupboards" were "full of the fat of the land," the Guilford Fair had its origin on the eve of the Civil War. The early agricultural fairs on the Guilford Green had become famous for their cattle shows, when the village was crowded with strings of parading cattle as farmers competed by sending the largest possible "delegation" of animals. In 1969 the Guilford Fair outgrew the confines of the eight-acre Green and relocated to the 30-acre Hunter Farm off Lover's Lane. This land is owned by the Society and is the largest open space parcel in the downtown area.

Dudley Farm Historical Museum

The Dudley Farm Historical Museum, an interactive, nineteenth-century homestead museum, is located on Route 77 at the intersection of Route 80. The ten original acres that make up the core of the Dudley Farm are a portion of the several hundred that where parceled out to William Dudley when he settled Guilford with Reverend Henry Whitfield in 1639. When David Dudley, a tenth generation Dudley passed away, the farm became the property of the North Guilford Volunteer Fire Company # 4. In 1995 the Company established the non-profit Dudley Foundation, which maintains and administers the operation of the farm as a historical, educational, and recreational resource. The Dudley Farm features locally-grown produce at its Dudley Farm Market, the Farmers' Community Garden, a plot at the Farm for communal use, a heritage garden where varieties from the 1800's are raised, tours, and educational and cultural arts events. Local students pursue studies in archeology, history, and period woodcrafts.

E.7 Farmland Habitat

Habitat created as a result of agricultural use is important for certain animal and plant species. This includes open farm fields (hunting habitat for birds of prey and nesting habitat for grassland bird species), hedgerows (denning for foxes, skunks, etc.), and barns (for barn owls and bats). See *Section D. Uplands.* Farming and the protection of grassland habitat can be compatible, and funding is available through the Connecticut Department of Environmental Protection (DEP) Landowner Incentive Program to promote private management of high quality, privately-owned grasslands as habitat.

E.8 Scenic Value of Farmland

The scenic amenity resulting from agriculture use of the land is in itself a resource. In the words of the Working Lands Alliance, "Connecticut has a distinct rural landscape richly accented by working farms." Pastoral settings are provided by and complimented by land in agricultural use. The open expanses of farm fields, the peacefulness of livestock grazing, the architectural integrity of historic farm buildings, are all scenic amenities. Agricultural land adds to the visual diversity of the landscape and affords a break from a continuum of residential development. (See *Section G. Natural Resource-Based Scenic Resources.*)

E.9 The Managed Forest Resource

This section concerns forestry as a managed resource. (For discussion of forests as a biological resource, see *Section D. Uplands.*) Sixty percent of Connecticut is forested.[8] The State of Connecticut values forested areas "to meet such needs as timber production, watershed protection wildlife habitat, scenic vistas, and protection of air quality."[9] According to the State, "ownership of forestlands is increasingly fragmented with 80 percent of the resource divided among thousands of owners. This inhibits active conservation and management of forests" for the valued functions listed above.[10]

The importance of preserving and managing Guilford's forest resource is clear, given the values of the resource and the increasing fragmentation of forest tracts. According to the Town Assessor 5,677 acres of forest land in Guilford, or roughly 19 percent of the Town land area, are under the P.A. 490 program (See *Appendix H-3.)*[11] The land base managed as a forest is in non-industrial private ownership (as opposed to a commercial enterprise), with large tracts under the management of the South Central Connecticut Regional Water Authority (SCCRWA), the State of Connecticut (Cockaponset State Forest), the Town (Timberlands) and the Guilford Sportsmen's Club, which manages 400 acres of forest. There is currently no inventory of those smaller forested tracts under private management as woodlots. Management is a long-term proposition, as it can be 25 to 50 years between harvests.

Wood Products

Wood products may include saw logs, sawdust, mulch, cordwood, biomass chips, mountain laurel boughs, and witch hazel. The one working sawmill in town off Great Hill Road imports saw logs and retails the lumber, sawdust, and mulch byproducts. Chittenden and other small woodlot owners sell firewood. The three largest areas of wood production and forestland management in Town are described below.

Timberlands

The approximately 600-acre, Town-owned Timberlands property supports high-value timber and cordwood that is harvested as part of an overall management plan under the auspices of the Conservation Commission and designed to enhance and preserve the richness of the forest. Private contractors bid on the product and conduct the harvesting under the supervision of a forester.

South Central Connecticut Regional Water Authority (SCCRWA)

Following the SCCRWA *Land Use Plan* (1996), the Authority maintains a forest management program on its land around Lake Menunketuc and on its holdings to the east of Lake Quonnipaug. The Authority has designated its forested land in the Totoket Mountain area for "preservation use," the terrain being too difficult to manage for forestry. According to Tim Hawley, Natural Resources Manager, SCCRWA, the Authority manages about 2,700 acres in Guilford for water supply and timber. This land contains about 11,000,000 board feet of timber, with an average annual timber growth of about 200,000 board feet. (For comparison, construction of an ordinary 3-bedroom wood house requires about 10,000 board feet for forms, framing, sheathing, flooring, trim, and furnishing.)

Over the past 20 years, SCCRWA has harvested 2,146,000 board feet, or an average of about 107,000 board feet per year. This equals one-half the average annual growth. About 80 percent of the harvesting was initiated to salvage hemlock trees dying from gypsy moth in 1982 and hemlock woolly adelgid in the 1990s. Significant but scattered mortality from Hurricane Gloria in 1985 and the drought of 1993 to 2002 was not salvaged. (Even within areas where dying trees are salvaged, some dying trees are kept to maintain a reservoir of dead wood in the forest.)

About 60,000 cords of wood are in fuelwood-size trees. SCCRWA has sold about 2,500 cords of firewood from Guilford over the past 20 years, an average of 125 cords per year. Natural mortality of fuelwood-size trees is probably at least equal to the amount harvested. Nearly all of these trees are left to decay.

Over the past 18 years 146 Guilford residents have been issued firewood cutting permits. In 2003, 24 Guilford residents held active firewood permits. In the past several people have also tapped trees for maple sugaring. Nearly all the SCCRWA land in Guilford, along with considerable land of others, lies upstream of a public drinking water reservoir, and SCCRWA will continue to manage the forest to protect water supply. The forestland is also valuable habitat for wildlife, scientific research, recreation, and education.

Cockaponset State Forest

Cockaponset State Forest (CSF) is composed of many discete parcels over several towns from Guilford to Middletown. The State began purchasing land for CSF in 1926 with the intent to grow timber for use in-state, as most of Connecticut's forests had been cut off around the turn of the century. Much of the forest probably was clear-cut during the charcoal industry period. This forest in Guilford is known as part of the Killingworth Block. It is comprised of one 372-acre parcel (abutting Route 80 to the north and Hart Road to the east) and three smaller parcels totaling about 377 acres (near Route 146, accessed off Dunk Rock Road) that are part of the Westwoods area and the CSF Michael Pochan Block.

The State does not conduct major harvesting in the Westwoods property, as it hosts a high-use trail system. (See *Section I.*) The area was one of the hardest hit by the adelgid infestation of 1985; most of its Eastern hemlocks have been killed. Trails were closed to public access beginning in 2001 due to the safety hazard posed by falling hemlocks. As trails are cleared, they are posted as open once again. A plan for management of this area is being developed.

In managing Cockaponset and the other 31 State forests, the Division of Forestry:

> ...seeks to develop a vigorous, resilient forest environment capable of sustaining the wide range of demands that the public places on these lands. These demands include a variety of recreational experiences, natural diversity (including threatened and endangered species), the preservation of unique sites (both geologic and archeological), the provision of raw materials as forest products, and the maintenance of wildlife and fisheries habitats.

The ten-year goals identified for CSF are to promote biological diversity, to promote healthy forest vegetation, and to provide dispersed recreational opportunities.

Guilford, like the rest of Connecticut, is losing oak trees at the rate of 10 percent per decade from a series of factors. The CSF management plan proposes to sustain oaks and pine and early successional habitat while minimizing impact upon habitat for interior nesting birds. Seven percent of Connecticut's mammals (e.g., rabbits, bobcat) and 14 percent of Connecticut's birds require the young forest habitat. The plan delineates areas in Guilford for sawtimber, poles, and thinning. A site-specific operations plan undergoes review by DEP's Wildlife, Fisheries, and Rare and Endangered Species Divisions. Areas to be cut go out to bid to loggers and sawmills. The cutting operatons follow best management practices to protect streams and the forest floor.

In regards to disposition of property, the State has both acquired forestland (420 acres added to Cockaponset in Madison in the last ten years, for example) and disposed of forest land in recent years, however, there are no current plans to alter the status of these forestlands in Guilford.

References

Bell, M. 1985. *The Face of Connecticut: People, Geology and the Land, Bulletin 10.*

State Geological and Natural History Survey of Connecticut

Bloomer, N., Reference Librarian, Guilford Free Library

Connecticut Department of Environmental Protection. 2001. *The Connecticut Green Plan: Open Space Acquisition-Fiscal Years 2001-200*6. Hartford, CT

Connecticut Department of Environmental Protection. 2003. *Management Plan for Cockaponset State Forest - Killingworth Block*, (available at Guilford Town Hall)

Daniels, B.C. 1979. *The Connecticut town: Growth and Development, 1635-1790.* Middletown, CT: Wesleyan University Press

Fallucci and Walicki, LLC. Madison, CT *1997 Timberlands Forest Management Plan*, (available at Guilford Town Hall)

Guilford Agricultural Society website: http://guilfordfair.org

Jenkins, E.H.. 1925. Connecticut Agriculture. In *The history of Connecticut: Volume II*, ed. N.G. Osborn, 289-425. New York: The States History Company

Merchant, C. 1989. *Ecological Revolutions: Nature, Gender, and Science in New England.* Chapel Hill: University of North Carolina Press

Natural Resources Conservation Service (NRCS) website: http://www.nrcs.usda.gov/

O'Hare E. 2004. *Preservation Mechanisms and Technical Assistance Programs for Farmland and Managed Forestland.* Guilford, CT. Available from Guilford Free Library

Appendix

E-1 Agricultural Products of Guilford

Maps

E-1 Land in Agricultural Use

Endnotes

1 For statutory definition of agriculture and farming, see CGS 1-1(q).

2 Daniels 1979.

3 According to Merchant (1989), Connecticut's population in 1750 was estimated at 100,000. In 1790, at the time of the first Census, the state population was 237,635. As the population expanded, the average family farm size in Connecticut declined rapidly from 486 acres in 1680, to 166 acres in 1750, to 81 acres in 1790. According to Jenkins (1925), as late as 1790 it was possible that nine out of ten breadwinners were engaged in some form of agriculture. One century later in 1890, the number was three out of ten.

4 Reference supplied by Nona Bloomer, Reference Librarian, Guilford Free Library.

5 According to the State of Connecticut Department of Agriculture, "The Connecticut Grown Program is an ongoing initiative to increase the demand for Connecticut products from within and from outside the region, increase sales and value of Connecticut products, increase farm product profitability, increase farm numbers and production to ensure equilibrium supply and demand, diversification of farm products and farm use capabilities, increase visibility of Connecticut products."

6 John Hammarlund, personal communication.

7 One of 1,300 designated nationwide as part of the Library of Congress's collection of American Folklife Center.

8 Forest land is defined by the State as any land one acre or greater with wooded vegetation.

9 *Conservation and Development Policies Plan for Connecticut: 1998-2003*, State of Connecticut Office of Policy and Management.

10 Ibid.

11 Figures dated August 6 2003

Section F THE DARK NIGHT SKY

See separate Map Atlas for map references

F.1 Introduction

Many consider the dark night sky and its contents a natural resource. Star-gazing is a connection to humanity's earliest curiosity about our place in the universe. Finding the Big Dipper, Orion, and the Milky Way is one of childhood's wonders. A survey conducted by the National Park Service indicated that 94 percent of park visitors surveyed agreed that "a dark night sky is important to that park's purpose and visitor experience." Guilford residents may value a dark night sky as well. Because all living things evolved with a dark night, the importance of the darkness of the night to the healthy functioning of the inhabitants of the natural world is now the subject of scientific investigation. In Guilford we are far enough away from the glow of city lights so that the natural beauty of the night sky still enriches our lives.

In 2003, the Legislature considered a bill establishing the dark night sky as a natural resource of the State of Connecticut, joining air, land, and water as the official natural resources of the State. Although the bill has not yet made it into law, it is expected to be introduced again in 2005.

F.2 Concern: Light Pollution

Under ideal conditions, about 2,500 stars are still visible in the night sky in the United States. But only ten percent of Americans today can actually see the majority of these stars from where they live.[1] Whereas the Milky Way used to be a familiar sight in the suburban sky, only ten percent of the stars in the Milky Way are still visible. Even fewer can be seen from urban areas.[2]

The proliferation of artificial outdoor light use, particularly light projecting into the night sky, has developed into a relatively new area of environmental degradation: light pollution. Light pollution is the scattering of light into the sky or on locations where it is not wanted or needed. It is caused by unshielded lights, spotlights, and ornamental lights that are directed toward the sky or at wide angles rather than straight down.

There are three categories of light pollution:

- sky glow (caused by the scattering of artificial light in the atmosphere)
- glare (excessive illumination that causes eye discomfort)
- light trespass (the poor control of outdoor lighting which crosses property lines)

In addition to diminishing the dark night sky as a natural resource for amateur and professional astronomers, light pollution harms aspects of the natural world. Many species of migratory birds depend on constellations to guide them during their migrations, and when birds use artificial light from built structures as a guide, high death tolls can result.[3] It has been demonstrated that foraging, reproduction, circadian rhythms, and hormone levels may be adversely impacted by excessive artificial light in the natural environment. The effects of light pollution on animals inhabiting lakes and coastal waters - areas unshielded and openly exposed to light - are currently under study.[4]

Residential consumption of electricity for lighting has increased 40 percent since 1970. The United States generates so much upward-shining light that the nation's borders and major metropolitan areas appear visible on satellite images taken at night.[5] *Appendix F-1* shows a dramatic look at the Greater New York City Metropolitan area at night. The brightness of the developed Guilford coastline contrasts with the relative darkness of the less-developed areas to the north in this image.

States and municipalities have begun to react with legislation aimed to curb light pollution. In 2003 the Connecticut Legislature passed a bill requiring the State to reduce road glare and light pollution from private area floodlighting located within the State Right-of-Way.[6] In 2004 the State approved the Light

Pollution Controls amendment to the State Building Code, as a Connecticut amendment to the 2003 International Energy Conservation Code. The amendment requires full cutoff luminaries for all exterior lighting of new buildings and renovations, excluding one and two family dwellings.

F.3 Summary

Much of Guilford is still relatively dark at night, and this darkness is a resource to be protected. Light pollution and light trespass seriously impact the natural beauty of the night sky, may harm and disrupt instinctive nocturnal patterns of fauna and flora, and waste energy. Correcting outdoor lighting problems can save money and electricity, improve public safety, and increase visibility, while reducing air pollution and greenhouse gas emissions.

References

Bower, J. March-April 2000. *"The Dark Side of Night."* Audubon

Chaney, W. June 2002. *"Does Night Lighting Harm Trees?"* Purdue University Forestry & Natural Resources, FRN-FAQ-17

Connecticut General Assembly, Public Act 03-210, An Act Requiring Reduction in Hazardous Road Glare and Light Pollution from Private Area Floodlighting Located Within the State Right-of-Way

International Dark-Sky Association website: www.darksky.org

Nadis, S. Oct. 31, 2002. *"Biologists Join Drive to Turn Down the Lights."* Nature, Vol.419

Town of Tolland, Connecticut. Zoning Regulations, Section 170-137. Outdoor Lighting Regulation

Appendix

F-1 New York Metropolitan Area at Night

Maps - none

Endnotes

1 Bower, 2000
2 Reese, 2000
3 Bower, ibid.
4 Nadis 2002.
5 Ploetz 2002.
6 Connecticut General Assembly 2003.

Section G NATURAL SCENIC RESOURCES

See separate Map Atlas for map references

G.1 Introduction

Natural resources, although valued primarily for the physical sustenance they provide humans and wildlife, possess intrinsic beauty that stirs the mind and renews the soul.

Guilford is well-known for its scenic character which affords beauty and well-being, a sense of place and history, a source of recreation, and opportunity for tourism as well as added value to properties. Policy A from Guilford's *2002 Plan of Conservation and Development (POCD)* stresses the importance of protecting Guilford's scenic features:

> …in order to preserve the Town's unique character.… The Plan continues ...As stated in the recently developed *Plan for Open Space and Municipal Land Needs (2001),* Guilford's open space goals are to preserve resources along scenic corridors, preserve the "gateways" to Guilford, foster conservation and preservation of the important natural habitats and scenic resources of Guilford, protect cultural features and shoreline views….

Land use analysis figures in the Guilford Planning and Zoning Commission Planning Committee's *Growth Management Plan* (2004) indicate the Town is 46 percent developed, 27 percent committed open space, and 27 percent vacant land. As vacant land and committed open space blend visually, the Town appears to be 54 percent "green."

G.2 Types of Natural Scenic Resources

This section analyzes the Town's natural scenic amenity and illustrates the dynamic relationship between its scenic assets and its natural resources**.** Scenic geological features, views from scenic roads, scenic rivers and 14 other natural scenic resources are depicted on *Map G-1* Guilford's natural scenic resources include: scenic areas and scenic views, scenic roads, mature trees, stone walls, ridgelines and hillsides, coastline and marshes, lakes and streams, and pastoral landscapes. The emphasis of this section is the resources' appearance rather than their functional value addressed in other sections. In regard to tourism and quality of life in Guilford, the value of scenic features should not be perceived individually but rather, in the context of the whole Town.

Scenic Resources Catalogued in Other Documents

Guilford's natural beauty has inspired recognition of the Town's scenic areas in plans of the Guilford Preservation Alliance (GPA) (1995) and the Town's Land Acquisition Committee (2001), both maps of which are available at Town Hall, and South Central Connecticut Regional Water Authority (SCCRWA) (1996). Some areas listed in these documents are noted for their scenic qualities. However, the basis behind all three lists differs in intent from this NRIA list. And, in contrast to the latter scenic areas, the scenic views and areas presented here are notable for their natural features exclusive of man-made .. structures. (See *Appendices G-1* and *G-2*, which compare these lists.*)*

The SCCRWA *Land Use Plan* (1996) identifies these scenic features for preservation on SCCRWA land in Guilford:

- Scenic ridges on East and West Sugarloaf Hills
- Scenic waterfall (near Cook's Lane; in fall, winter, and spring)
- Sandstone cliffs and caves (east side of Menunketuc Reservoir)
- Scenic ridges on Totoket Mountain (afford views and vantage points)

Recognizing the sensitivity of ridgeline views to alteration, the SCCRWA Plan says that "proposals to construct towers or other structures on Authority owned portions of the ridge will be critically evaluated for visual impact and weighed against public need."

Scenic Views and Scenic Areas

Since beauty is in the eye of the beholder, any categorization of a scenic area or view is necessarily subjective. To clarify meaning this section uses these definitions:

Scenic area: an area that *most* people would agree has natural intrinsic beauty and character

Scenic view: the sight obtained from a vantage point (See below.) The subject of the view may be a discrete feature, an area, or a panoramic landscape

Vantage point: the public place from which a scenic view can be observed. These include public roads and right-of-ways, trails, lakes, ridges and bluffs, beaches, coastal waters and off-shore

A preliminary list of Guilford's public vantage points and corresponding scenic views follows. Areas that are both a public vantage point and a scenic area, as defined above, are indicated. Although not all are listed, Guilford's water resources are recognized as scenic areas.

PUBLIC VANTAGE POINT	**SCENIC VIEW**
Bluff Head*	Panoramic views of North Guilford, Broomstick Ledges, Hartford, and Long Island Sound
Bridge on Clapboard Hill Road	East River Marshes Estuary
Great Hill Road	Fields looking west and east and northwest near Cook's Lane
Westwoods*	Woodlands and marshes
East Woods off Podunk Road	Woodlands
Guilford Town Marina	Grass Island, marshes, Long Island Sound and Faulkner's Island
Route 77 North	Bluff Head, Broomstick Ledges, and ridges to the west
Route 77 and Lake Drive	Lake Quonnipaug and ridges to the north and west
Route 77, North of Route 80	West River valley floodplain, and fields and woods
Chaffinch Island*	West River inlet, Guilford coast & Long Island Sound
Indian Cove*, Sachem's Head*, Mulberry Point*	Town beaches, coast and the Sound
Joshua Cove*, Vineyard Point*	Town beaches, coast and Long Island Sound
Route 146 at Shell Beach Road	Leetes' Island, and tidal flats
Route 146 at Lost Lake	Great Harbor marshes and Westwoods
Olmstead's Outlook*, River Street	West River marshes
Chittenden Park*	Marshes

PUBLIC VANTAGE POINT	SCENIC VIEW
Scenic View Road	fields, Lake Quonnipaug and Quonnipaug Mountain
Long Island Sound*	Guilford coast, coves and ridgetops
West Street	Totoket Mountain
Overlook Road	Totoket Mountain
Hemlock Avenue	Ravine on south side of Hemlock Avenue
North Madison Road	Guilford Lakes

* a public vantage point which is also a scenic area or view in its own right

Scenic Roads

Guilford has many scenic roadways that lend a distinctively rural character to the Town. Many still follow the routes of the first roads built several hundred years ago on cow paths or carriage routes between villages. A number of Town roads have remained unpaved. Some roads are canopied, with mature trees that arch over the roadway, untouched by utility company trimming.

Dozens of roads in Guilford meet one or more of the statutory criteria for protection as municipal scenic roads: roads that are unpaved, lined with mature trees or stone walls, crossing brooks or streams, possessing scenic views, or less than 20 feet wide. Examples of such roads in Guilford include Clapboard Hill Road, Moose Hill Road, County Road, West Street, Elm Street, Beaver Head Road, and Great Hill Road. (See *Appendix G-3* for an example of how such roads may be assessed for their scenic characteristics.)

Route 77 and Route 146, two of Guilford's four state highways, are officially designated as Scenic Roads by the State of Connecticut. The view from the roadway is the scenic asset. Alterations within these designated scenic corridors are subject to review by the Guilford/Branford Scenic Roads Advisory Committee.

Mature Trees

It is easy to take Guilford's lovely tree-lined roadways for granted. The Town is blessed with many mature trees along our thoroughfares. Seventeen Guilford trees are recognized in "Connecticut Notable Trees," a state-wide catalogue of the largest trees by species, published by the CT Botanical Society, Connecticut College Arboretum, and the CT Urban Forest Council. (See *Appendix G-4* for further detail.) Many of them are the largest examples of their type in the state, however most of them are not species native to the area. An inventory of outstanding native specimens within Town has not yet been completed for Guilford but such studies have been undertaken in several Connecticut communities.[1]

Stone walls

Stone walls are uniquely characteristic of New England as a result of glaciation and are a hallmark feature of our landscape. Whether lining roads or criss-crossing the woods as remnants of former agricultural use, they are scenic features worthy of preservation. Many are located within Town rights-of-way, and as such are maintained by the Public Works Department. Although not yet inventoried for the NRIA, stone walls can be identified on USGS topographical maps and on aerial photos.

Ridgelines

These landforms are visually prominent due to their elevation and expansive size. They anchor the landscape. The traprock ridges of Totoket and Pistapaug Mountains are protected by statute[2] and through the Metacomet Ridge Conservation Compact Agreement. (See *Appendix I-3* and accompanying map.) Ridgelines or ridgetops, including traprock ridges and prominent hillsides, likely will be mapped in future editions of the NRIA.

Pastoral landscapes

Agricultural land use is inherently scenic (pastoral scenes are a favorite genre in the art world) and adds diversity to the visual landscape. (See *Section E. 8, Agriculture* and *Map E-1 for location.*)

Waterbodies and Coastal Areas

Throughout time humans have found water and views of water restful and rejuvenating. Although not all are individually depicted as scenic resources on *Map G-1*, all Guilford's abundant streams, ponds, and lakes add to the scenic experience. Coastal areas, including Faulkner's Island, are treasured scenic amenities. (See *Section B.* and *Map B-1.)*

G.3 Threats

The build-out prognosis in the *Growth Management Plan* (2004) indicates that, if we opt to maintain the current ratio of committed open space land to developed land (1 to1.7), today's 8,100 acres of vacant land would be converted to about 5,100 acres of developed land and 3,000 acres of additional committed open space at build-out. This scenario represents a net loss of 17 percent of the existing "green" area. Although 17 percent may not sound like a big change, the visual impact would be notable.

Scenic views: Views and the span of the view, termed a viewshed, are particularly sensitive to land use changes that may impact the integrity of the viewing experience. Scenic views can easily become degraded or reduced in scope. To protect some scenic areas, the integrity of the scenic area and the view that area affords both have to be protected. Bluff Head, for example, is a scenic area as viewed from a distance and up close. The top of Bluff Head is a well-known vantage point from which the public enjoys a panoramic scenic view. As more rooftops and roads become visible, the less attractive its views will become. Its status as a treasured viewpoint may diminish and a public constituency may be lost. Several Connecticut communities have used scenic easements and open space (or conservation) design to maintain the integrity of views. (Also see *Ridgelines section.*)

Scenic roads: The visual integrity of viewsheds from scenic roads and highways can be compromised by insensitive development and associated utility lines.

Mature trees: Mature trees, once lost, cannot be replaced in a lifetime. Adequate tree maintenance by the Town is important to preserve the attractiveness and longevity of trees gracing our roads. And, although there are safeguards to prevent tree cutting by private parties within the Town right-of-way, there are no safeguards to protect even the most extraordinary tree specimens from insensitive development in other areas.

Stone walls: Loss of integrity of Guilford's stone walls over time due to deterioration by vine damage, relocation, and theft is a concern.

Ridgelines: Visual degradation of ridgelines has potentially far-reaching impacts. Potential location of telecommunications towers remains a concern for all ridgelines and other visually prominent areas.

Pastoral landscapes: As land in agricultural use is an integral piece of the Guilford landscape, its potential loss to development is a concern.

Waterboadies and coastal areas: The potential for loss of visual access to the coastal landscape and Long Island Sound as a result of new development is a concern.

G.4 Summary

Guilford's scenic resources are one of the Town's most compelling attractions. They are a major component of our quality of life and a significant factor in the economic value of land. The process of inventorying and mapping the Town's natural scenic resources revealed that the key to Guilford's signature beauty lies in the diversity and distribution of these scenic amenities. As build out continues, there is concern that without a program to protect them, the Town's natural scenic qualities will be eroded over time.

Resources

Connecticut Department of Transportation Scenic Roads Advisory Committee. 1998. *Preserving Connecticut's scenic roads: A handbook for collaboration on corridor management planning*

Connecticut's Notable Trees project website: http://notabletrees.conncoll.edu/

Guilford Preservation Alliance. 1986 revised 1995. *Master Plan for Preservation and Scenic Conservation – Town of Guilford, Connecticut*

O'Hare, E. 2004. *Scenic resource protection methodologies, including tools currently used in the Town of Guilford.* Guilford, CT. Available in Guilford Free Library

Scenic America website: http://www.scenic.org/

South Central Connecticut Regional Water Authority (SCCRWA). 1996. *Land Use Plan*

Town of Guilford. December, 1996. *From the Mountains to the Sea: Routes 77 and 146 Corridor Management Plan.* Route 77 and 146 Scenic Road Advisory Committee and the Connecticut Department of Transportation

Town of Guilford. 2002 *Plan of Conservation and Development* (POCD)

Town of Guilford. 1999 revised 2001. *Plan for Open Space and Municipal Land Needs.* Land Acquisition Commission

Town of Guilford. 2003. *Transportation Plan*

Towns of North Stonington, Hebron, and Mansfield, CT zoning and subdivision regulations

Appendix

G-1 Comparison of NRIAC's Natural Scenic Resources with LAC's Areas of Conservation Interest and GPA's Favorite Scenes and Places

G-2 Natural Resource Elements Applied to GPA's Favorite Scenes and Places and Natural Resource Elements Applied to LAC's Areas of Conservation Interest

G-3 Guilford's Town-owned Scenic Roads – an inventory sample

G-4 Guilford's Notable Trees

Maps

G-1 Natural Scenic Resources

Endnotes

[1] Biggest tree contests have been conducted in Newtown, Orange, Milford, and other Connecticut communities.

[2] CGS Sec. 8-2(c) authorizes municipalities to adopt regulatory provisions for development restrictions in ridgeline setback areas. Also see CGS Sec. 8-1aa. Ridgeline protection.

Section H OPEN SPACE

See separate Map Atlas for map references

H.1 Introduction

Open space provides the framework for experiencing and enjoying our natural assets and provides access to them. This chapter identifies, catalogues, and analyzes Guilford's open space rather than the natural resources it supports, and describes it in regional, state, and national terms. Among the most important open space for natural resources are those areas that protect public sources of drinking water and critical habitats such as unfragmented forestland. The Planning and Zoning Commission's (PZC) *Build Out Study* (2002) indicated that of Guilford's approximate 30,000 acres, roughly 7,500 acres are committed as open space and roughly 8,100 acres remains as privately-held vacant land. It is this undeveloped, vacant land where opportunities exist to further protect Guilford's natural resources. The Town's commitment to acquire additional open space will help make this possible.

H.2 Benefits and Functions of Open Space

Open space provides multiple natural resource-related benefits and functions. For example, within a given area of open space, a stream affords habitat for aquatic organisms, a travel route for terrestrial organisms, and a food and water source. The open space resource affords access to that stream, recreational pastimes like fishing, wading, and exploring, and a view of the stream. The integrity of the open space includes the air above it, the geology below it, a flood buffering function, and the irrigation the stream may provide to abutting farmland. Open space:

- protects natural resources (water and drinking water supply, wildlife habitat and corridors, soil resources, air quality, ecological processes)
- enhances quality of life
- provides opportunities for personal rejuvenation
- contributes to our sense of place
- provides outdoor recreation
- protects public health and safety (floodplains, wetlands, vegetated steep slopes, aquifer recharge areas)
- shapes community character (scenic vistas, buffer strips, greenways, open space dedications related to development)
- protects historic and archeological sites, historic structures and grounds, historic districts, town greens
- benefits the region beyond the Town's borders (e.g., contributes to the State's green infrastructure[1])

The economic benefits of open space are many. Studies have shown that, compared with residential development, open space (without need for roads, schools or emergency services) provides a net fiscal benefit to towns. Economic benefits of open space that accrue to private landowners include:

- tax benefits when landowners participate in the P.A. 490 program
- tax relief through conservation easements
- resource management for agricultural and forest products, fisheries
- enhanced property values for owners of land that abuts open space and conservation easements

H.3 Definition of Open Space

Various definitions of open space are used by the State of Connecticut, the Connecticut General Statutes, the Land Acquisition Commission (LAC), and the Town Assessor. This section clarifies these distinctions. *Appendix H-1* itemizes the way in which these terms are applied to Guilford's open land. The NRIA uses the Connecticut DEP's definition of "open space," which is broader than that used by LAC:

> … any land whose preservation or restricted use would maintain and enhance the conservation of natural or scenic resources, protect natural streams or water supply, promote the conservation of soils, wetlands, beaches or tidal marshes, enhance the value to the public of abutting or neighboring parks, forests, wildlife preserves, natural reservations or sanctuaries or other open spaces enhance our public recreation opportunities[2], preserve historic sites or promote orderly urban or suburban development.

The Town refers to open space land using LAC's three-tiered classification system, which is based primarily on use[3]:

- Class A - land classified by the Town for low-impact use, i.e., for passive recreation only (e.g., Timberlands)
- Class B - land on which the Town allows formal recreation activities (e.g., golf course, athletic playing fields)
- Class C - Town-owned land for possible high-impact use with the intent of development for town infrastructure or other uses allowed under Class A or B, (e.g., Woodruff Farm)

Other terms used in the NRIA to describe open land are:

- *Committed open space* - open land (Class A if Town-owned) under permanent protection. To be considered preserved in perpetuity, permanent protection must be adequately reflected in the property deed or other legal document, or by state statutes (e.g., Braemore Preserve).
- *Uncommitted open space* - land not classified or dedicated as permanently protected open space (Class B and C if Town-owned). LAC uses the term *non-committed* for such land (e.g., Class III water company land, fish and game club land).
- *Vacant land* - the approximately 8,100 acres of open space in Guilford currently in private ownership, not built upon, and not meeting the definition of "uncommitted open space" above. This land is not classified under the LAC classification system described above. The *Build Out Study* (PZC 2002) refers to this as "buildable land."

"Open space" as used in the NRIA is not to be confused with the term and definition for "open space land" used by the Town Assessor for land classification under the Public Act 490 Preferential Tax Program. (See *Appendix H-3* for latter definition.)

H.4 Regional, State, and Federal Recognition

The following Town assets recognized by Regional, State or Federal designation are depicted on *Map H-1.*

- *South Central Connecticut Regional Water Authority lands*: The SCCRWA owns about 3,227 acres in Guilford, mostly in large, unfragmented tracts that afford watershed protection for a regional water supply as well as recreational areas and water and air purification benefiting the entire region. (See also *Section H.5* and *Section E.*)
- *Greenway systems*: Sections of two state-designated Greenways[4] are found in Guilford. A portion of Totoket Mountain and a portion of the basalt ridge northeast of Totoket Mountain comprise part of the Metacomet Ridge Greenway. (See *Appendix H-2* and *Map H-1* for maps of this area.) A section of the Mattabesett Trail – part of the Blue Blaze Trail Greenway – traverses Guilford (See *Section I.*)
- *Scenic Road Corridors*: The State has designated scenic corridors along Route 77 and Route 146 for their beauty and natural features. They are regulated by state statute administered locally by

the Scenic Roads Advisory Committee, a bi-municipal group. (See *Section G.*)

- *Lower Connecticut River Focus Area (LCRFA)*: Guilford lies within the LCRFA, one of nine areas identified in the 1998 DEP Connecticut Resource Protection Project Focus Area Program. The focus area, recognized as a "multiple high value resource," includes land in the Town's northwestern and northeastern corners and an area near the East River marshes.
- *Coastal Management Area*: In 1980 the fragility and critical importance of coastal areas spawned a federally-mandated regulatory program administered at the state and local level. Guilford's coastal area management district, containing many kinds of coastal habitats and coastal resources and covering approximately 17 percent of the town, was adopted in 1983. (See *Section B.*)
- *Faulkner's Island*: Situated approximately 4 miles off the Guilford coastline, the Island is owned by the U.S. Fish and Wildlife Service as part of the Stewart B. McKinney National Wildlife Refuge. National Audubon, which identifies sites that provide critical habitat for birds under its Important Bird Area Program (IBA), recently designated the Island a state IBA for nesting common tern and the federally-endangered roseate tern. This site will likely soon be identified as a continentally significant site. American Bird Conservancy designated Faulkner's Island as a nationally important site in its independent IBA program.
- *East and West River marsh complex*: This area of marshes and associated uplands is an extremely important bird breeding grounds and migratory stopover site and supports several state-listed species. In 2004, National Audubon designated this area a global IBA due to its saltmarsh sharp-tailed sparrow population.
- *Long Island Sound*: The geopolitical boundary of Guilford extends southward to the Connecticut/New York line, roughly in the middle of Long Island Sound.[5] The Sound is recognized as an "Estuary of National Significance" and is part of the National Estuary Program.

Regional Compact

In 1998 Guilford joined 16 other municipalities in signing the Metacomet Ridge Conservation Compact. This is the only inter-town conservation compact involving land in south central Connecticut. The Compact is an inter-town agreement to protect and preserve the integrity of the system of basalt ridges and formations that stretch from East Haven/Branford, through Guilford, and north into Massachusetts. The existence of the Compact recognizes the need for a regional approach when a natural feature exceeds municipal boundaries and the individual municipality's ability to comprehensively care for its welfare. (See *Appendix H-2.)*

Proposed Regional and National Initiatives

Among proposed regional initiatives are three which seek to provide greater public access to, and enjoyment of open space and the natural environment: a Shoreline Greenway Trail sponsored by private citizens that would link four coastal towns, the Connecticut Coastal Area Bird Trail proposed by DEP to promote coastal eco-tourism and a Canoe/Kayak Trail from Guilford Harbor to Foote's Bridge on the East River sponsored by National Audubon. A fourth trail initiative, under the auspices of the Connecticut Forest and Park Association, concerns a National Scenic Trail nomination under study for Guilford involving a possible extension of the Mattabesett Trail to the shore. (See *Section I.* for further discussion of the above initiative.)

H.5 Open Space Inventory

Open Space Inventory

As shown in *Appendix H-1* and depicted on *Map H-2,* about 7,287 acres of land are now protected as committed open space. Ninety-nine percent of this open space is owned by the four largest landowners in Guilford: SCCRWA, GLCT, the State of Connecticut, and the Town of Guilford, as detailed below.

- Town-owned Open Space – 1,626 acres
  Among the Town-owned open space properties, the largest are:

*Timberlands:	588 acres	A forest preserve with trails
Bittner Park:	115 acres	Open land including multiple recreational facilities
Public Schools	160 acres	Including the 44-acre Baldwin School and adjoining former Cushing and Hull properties
Former Menunkatuc Land Corporation property:	141 acres	Open field, forest and wetland
Lake Quonnipaug:	100+ acres	Beach and parking area on west shoreline
*Braemore Preserve:	95 acres	Meadow east of Route 77 with trails in forest preserve
*James Valley:	73 acres	New trails connect with Mattabasett Trail
Peddler's Park:	30 acres	Provides access to Westwoods
Grass Island:	30 acres	Accessible across the East River from the Town Marina
Jacobs Beach:	25 acres	Picnic shelter, playground, beach/bathhouse, boat racks
Chaffinch Island Park:	22 acres	Picnic facilities and shellfishing

*Managed by the Conservation Commission

Most of the Town's committed open space is in North Guilford. The most popular and most-used open space locations in Guilford, according to a 2003 survey of residents[6], include Bluff Head, Bittner Park, Chaffinch Island Park, Westwoods, Timberlands, and the coastal marshes. Much of the Town's open space is under the purview of the Town Parks and Recreation Department and used for "active recreational use." (See *Appendix I-1.)* Many of these areas are host to permanent recreational structures and facilities, athletic fields, and parking, beaches, and playgrounds.

A six-acre, Town-owned parcel on County Road houses Guilford's environmental education center, the non-profit Shoreline Outdoor Education Center, in an old school building. Since 1982 environmental education curricula have been offered at the center for regional school systems, the shoreline communities, and the Guilford school system.

- Guilford Land Conservation Trust land (2,246 acres)[7]
  The Guilford Land Conservation Trust was founded in 1965. It is the largest single-town land trust in Connecticut in terms of membership and land holdings, currently holding 2,245 acres in Guilford.[8] Its largest landholdings are concentrated in the areas of Bluff Head (about 500 acres), Westwoods, and the east central part of Town. In addition to acquiring land, the Trust assists in other land protection negotiations, stewards the land, and fosters environmental education and public recreational events on its land.

- State of Connecticut's Guilford Holdings (1,236 acres)
  Most State-owned land in Guilford is classified as forest land under the Public Act 490 Program. The 749 acres of Cockaponset State Forest land in Guilford is divided among several tracts: 372 acres on the northern border of Route 80, opposite Timberlands and 377 acres in Westwoods. (See *Section E.*) There are also two DEP Wildlife Management Areas in Guilford on the coast. (See *Section B.*)

- South Central Connecticut Regional Water Authority Land (3,228 acres)[9]
  SCCRWA holdings are further broken down into three classifications of land: Class I (1,244 acres), Class II (1,479 acres), and Class III (505 acres). These classifications are used for water company lands statewide (as defined by the Connecticut General Assembly) and have particular meaning regarding the use and disposition of land in each class.

  Of the total SCCRWA land holdings in Guilford, 2,316 acres are classified as forestland under the Public Act 490 Program. (See below and *Section E.*) The vast holdings of the SCCRWA represent significant open space on a regional scale. The only areas open to the public by permit in Guilford for recreational use are the Sugarloaf tract (hiking and cross-country skiing trails), with access on West Street, and the Genesee Tract, with hiking trail access off Lake Drive. A portion of the Mattabesett Trail traverses SCCRWA land near Bluff Head.

- Land Classified Under Public Act 490 (10,181 acres)
  Public Act 490, a preferential tax assessment program passed by the Connecticut General Assembly in 1963, reduces the tax burden of parcels that meet certain criteria, making it less likely such land would be sold for development. Under this program designation ends upon sale of the property or 10 years from the classification date, whichever comes first. A modest fiscal advantage for the Town results from P.A. 490 land because this vacant land requires no Town services and produces no school enrollments.
  According to the Town Assessor, 10,181 acres[10], about 33 percent of the land in Town, now receive preferential tax relief under the provisions of P.A. 490 as forested land (2,838 acres), farmland (5,677 acres), or "open space[11]"(1,665 acres). (See *Appendix H-3* for more on P.A. 490.)

Conservation Areas Identified in Guilford Documents

Three documents identify open space in Guilford:

- *Master Plan for Preservation and Scenic Conservation: Town of Guilford, Connecticut* (GPA 1995) describes favorite scenes, views, areas of conservation interest and resources

- *Map #3* in the *Plan of Conservation and Development* (PZC 2002) depicts location and photographs of some of these areas

- *Plan for Open Space and Municipal Land Needs* (LAC 2001) lists 17 locations as "Areas of Conservation Interest" (See *Appendix G-1* for lists.) *Appendix G-2* compares these lists with the natural scenic resource elements identified in the NRIA, in *Section G.*

H.6 Analysis of Vacant Land

Guilford has about 8,100 acres[12] of vacant land (See definition in H.3, above.)

Vacant Land Parcels in Guilford

Size:	Number of Parcels:	Total Acres:	Percent of Vacant Land:
>40 acres	39	3,724	46 percent
>20 acres	96	5,341	66 percent
>10 acres	171	6,408	79 percent

Map H-3 shows the relationship between this currently vacant land and current committed open space.

H.7 Open Space Efforts Underway

In addition to the ongoing efforts of the Conservation Commission (CC) and the LAC's work to protect open space, specific initiatives underway include a systematic inventory of conservation easements and land designated as open space set-asides in subdivision developments. The CC is also collaborating with groups involved in trail networking and expansion possibilities (including GLCT, Connecticut Forest and Park Association, Fields Committee, and the Parks and Recreation Committee).

H.8 Threats and Concerns

Given the rapid pace of development, vacant land that supports the important natural resources identified in the NRIA may be developed before there is an opportunity to pursue protection of the land for open space. Also, incompatible recreational use of existing open space (See other sections) can compromise the health of natural resources.

H.9 Summary

Guilford's open space is a precious asset, helping to conserve natural resources and to enrich our lives. Our open space provides the base for the Town's biodiversity, ecological functions, recreation and more. Open space adds value to our quality of life in multiple ways by enhancing the character of our Town.

Resources

American Planning Association website: http://www.planning.org

Gibbons, J. *Open Space Fact Sheet #1.* University of Connecticut Cooperative Extension System. http://nemo.uconn.edu/

Green infrastructure website: http://www.greeninfrastructure.net

Guilford Preservation Alliance. 1995 revised 1995. *Master Plan for Preservation and Scenic Conservation – Town of Guilford, Connecticut*

O'Hare, E. 2004. *Protection mechanisms and regulatory options to protect open space in lieu of acquisition, including options currently utilized in Guilford.* Guilford, CT. Available in Guilford Free Library

The National Audubon Society website: http://www.audubon.org

Town of Guilford. 1999 revised 2001. *Plan for Open Space and Municipal Land Needs*. Land Acquisition Commission

Town of Guilford, Planning and Zoning Commission *2002 Plan of Conservation and Development* (POCD)
The Trust for Public Land website: http://www.tpl.org/
University of Connecticut Cooperative Extension System website: http://www.canr.uconn.edu/ces

Appendix

H-1 A Compilation of Guilford's Open Space Data

H-2 Metacomet Ridge Conservation Compact and Map

H-3 PA 490 Preferential Tax Assessment Program

Maps:

H-1 Open Space Resources of State/Regional/Federal Significance

H-2 Ownership of Open Space

H-3 Open Space, Built Land and Vacant Land

Endnotes

1 The American Planning Association defines green infrastructure as "the interconnected network of natural lands, open space, waterways, and Smart Growth design measures that protects native species and ecological processes, maintains clean air and water, reduces habitat fragmentation, pollution, and other threats to biodiversity, and improves the quality of life for people."

2 State of Connecticut considers golf courses to be open space.

3 Taken from *Plan for Open Space and Municipal Land Needs* (LAC 2000).

4 "Greenway," as defined by statute (CGS 23-100), means a corridor of open space that 1) may protect natural resources, preserve scenic landscapes and historical resources or offer opportunities for recreation or non-motorized transportation, 2) may connect existing protected areas and provide access to the outdoors, 3) may be located along a defining natural feature, such as a waterway, along a man-made corridor, including an unused right-of-way, traditional trail routes or historic barge canals, or 4) may be a greenspace along a highway or around a village.

5 State of Connecticut DEP Office of Long Island Sound Programs (OLISP)

6 Survey conducted as part of the Natural Resource Conservation Service Community Landscape Analysis.

7 Figure dated January 10, 2003, as per Carolie Evans, LAC Chairman, GLCT Land Acquisition Committee, and Guilford's appointee to SCCRWA's Representative Policy Board.

8 *Ibid.*

9 Figures as per SCCRWA, dated January 10, 2004, reflecting the January 2003 divestment of about 61 acres of Class III land to GLCT with permanent conservation easement.

10 Figures used herein accurate as of August 6, 2003.

11 See *Appendix H.3* for Town Assessor's definition of open space.

12 Figure taken from Guilford Planning and Zoning Commission's *Build Out Study* (2002) and *Growth Management Strategies (2004)*

Section I NATURAL RESOURCE-BASED RECREATION

See separate Map Atlas for map references

I.1 Introduction

This section is intended to offer a fresh perspective on recreational issues as they relate to natural resources. A physical inventory of natural resources that are currently used for recreation is then presented, along with brief descriptions and comments. Guilford now possesses an excellent array of outdoor public recreational areas. However, land managers are faced with the problem of balancing recreational use with protecting the integrity of the resource upon which it is based. Land or water areas designated for recreation need varying degrees of control and must be monitored for possible abuse and overuse. This is a critical aspect of any stewardship program for natural resources. Guilford has aggressively worked toward setting aside open space, but systematically addressing land management issues subsequent to purchase is a project still in its infancy. It is hoped that the following will stimulate more discussion among Town officials in regards to the management of Guilford's recreation areas. Questions are raised indicating the need for further study and dedicated policy-making in the area of land stewardship.

I.2 Characteristics of Natural Resource-based Recreation

Terms such as "passive" or "informal" traditionally have been used to loosely describe the kinds of recreation such as playing fields and buildings that do not involve intensive development of the landscape. However, officials are hard-pressed to define exactly what is meant by these terms. To clarify the Town's discussions of recreational issues, the NRIA uses the term natural resource based (NRB) recreation, defined as outdoor leisure activities compatible with natural resource protection, and typically dependent on an unstructured setting. Keeping in mind that an interpretation of any particular activity often depends on the viewpoint of the person who is doing it, here is a list of some general criteria for NRB recreational activities:

- contact with undeveloped or minimally disturbed landscapes is required
- quiet and solitude are valued
- presence of wildlife is desirable or essential
- non-competitive; goals are individual
- may or may not be construed as a "sport"
- minimal structures and landscape changes are used (e.g., trails, footbridges, kiosks, clearings for vistas or habitat enhancement)
- minimal, often unimproved, parking facilities blend into surroundings as much as possible
- transport is by foot and possibly, if compatible, by bicycle, wheelchair, or horseback
- impact on the resources is carefully balanced with achieving recreational goals.

I.3 Managing Agencies and Organizations

It is the task of the agencies or people acting on behalf of the owner to determine which recreation activities are appropriate for a given land or water area, to regulate them, and to maintain basic accommodations for access. Natural resource considerations should be primary in this determination. Even when applying the criteria listed above, it can be difficult to clearly delineate which specific recreation activities are actually compatible with good resource management. Much depends upon the site in question and even the time of year, so it is the *where* and *when* as well as the *what* that must be considered. (See *Sections B. Coast, C. Freshwater* and *D. Uplands*, and *Section I.6* for further discussion of recreational activities' impact on natural resources.)

Public recreation takes place primarily on land owned by the Town, the State, South Central Connecticut Regional Water Authority (SCCRWA), or Guilford Land Conservation Trust (GLCT). For the town, the primary governing agencies are the Parks and Recreation (PRC) and Conservation (CC) Commissions. Athletic fields are governed by the Board of Education and cared for by the Parks and

Recreation Department. *Appendix I-1* summarizes recreational facilities on municipal and water company land. Below is a list of the recreation areas by jurisdiction:

- *Conservation Commission* — 1,025 acres
  - Braemore Preserve
  - Meyerhuber Preserve
  - James Valley Preserve
  - Timberlands Forest
- *Parks and Recreation* — 95 acres
  - Bittner Park trails
  - Nut Plains Park
  - Dudley fields
- *State of Connecticut* — 749 acres
  - Cockaponset State Forest (Killingworth Block)
- *GLCT* — 2,000 acres
  - Portions of Westwoods
  - Portions of Bluff Head
  - Several preserves
- *SCCRWA* — 3,228 acres
  - Sugarloaf trail system (by permit)
  - Genesee trail system (by permit)
- *CFPA*
  - Mattabessett Trail corridor at Bluff Head and Totoket Mountain — 5.5 miles in Guilford
- *National Audubon Society* — 235 acres
  - Salt Meadow Sanctuary
- *Other private organizations*:
  - Trout Unlimited (local chapter)
  - Guilford Sportsman's Club: Hart Road
  - New Haven Sportsman's Club: on Route 77 near Lake Quonnipaug
  - Trail Riders of the Shoreline (TROTS): a horseback riding group
  - Westwoods Trails Committee (WWTC): a sub-committee of GLCT

I.4 Specific Types of NRB Recreation and Their Regulation

Consumptive Recreation

A category of NRB recreation called consumptive recreation focuses on harvesting wildlife resources through fishing (including shellfishing and crabbing), hunting, and trapping. These activities are generally regulated at the State level. The DEP promotes harvesting as part of its wildlife management program; revenue from fees and licenses is used to offset the cost of other land management activities. In most cases strict regulations concerning seasons and bag limits control consumptive recreation, to guard against over-harvesting of wildlife species. There are also programs aimed at reducing certain over-productive wildlife populations such as white-tailed deer.

Hunting and trapping: are regulated by the DEP Wildlife Division and are confined to areas owned by the State (i.e. Cockaponset Forest, including the Michael Pochan Block in Westwoods) or private land. Town ordinances currently prohibit hunting or trapping on Town-owned land. Many privately held lands,

particularly in North Guilford, are actively hunted either by the landowners themselves or by permit. The GLCT does not permit hunting on its properties.

Fishing: is regulated by the DEP Fisheries Division and is not otherwise restricted by the Town. *Map I-1* includes locations of fishing access in Guilford. A local chapter of Trout Unlimited is dedicated to maintaining and enhancing freshwater fishing access and helping the State with its stocking program. The DEP stocks these waters with hatchery-bred fish annually:

- West River: 3,000 brown, rainbow, and brook trout
- East River: 500 brown trout
- Iron Stream: 400 brown trout
- Neck River: 500 brown trout
- Lake Quonnipaug: 3,800 brown and rainbow trout

Non-consumptive Recreation

The trail—the officially designated route of travel through a natural area—is the primary "infrastructure" to be managed for recreation that is non-consumptive. Ideally it is designed to optimally accommodate the particular methods of travel permitted (i.e. foot, horseback, bicycle, cross-country skis, watercraft). Both land and water-based trails have been developed in Guilford. Terrestrial trails are managed by official trails committees established by the Town, GLCT, or National Audubon. By carefully guiding users, trails can help to protect areas from unrestrained trampling and erosion.

A Town ordinance regulates trail-based activities on Town property, while State statutes regulate Cockaponset Forest. The GLCT has its own set of land use guidelines. These rules generally are aimed at preventing abuse of precious resources which make the land in question valuable to recreationists in the first place.

Hiking: probably the most prevalent NRB recreation activity in Town, with opportunities on more than 80 miles of marked trails within Guilford. Detailed maps of several hiking trail systems indicated on *Map I-1* are available from the managing agencies or organizations.

Horseback riding: Guilford has a small but enthusiastic and loosely organized riding constituency. Riders restrict themselves to suitable trails, many of which are dedicated to horse travel, and have developed their own town-wide trail network connecting many established recreation areas.

Cross-country skiing and snowshoeing: specific areas for these activities are not currently designated in Guilford, but virtually all of the recreation areas shown have suitable winter-use trails. Parking after a snowstorm can be an issue. Areas are plowed at Bittner Park and Bluff Head. Certain trails that are wet much of the year are better used in mid-winter when surface water is frozen, and perhaps should be designated for winter use only.

Backpacking: camping and nighttime use of Town properties and the Mattabesett Trail are currently prohibited. To consider allowing backpacking would raise regulatory issues currently beyond the ability of Town agencies to address.

Trails for disabled persons: Guilford currently lacks nature trails designed for wheelchair access or for those with limited mobility. National standards for such trails have been established, and this is an area deserving further study by Guilford's trails committees.

Paddling: PRC maintains access to coastal waters for kayaks and canoes at Jacob's Beach. A canoe/kayak trail that will incorporate the waters between Jacob's Beach and Foote's Bridge on the East River is currently being developed. For freshwater access Lake Quonnipaug has a State boat launch on Route 77 at the Lake's north end. Guilford's major rivers, East and West, can accommodate paddlers in high water season.

Nature study/birdwatching: Connecticut lies in the path of the Atlantic Flyway, a major bird migration route, which affords exceptional spring and fall birdwatching. The DEP has launched a project to link coastal birding areas in the state with a highway-based trail which will include Guilford. Spring warblers abound in our local forests and preserves. (See *Appendix D-1 Birds of Guilford, Noble Proctor.)*

Bicycling: road bikes require pavement, and the issue of bike lanes on roadways is beyond the scope of this document. Mountain bikers have become a significant user group in our forests, particularly in Westwoods and Timberlands. These bikes require use of either existing woods roads or trails designed to handle the considerable impact of aggressive tire tread. The potential for conflict between mountain bike users and other trail users exists, but there is also the opportunity for creative cooperation.

I.5 NRB Recreation Areas Inventory

Map I-1 shows the locations of Guilford's major NRB recreation areas. The list below is keyed to the map.

1. Mattabesett Trail (MT) Corridor (Blue Trail System): hiking only. CFPA (based in Middlefield, CT) is a private non-profit responsible for creating and maintaining the Connecticut Blue Trail System. Guilford hosts a six-mile segment of the MT, one of the longest continuous trails in the system. The MT links Guilford with Durham and Madison and is now being studied for possible designation as a National Scenic Trail that would eventually terminate on the coast. It is hoped that, along with several side trails and local trail systems, the MT will eventually become the centerpiece of a comprehensive "North Woods" trail system, corresponding to the GLCT's Westwoods and Eastwoods. Access is from Bluff Head Parking Area or Braemore Parking Area, one mile apart on Route 77.
2. Braemore Preserve: horses and bikes permitted. 95 acres just north of Broomstick Ledges, five miles of trails, connecting with MT and Madison's Rockland Preserve.
3. James Valley Preserve: 70 acres on Totoket Mountain, trail development in early stages, plans to connect with MT, GLCT trails, and Braemore
4. Sugarloaf Recreation Area: off West St., SCCRWA land, trail use by permit only
5. Genesee Recreation Area: off Rockland Road, SCCRWA land, trail use by permit only
6. Lake Quonnipaug: hand launch canoes, sailboats, and kayaks near Town Beach area or State boat launch at north end
7. Timberlands Forest: horses and bikes permitted. 600 acres just south of Route 80 and north of Guilford Lakes. 15 miles of trails. Managed forest.
8. Bittner Park / Baldwin Trails: horses and bikes permitted. Between Route 77 and Long Hill Rd. in central part of town, 150 acres, five miles of trails
9. Kampmeyer Preserve: 95-acre GLCT preserve with trail system, accessed off West Lake Avenue at Laurel Hollow.
10. Eastwoods: amalgam of GLCT-owned parcels in east-central part of town, with trail system under development, and final acreage unknown at this writing
11. Nut Plains Woods: 40-acre GLCT preserve with trail system, off White Birch Drive and Cindy Lane.
12. Westwoods: horses and bikes permitted. Guilford's oldest and most widely known trail system (1963), 2000 acres, 40 miles of trails. Composite ownership: State, GLCT, Town, private. Trails managed by Westwoods Trails Committee (WWTC), an arm of GLCT.
13. East River: trout fishing, kayak trail, National Audubon Society interpretive nature trail
14. Iron Stream: trout fishing access in Timberlands Forest
15. West River: trout fishing access at Bittner Park's Scott Carey Trout Trail and just north of junction of Highways 77 and 80
16. Jacobs Beach: canoe and kayak launch area and storage

I.6 Threats and Concerns: the Future of NRB Recreation

The rapid pace of residential development in Guilford raises the concern of overuse and eventual degradation of outdoor recreational areas. There is increased pressure to provide more playing fields and other costly, permanent structures, and these are constructed usually at the expense of natural resources. Meanwhile, as the Town struggles with budget limitations, it becomes increasingly important to promote ways to recreate in a natural setting and to steward land effectively.

The NRB Recreation Constituency

NRB recreation activities go lightly on the land, so to speak, as well as on the Town's budget. In Guilford with its extensive forestlands, these kinds of recreation have a large, often silent, constituency. This constituency is growing as more and more people seek relaxation and renewal in a natural setting. The CC is taking a lead role in meeting this need and balancing it with resource protection by enacting management plans for Town-owned preserves. There is a reciprocal relationship between outdoor recreation and natural resources. The popularity of NRB recreation activities strongly influences how resources are prioritized and protected in the community. The DEP has long recognized and taken advantage of this fact in its relationship with hunting, fishing, and hiking organizations. People must be afforded the opportunity to observe native flora and fauna in their habitat and learn about the natural world first hand. Allowing access to natural areas, combined with nature education, assures a strong constituency for resource protection. Indeed, the same open space "linkages" sought by land preservationists are desired by hikers to increase opportunities for longer outings.

Town-wide and Inter-town Trail System Concept

As more open space is being protected through purchase or easement, the potential to create a town-wide trail system via linkages between the existing trail systems is being studied. Some of the potential linkages can be imagined from *Map I-1*. In concept the system would have to be cooperatively managed by Town and non-profit organizations. In addition to providing expanded trail opportunities, such a network would help to distribute recreational impact over a larger area and reinforce Guilford's link to neighboring towns.

Dealing with Impacts

Though the goal is to tread lightly on the land, NRB recreation of any type inevitably will impact natural resources. These impacts may be relatively subtle initially, but can accumulate to the point of damaging sensitive resources. Trails are meant to bring people in close contact with various habitats and scenic areas, but striking the balance between use and protection is not easy. Trails are in fact a kind of "development," albeit with far less permanence or threat than a road. Only recently has the sensitivity of certain resources become a consideration in trail building. Effects of trails on the land, flora, and fauna have been the subject of increasingly intensive study by scientists in recent years. The fruit of these studies can be creatively applied by land managers, as financial and manpower resources allow. Certainly a comprehensive set of standards for trail construction and maintenance based on ecological principles would be desirable.

For example, in 2002 the Connecticut King's Mark Environmental Review Team conducted a study of Bittner Park, which contains a trail system that has not had the benefit of systematic management. Their report concluded that natural resources had been significantly impacted by these trails, particularly where they crossed streams or passed through or near wetland soils. The PRC has recently established a Trails Committee to address this problem. Westwoods Trails also have suffered extensive damage from mountain bikes in recent years.

Trails can turn into gullies, stream banks can erode, invasive weeds can infest property access points and spread to the interior. Motorized vehicles can run rampant. Trash and litter can accumulate to the point where abuse of public land is simply shrugged off as inevitable. Land managers need to devise creative ways of addressing problems inherent in setting aside open space. A number of factors make managing recreation and preventing illegal activity on Town land difficult, among them uncontrolled access points, the size of the natural areas, and lack of stewardship staff. As the acreage of open space owned by the Town increases, land management as a budgetary concern will grow in importance. Overuse, consequent

degradation of trails and habitats, disturbance of wildlife, and diminished experiences of users are key concerns that require more study and planning. If the compatibility of recreational access to particular lands or waters are evaluated and actively monitored and managed to minimize impact, Guilford's natural resources can accommodate a wide variety of recreational activities in a way consistent with the long-term integrity of our environment.

Other Forms of Recreation and Their Impacts

Certain unstructured recreation activities are difficult to categorize, but might simply be called "park activities." These are based on a natural resource, but the impacts of facilities on the resource are considerably higher. Examples include swimming (requires bathhouses, groomed beaches, supervisory facilities and extensive parking), picnicking (requires regular mowing of grass, trash receptacles, tables, barbecue pits), playgrounds, and freestyle field sports such as Frisbee, Wiffle Ball, kite flying, and remote control vehicles. Areas used for these activities are generally under the governance of the Parks and Recreation Commission.

By definition the majority of the land area of a "park" is subject to intensive landscaping for human convenience and safety, with natural resource values taking a back seat. A large portion of the land cover in a park may be impervious, and non-point source pollution is a significant concern. Fertilizers, pesticides, motor traffic, crowding, noise, litter, and the introduction of invasive plant species combine to exert pressure on natural resources in adjacent areas. However, when properly designed and maintained using best management practices, parks can be a scenic asset harmonious with the environment.

The Problem of Motorized Recreation

Land-based motorized recreation, while valid and legal in and of itself, has created serious problems for open space management. All-terrain vehicles (ATVs), dirt bikes, snowmobiles, and other off-road vehicles have grown in popularity, even as the acreage of unfragmented forest land traditionally used for this activity has shrunk. Motorized travel is prohibited by ordinance on Town land, except for emergencies or administrative matters. According to State statute, on private land the vehicle user must carry written permission from the land owner. As both State and Town open space acquisition of forest areas proceeds, the problem of enforcement in remote areas becomes woefully evident.

Motorized recreation in our public forests and fields is prohibited because it is inherently incompatible with natural resource protection. This activity disturbs wildlife, pollutes the air with noise and fumes, destroys vegetation, and exposes soil to erode deep ruts in trails, cause siltation of wetlands and watercourses, and provide a ready site for invasive plants. The damage done by such vehicles is evident in many parts of town, especially on Bluff Head and Totoket Mountain. Perpetrators often come from across town boundaries. Unlike mountain bikers and horseback riders, there is no known association or club for ATVs active in our region (except to lobby for loosening restrictions), and therefore no means of peer-policing or communicating. The Conservation Commission is now sponsoring a citizen's task force to address the ATV problem on Town-owned land.

Paintball

Like ATV riders, paintball enthusiasts have taken advantage of public forest areas. This activity is likewise incompatible with NRB recreation interests. The colorful latex shells from spent ammunition are often left where they fall, littering the forest floor. The idea of this sort of stealth "warfare" being conducted in a public forest is contrary to the intent of purchasing these areas. Town ordinance currently prohibits paintball, and no public areas have yet been set aside for this activity. Like motorized recreation, paintball is best suited for a supervised setting apart from other recreation activities, on the person's own property or on public land specifically set aside for that use.

Summary

Guilford's natural resources provide many and varied opportunities for recreation and natural resource based recreational resources make a significant contribution to Guilford's quality of life. Ways to educate and involve more users as stewards of our public lands need to be identified.

References

Demrow, C. and D. Salisbury. 1998. *The Complete Guide to Trail Building and Maintenance.* Appalachian Mountain Club

International Mountain Bicycling Association website: http://www.imba.com

Jordan, M. 2000. *Ecological Impacts of Recreational Use of Trails: A literature review.* The Nature Conservancy.

Kings Mark Environmental Review Team. September 2002. *Report on Bittner Park*

Leung and Marion. May 2000. *Recreation Impacts and Management in Wilderness: A state-of-knowledge review.* USDA Forest Service

Appendix - none

Maps

I-1 Trail Systems and Recreational Land

Section J SIGNIFICANT NATURAL RESOURCE AREAS

See separate Map Atlas for map references

J.1 Introduction

In reviewing and assessing maps of resources individually and in combination with each other, certain areas emerged as particularly outstanding or significant. These are Guilford's best examples of rivers, waterbodies, wetland complexes, large grasslands, forests, wildlife movement corridors, and locations of rare species and natural communities. These are places that have maintained their ecological integrity; that is, the mosaics of different habitats and the processes that sustain them over the long term are relatively intact (e.g., water flows, movement of plants and animals). Termed Important Ecological Systems in the NRIA, taken together they form Significant Natural Resource Areas (SNRAs).

Areas composed of habitat mosaics, including forest, fields, and various types of wetlands are critical to animals that use different habitats at different points in their life cycles. Areas that include diverse habitats also support a greater variety of plants and animals, and these species will be more likely to persist over time.

J.2 Components of Important Ecological Systems

Forests – *Map J-1*

- Seven forest blocks are significant because they are large and relatively intact, not fragmented by paved roads or development. Many also capture Guilford's most intact wetland complexes and include the headwaters of our significant watercourses.
- Bobcat, forest-interior birds (e.g., warblers, veery, wood thrush), and other native Guilford wildlife require large, intact forests to forage and hunt, protect their young from predators and parasites (e.g., domestic cats, raccoons, cowbirds), and establish new territories.
- Although wooded backyard lots also have trees, they are not equivalent. An intact forest functions differently and can support interior-forest animals and plants that these woodlands cannot.
- Given its location, the coastal hardwood forest on Sachem's Head is important because it is uniquely influenced by the coast (e.g., salt spray, storms).

Sources: U.S. Natural Resource Conservation Service (NRCS) Land Use/Land Cover map for Guilford (See *Map 2),* The Nature Conservancy Northeast forest block map

River Systems – *Map J-2*

- Included are Guilford's healthiest aquatic (in-water), riparian (stream edge), and floodplain habitats. They are situated within relatively intact landscapes and support species that require particularly clean water (e.g., trout, bottom-dwelling insects) or contiguous habitat (e.g., migratory fish, river otter).
- The West River serves as a critical north-south link for wildlife movement, despite having been degraded along some of its reaches.
- Watercourses are bounded by a 300-foot riparian corridor, the width that the scientific community has found is required to support wildlife habitat functions, remove pollutants and sediment, regulate temperature, and stabilize banks. (See *Appendix J-1.)*

While the particular systems included within the SNRA are outstanding, all of Guilford's streams are important and reflect the quality of their watershed's surface and ground water.

Sources: NRCS Land Use/Land Cover map (*Map 2),* BioBlitz field days**,** interviews with local naturalists and biologists

Wetlands Complexes – *Map J-2*

- Include Guilford's healthiest and most diverse wetland systems. They are comprised primarily of red maple swamps, wet meadows, vernal pools, and salt, brackish, and freshwater marshes, and typically are nested within or adjacent to intact uplands.
- Include the wetlands themselves and, recognizing the importance of intact adjacent uplands, a 300-foot buffer

Sources: NRCS Land Use/Land Cover map (*Map 2),* USGS topographic maps, interviews with local naturalists and biologists

Grasslands – *Map J-1*

- These are Guilford's largest grasslands that are most viable for grassland-dependent animals and plants.
- Important because many species, such as bobolinks and eastern meadowlarks, require large tracts of grassland. Many butterflies and birds of prey rely on grasslands for feeding on wildflower nectar or hunting small mammals, and waterfowl feed in flooded fields during migration.
- Agricultural grasslands (i.e., hayfields, pastures) can support grassland-dependent plants and animals if cuts are timed to avoid nesting and fledgling seasons.

Sources: NRCS Land Use/Land Cover map (See *Map 2),* interviews with local naturalists and biologists

Endangered, Threatened, and Special Concern Species and Natural Communities – *Map J-3*

- Documented occurrences of State and federally-identified imperiled plants, animals, and natural communities (i.e., Natural Diversity Database sites), are mapped by the CT DEP Natural Heritage Program and updated periodically. Circled areas give approximate locations; neither the exact locations nor the identities of the species or communities is publicly disclosed.
- The State provides this information to help towns protect their share of the State's biodiversity during land use planning and permitting.
- It is important to prevent the extirpation or extinction of any native species or natural community and to maintain Guilford's biodiversity

Source: Connecticut DEP Natural Diversity Data Base sites

Wildlife Movement Corridors – *Map J-4*

Animal and plant populations cannot survive over the long term in isolated habitat patches. They must disperse and migrate and, like humans, mix among populations to maintain genetic health.

- These movement corridors help to connect existing upland habitat patches.
- Watercourses also serve as natural movement corridors.

Sources: NRCS Land Use/Land Cover map (See *Map 2* and *Map H-3.)*

J.3 Map Analysis

The components listed above first were mapped separately on transparent Mylar material, and then overlaid on each other. A composite map was drawn to outline all the components (See *Map J-5.)* In many locations ecological systems coincide - in others, one such system is represented. The combined areas are outlined and titled as Significant Natural Resource Areas (SNRA) as *Map J-6*

The ways in which Significant Natural Resource Areas and wildlife movement corridors relate to committed open space are displayed on *Map J-7.*

J.4 Location and Ecological Content of Guilford's Significant Natural Resource Areas

The SNRAs fall into eight geographic areas:

Totoket Mountain: Guilford's largest forest block, which extends into Durham and North Branford; outstanding wetland complex nested in forest; Bluff Head and associated rare natural communities; Myer Huber Pond (migratory bird concentration area, etc.); Coginchaug River (healthy tributary to Connecticut River)

Beaver Head/Menunkatuck: unusually large red maple swamp in excellent condition and nested in large forest; significant area for amphibians; nesting goshawk; Branch Brook, an exemplary quality stream; Menunkatuck Reservoir (a public surface water supply); large grassland (hayfield); Quonnipaug Mountain (staging area for wintering ducks); rare plants

Northeast Forest/Broomstick Ledges: diverse wetlands nested in large forest that extends into Madison; sunny sandstone slopes; Sucker Brook (high-quality stream); Braemore wet meadow (butterflies, orchids); large grassland; Little Meadow Brook headwaters

West River Corridor (freshwater portion): wet meadow complex, Town's largest grassland; river system and riparian zone; trout; migratory fish; serves as north-south link

Hoadley Creek/Westwoods: Hoadley Creek river/forest/marsh complex, which links with protected land in Branford; large forest with embedded wetlands (e.g., Great Swamp, Towner Swamp); unusual elm swamp; shellfish bed at mouth

Sachem's Head/Central Coast: coastal hardwood forest; Long Cove Marsh; tidal portion of West River and associated marshes

East River marsh/forest system: diverse, high-quality tidal river and wetlands with adjacent large forest (one of last large forests in coastal Connecticut and an important migratory bird stopover site); migratory fish and Old Scroggie Pond (significant for reptiles). National Audubon recently announced the formal designation of the East and West River Complex as an Important Bird Area in Connecticut because it meets criteria as a globally significant bird area.

Long Island Sound: An Estuary of National Significance; habitat for a wide diversity of species; major recreational asset; provides Town's coastal identity (including significant habitats described in *Section B.7*); supports fishing and shellfishing industries; Guilford's bays provide significant over-wintering habitat for waterfowl; globally Important Bird Area for tern colonies on Faulkner Island.

J.5 Threats

As already described in previous sections that address nine specific resource categories, there are many threats to their health. A single threat could have multiple impacts within an SNRA if the resources in that area share that threat. In turn, abating that threat could benefit multiple resources within the SNRA.

J.6 Summary

Significant Natural Resource Areas are the places in Guilford that are particularly important for wildlife populations and movement corridors (including rare and endangered species), the mitigation of flooding, air and water quality, natural resource-based recreational opportunities, scenic views, and the Town's rural character. As special places, their ecological integrity and the benefits they provide should receive particular focus for protection. It is hoped that property owners, developers, and land acquisition agencies will find ways to respect these resources.

References

Environmental Law Institute. 2003. *Conservation thresholds for land use planners.* Washington, D.C.

Appendix:

J-1 The Benefits of Buffers by Width – a diagram

Maps:

J-1 Significant Forests and Grasslands

J-2 Significant Wetlands, Rivers and Waterbodies

J-3 State and Federally Listed Species and Significant Natural Communities

J-4 Wildlife Movement Corridors and Open Space

J-5 Important Ecological Systems and Natural Diversity Data Base Sites

J-6 Significant Natural Resource Areas (SNRAs) by Location

J-7 SNRAs, Open Space and Wildlife Movement Corridors

Areas for Future Study and Consideration

In the process of completing Guilford's first Natural Resource Inventory and Assessment, certain information was noted as currently unavailable, incomplete, or not possible to include. It is listed here, with the expectation that future editions will address these issues.

Geology

- Add a slope map depicting slopes in categories of 10 percent, 15 percent, 20 percent, 25 percent, 30 percent

Freshwater

- Update information on impervious surface coverage in Guilford's sub-regional watersheds
- Update information on fish runs in West and East Rivers
- Update information on status of Lake Quonnipaug

Uplands

- Map small grasslands
- Describe Broomstick Ledges in more detail
- Inventory coastal upland vegetation
- Describe shift in annual species over time (coyote, turkey, red fox, grey fox, white-tailed deer)

Coast

- Describe commercial shellfish beds
- Describe moderating effect of the coast on our climate
- Identify and discuss Guilford's critical stop-over areas used by migrating shorebirds
- Update information on the decline of lobster aquaculture in Guilford

Agriculture

- Analyze agricultural and forest acreage

The Dark Night Sky

- Analyze the diminution of Guilford's dark night sky by night lighting

Natural Resource-Based Scenic Resources

- Map ridgetops
- Identify additional Town-owned Scenic Roads

Open Space

- Map lands classified under Public Act 490 Preferential Tax Program
- Include more information about SCCRWA ownership of land in Guilford
- Identify committed open space in abutting towns that could serve as wildlife movement corridors and/or connecting trail systems

Significant Natural Resource Areas

- Ground-truth specific areas of concern

Add Archeological and other cultural resources

- As a coastal town with fertile soils, Guilford is rich in archeological resources. The map Archeological Resources of the Town of Guilford (2003), prepared by Nicolas Bellantoni, State Archeologist is available in Town Hall South. The next edition of the NRIA should include a specific section on these important resources.

General

- Emphasize value of biodiversity
- Rank threats to individual resources and across resources
- Assess the likely effects of climate change on Guilford's natural resources
- Assess air pollution and its effect on Guilford's natural resources
- Include approaches to preservation and conservation of natural resources in Guilford
- Discuss Guilford's location within the North Atlantic Coast ecoregion
- Incorporate studies and reports conducted by university students (e.g., Yale School of Forestry and Environmental Studies) over past several years

Comments on this edition and suggestions for the next edition of this document are welcome. Readers are invited to respond directly to: Conservation Commission Chairperson, Town Hall, Guilford, CT 06437

Afterword

Future Considerations

As Guilford's first Natural Resource Inventory and Assessment, this document is presented by the Conservation Commission for use by members of Town boards and commissions and the general public. Given the severe limitations on personnel and funds available for this project, this first edition is necessarily limited to a Town-wide perspective. It is hoped that future additions will include verification in the field.

The information herein will be helpful, not just in creating the Town's first natural resource data base, but also for educating children and their parents about the richness of the environment in which they live.

The NRIA is intended as a living document, to be improved, augmented, and supplemented in years to come. As new data are obtained, new ways of viewing natural resources will emerge, and as changes in conditions occur it will be the responsibility of the Conservation Commission to update this document.

December 31, 2004

Natural Resource Inventory and Assessment

Part II APPENDIX

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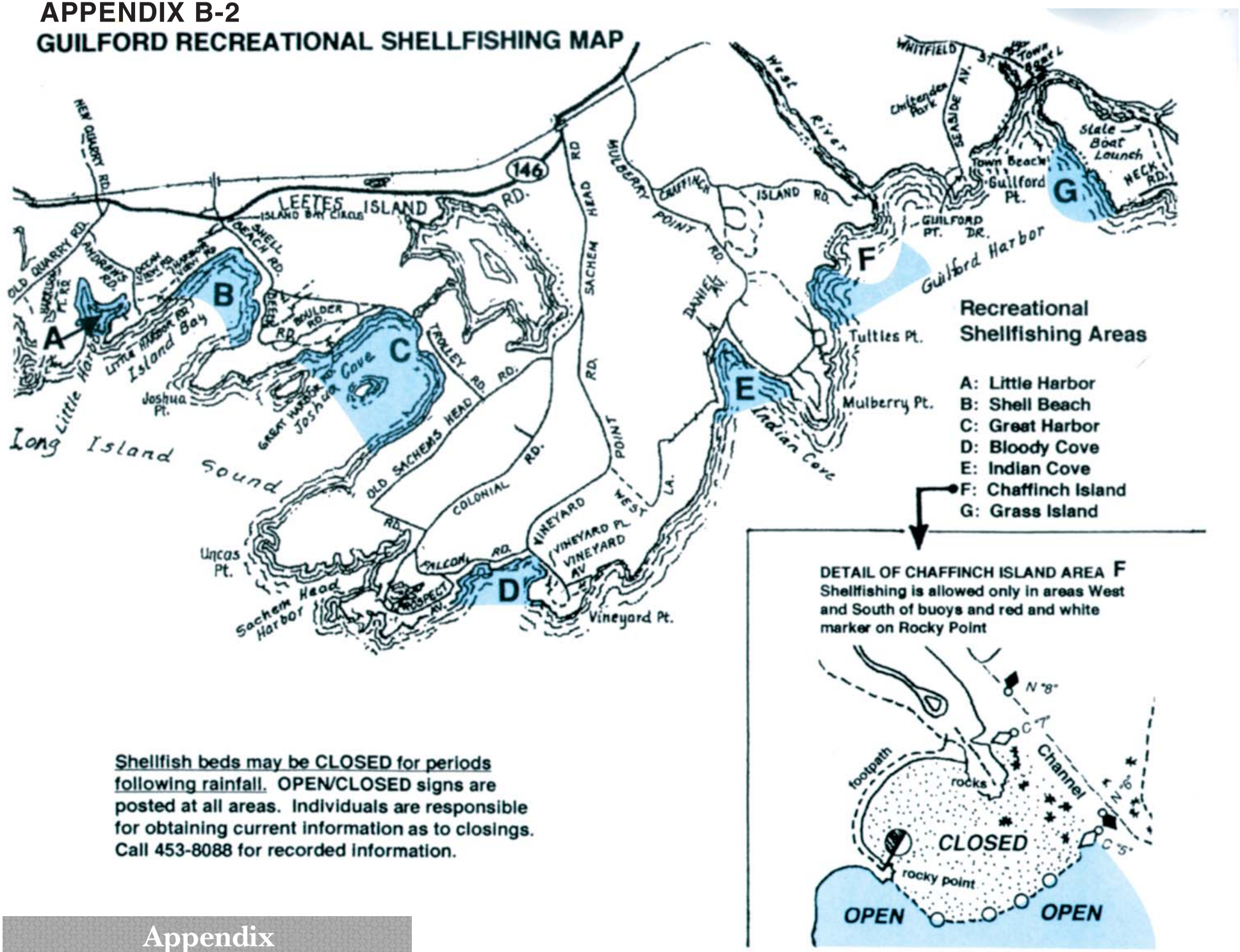
APPENDIX B-1

Guilford Coastal Data

2004

GUILFORD'S COASTAL AREA	# miles	ACREAGE	percent land area	EXAMPLES/COMMENTS
Coastal Boundary Area (CBA) (8.2 square miles)		5,235	17.7 percent of town	1,000' landward of mean high tide level
Coastal flood hazard areas		2,273	43 percent of CBA	
Tidal wetlands		1,271	24 percent of CBA	47% owned by State, Town, GLCT or Audubon Society
Shorefront length	13.3			FRONTAGE AREAS OVERLAP
Tidal wetlands frontage	5.9		17 percent of the shoreline	
Rocky shoreline	8.8		67 percent of shoreline	
Beach frontage	1.4		10.8 percent of shoreline	60% of beaches are more like tidal flats
Residential frontage	10.9		80% of shoreline	
SHORELINE OWNERSHIP				
TOWN OF GUILFORD				
Jacob's Beach (Seaside Avenue)		25		Picnic shelter, playground, volleyball, boat rack, bathhouse
Chittenden Park (Seaside Avenue)		14		4 bocci courts, pedestrian access to Long Island Sound
Guilford Town Marina (Whitfield Street)		12.94		1 ramps, 14 moorings, 138 slips, fishing, water views
Grass Island (south bank of East River)		29.6		Fishing, bird watching, picnics
Shell Beach (Leete's Island)		0.5		Clamming
Chaffinch Island Park (on Mulberry Point)		22		Picnic tables, grills, fishing
Trolley Road (100' x 50' sand lot)		0.12		Parking for clammers, kayakers, etc
Total Town-owned shoreline		93.62		
US FISH & WILDLIFE SERVICE				Part of Stewart B. McKinney National Wildlife Refuge
Faulkner's Island		5		Lighthouse & bird sanctuary. No public access
CT DEP WILDLIFE MANAGEMENT AREAS				
Great Harbor (Island Creek)		147		Fishing, clamming, crabbing, birdwatching, kayaking
East River Marsh		147		Public access by boat, none by road
OTHER COASTAL PRESERVES				
Guilford Salt Meadows Sanctuary		235		Salt marsh: animal and plant life, nature trail
Jarod Eliot Preserve (Mulberry Point Road)		36		Owned and managed by Guilford Land Conservation Trust
Spencer's Creek Preserve (Three Mile Course Road)		11.5		Owned and managed by Guilford Land Conservation Trust

APPENDIX B-2
GUILFORD RECREATIONAL SHELLFISHING MAP



Shellfish beds may be CLOSED for periods following rainfall. OPEN/CLOSED signs are posted at all areas. Individuals are responsible for obtaining current information as to closings. Call 453-8088 for recorded information.

Appendix B-3

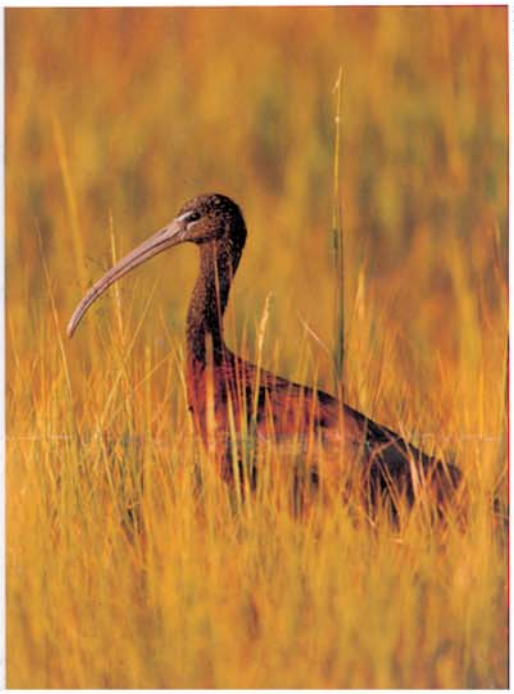
Restoring "New Life" to East River Marsh

Written by Roger Wolfe and Paul Capotosto, Wetland Habitat and Mosquito Management Program, Min Huang, Migratory Bird Program and Chris Samor, Research Assistant

The East River in Guilford meanders through an extensive wetland system that separates Madison and Guilford. Like most other tidal wetlands along the Atlantic Coast, this 160-acre salt marsh was heavily grid-ditched by the Civilian Conservation Corps in the 1920s and 1930s for mosquito control. Although this activity provided employment for many people during the Great Depression and did control mosquitoes to a great extent, it also had many negative impacts to the habitat and the species that depend on it.

Prior to the extensive grid ditching, these tidal wetlands provided habitat for a variety of wetland dependent birds, such as black ducks, snowy and great egrets, herons, rails and a variety of shorebirds. These species used the shallow ponds, pannes and creeks for feeding, nesting and resting. The tidal wetlands also were valuable habitat for a number of resident and migratory fish species. Because of the drainage effect caused by the hand-dug ditches, much of this shallow water habitat was lost. Thus, a diverse wetland once interspersed with high and low marsh vegetation and shallow, open water was converted to one of predominantly high marsh grasses and shrubs. The only surface water that existed was in the ditches and, then, only at high tide. As a result, many wildlife species, primarily water birds, declined in number.

Realizing the need for this type of shallow water habitat, an attempt was made in 1960 at East River Marsh to restore some surface water with the excavation (using only a shovel and a wheelbarrow!) of a 0.25-acre pond. Laborious as it was, this showed promise but was just the tip of the iceberg considering the size of the marsh and the amount of habitat that was lost. A 1990 study conducted by the DEP Wildlife Division found that East River Marsh had some of the lowest habitat value for water birds in the state.



P. J. FUSCO

Newly created ponds and pannes provide foraging habitat for wading birds, including glossy ibis.

Following implementation of IMM, the East River Marsh now provides a mosiac of open water, shallow flats and interspersed vegetation. This photo gives a glimpse of what the marsh looked like prior to parallel grid ditching in the 1920s and 1930s.

Turning the Tide on Grid-ditching

In the spring of 1999, following a review by the DEP's Wetland Restoration Steering Committee and after obtaining the necessary permits and funding, the Wildlife Division's Wetland Habitat and Mosquito Management (WHAMM) Program completed a restoration project on approximately 40 acres in the East River Marsh Wildlife Management Area. This was done as part of the Program's Integrated Marsh Management (IMM) approach to wetland restoration and enhancement. As the name implies, IMM is an integrated approach to holistically manage wetland habitats to satisfy a variety of site-specific objectives. These

objectives could include water management for mosquito control, invasive vegetation control, fill removal, hydrologic modification and wildlife habitat enhancement. Over the past 10 years, IMM has been used to restore over 2,200 acres of tidal and non-tidal wetlands in Connecticut.

The primary objective of the East River Project was to create and enhance wetland wildlife habitat by restoring the natural flow of salt water into this drained system. The project involved the excavation of 16 ponds, ranging in size from 0.1-0.25 acres. The ponds were constructed with irregular edges and shallow, tapered bottoms that provide better foraging habitat for shorebirds and dabbling ducks. The ponds are not directly connected to a tidal ditch or creek and therefore retain water even at low tide, providing habitat during all tidal stages. The excavated material was used to plug some of the old grid ditches. As a result, the high water table caused by the plugged ditches created shallow pannes adjacent to the ditches. This hydrologic change also resulted in a desired change in vegetation, creating a more diverse mosaic of vegetation types.

The work was done using the WHAMM Program's low ground pressure excavators and bulldozers. These specialized pieces of equipment can work in soft, marshy conditions where more conventional equipment would quickly sink. The total cost for this project was $110,000. Projects of this nature can often be quite expensive; therefore, the formation of partnerships is needed to share costs, equipment and expertise. The East River Marsh Restoration Project was funded by the DEP's Long Island Sound Cleanup Funds, Department of Transportation, Connecticut Duck Stamp Program and U.S. Fish and Wildlife Service.

R. WOLFE (2)

The WHAMM Program's low ground pressure (less than 2 lbs. per square inch) excavators can work in soft, marsh soils to create ponds and plug old ditches.

Did the Birds Return?

To evaluate the success of this project, an assessment of bird use in the treated (restored) and untreated (control) areas was undertaken by the Wildlife Division's Migratory Game Bird Program in 1999-2000 and again in 2002-2003 (see graph). In the initial assessment, birds were grouped into three categories or guilds: wading birds, shorebirds and waterfowl. Birds were observed during different tidal stages and their activities and the habitats they were using were recorded.

In just the first year following restoration, wading bird use was three times higher, shorebird use was more than four times higher and waterfowl use was almost twice as high as the untreated sites. Wading birds were mainly found using the flooded high marsh and plugged ditches. The plugged ditches created excellent habitat for killifish and other marsh fishes, fiddler crabs and snails that provide a food source for herons and egrets. As was expected in the control sites, foraging was limited to higher tidal stages as the ditches were dry at low tide. Shorebirds primarily used the shallow pannes created by the plugged ditches for foraging and loafing. Waterfowl primarily used the plugged ditches and shallow edges for foraging on snails and other invertebrates. The newly created ponds were used somewhat less and then, only for loafing. This was expected because, being recently excavated, the pond bottom was relatively sterile with little vegetative structure for harboring fish and invertebrates.

The survey in 2002-2003 had even more dramatic results. Twenty-eight different species of birds were observed, including four state-listed species of special concern (glossy ibis, seaside sparrow, saltmarsh sharp-tailed sparrow, willet), three threatened species (great egret, snowy egret, least tern) and one endangered species (northern harrier). Black ducks and greater yellowlegs were the most abundant, with willets, ruddy turnstones and saltmarsh sharp-tailed sparrows also being fairly common. Bird use of the marsh increased

Open grid ditches (left) drain natural ponds at low tides. Plugging old grid ditches (right) allows water to flood low areas even at low tide. This creates shallow ponds and pannes that are used by foraging shorebirds and dabbling ducks.

R.WOLFE

The East River Marsh prior to implementing IMM. Grid ditching for mosquito control in the 1920s left tidal salt marshes drained and devoid of surface water, which in turn degraded wildlife habitat. Note Haines Pond that was hand dug in 1960.

East River Marsh Restoration,
continued from page 5

through the fall, decreased in winter and increased again during spring. These results indicate that East River Marsh is an important staging area for migratory water birds.

The constructed ponds were used significantly more by all guilds of birds than in the 1999 assessment. Waterfowl, shorebirds and wading birds were observed using the constructed ponds 76%, 57% and 75% of the time, respectively. It is presumed that after three years, the ponds and pannes had time to mature and establish a more diverse community structure that is more attractive to the birds.

Fishing for Clues

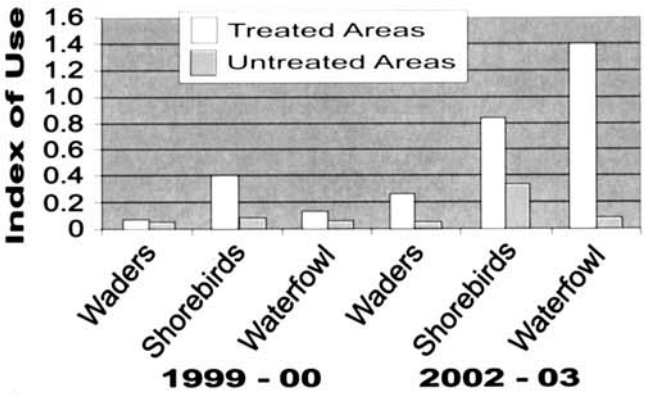
Fish and invertebrates are also an integral component of a healthy estuarine ecosystem. The WHAMM Program does not stock any of its restored systems. Rather, fish and other aquatic organisms (including plants) naturally find their way into the ponds following tidal flooding events. Over time, populations of these organisms will become established with some individuals moving in to and out of the ponds during flooding.

In 2000 and 2001, a study was done by WHAMM Program biologists to assess fish and invertebrate abundance in the created ponds and plugged ditches as compared to control sites, including the pond created in 1960. Sampling was done using minnow traps and sweep nets. A total of 2,184 individuals comprising 10 different species were observed using the ponds, with mummichogs, striped killifish, sheepshead minnows and brackish grass shrimp comprising 95% of the total catch in both the created ponds and the control pond. This demonstrated similar species assemblages in the treatment and control sites. Mummichogs and blue crabs were present in all sites, with other species being present to a lesser extent. Northern diamondback terrapins were present in five of the 15 constructed ponds but not in the control pond. The data also give an indication of the species diversity in the ponds. The control pond had eight of the 10 possible species in it, while 11 of the 15 treatment ponds had five or more species, demonstrating that within two years of completion, the ponds are showing signs of establishing viable aquatic communities.

Monitoring Will Continue

A final assessment of the wildlife use of East River Marsh will be undertaken in 2005-2006 to see if pond maturation results in an increase in species diversity and numbers. The WHAMM Program will continue to monitor the East River Marsh Restoration Project and other similar projects to get a better understanding of how coastal ecosystems, and the wildlife communities that rely on them, respond to various management techniques. Based on the positive results to date of the East River project and past similar projects, the WHAMM Program will continue its steady and methodic implementation of IMM throughout the tidal wetlands of Long Island Sound.

Assessment of bird use of treated and untreated areas at East River Marsh in Guilford, CT



P.J. FUSCO

Migrating shorebirds, including greater yellowlegs, are using the restored wetlands at East River Marsh with increased frequency.

APPENDIX B-4

Quick Facts About Long Island Sound

Long Island Sound (LIS) is 110 miles long and 21 miles wide at its widest point. The linear shoreline of CT is 130 miles, and the coastline is estimated to be 618 miles (includes coves and embayments) with 95 miles of publicly owned beaches

LIS covers 1,300 square miles and its average depth is 65 feet and its tidal range is 2.7 feet (east) and 7.4 feet (west). The Race is 350 feet deep and twice a day, 25 billion gallons of water rush into the Sound

Salinity averages 28 parts per thousand (ppt) representing 2 billion tons of dissolved salt

Because of the teeming life and great variety of dissolved materials in LIS, light penetration is often less than 30 feet below the surface (compare more than 200 feet in the Sargasso Sea)

LIS (and all oceans) soaks up carbon dioxide from the atmosphere via white caps and plumes

Long Island Sound Watershed

Watershed extends to Canada and covers 15,820 square miles. It is inhabited by 14.6 million people and it is estimated that 1 in 10 Americans live within 50 miles of LIS

90 percent of freshwater entering LIS comes from the Housatonic, Connecticut and Thames Rivers and any pollutants entering this vast watershed can ultimately harm the Sound

Living Resources

As of 1997, the Sound leaded the nation with 42,000 acres cultivated as oyster farms with an annual harvest of 700,000 bushels

Of the 60 million eggs produced by an adult female oyster in the wild, only 42,000 survive the larval stage to settle on the bottom. Of these, only about 13 survive to become adults

The American eel is catadromous, lives in freshwater, and spawns in the Sargasso Sea. The female lays 10-20 million eggs and the larvae swim 1,000 miles back to LIS and the rivers

LIS once had 50,000 acres of salt marsh – less than half remains today

Estuaries in general

Due to the mixing of nutrients from land and sea, estuaries are among the most productive natural systems on earth, producing more food per acre than the richest mid-western farmland

There are over 130 estuaries throughout the US of which 28 are designated as a "Nationally Significant Estuary" through the National Estuary Program (NEP). LIS is one of the first to receive this distinction.

Over 75 percent of commercially and recreationally important fisheries depend on estuaries

Over 45 percent of all endangered and threatened species rely on estuarine and coastal waters, as do 75 percent of all endangered and threatened birds and mammals and 30 percent of all wintering waterfowl

Sources: various

APPENDIX C-1

Listing of Guilford's Water Resources by Drainage Basin

To provide an overall sense of Guilford's drainage patterns and hydrology, Guilford's named water resources are listed below by the Major Drainage Basin, Regional Drainage Basin, and sub-regional basin in which they are located. Ultimately, all water draining from Guilford discharges to Long Island Sound and hence to the Atlantic Ocean.

KEY

- The basin names and numbers used are those assigned by the State of CT DEP. The term, "unnamed", is used herein when the local name of a waterbody does not appear on the USGS map or in local documents and is unknown by the NRIA Committee. (Proper local name for these, when ascertained, and additional waterbodies can be added to this preliminary listing.)
- For clarification, notation of location or status is included after some water resources
- As source protection is important, water bodies and watercourses that lie within a watershed used for public water supply are so indicated in parenthesis.

Connecticut Major Basin (#4) /Mattabesset Regional Basin (#46)

(discharges to Connecticut River and hence to Long Island Sound)

Coginchaug River Basin (#4607) - small section of basin lies within Guilford.

- ***Thody Pond*** - (southern end is located in Guilford) drains to Hemlock Brook
- ***Hemlock Brook*** - drains to Coginchaug River
- ***Myer Huber Pond*** - headwaters of the Coginchaug River
- ***Coginchaug River*** - drains north to Durham to Mattebesset River

South Central Coast Major Basin (#5) /South Central Eastern Regional Complex (#51)

(discharges to Long Island Sound)

East Haven River Basin (#5112) - only a few acres of this basin lie within Guilford, just to the northwest of Lane's Pond. There are no water bodies in this area to list. (Public water supply watershed area). Drains to North Branford, then to East Haven, discharging to the Sound via the Farm River.

Branford River Basin (#5111) - a minor portion of this basin lies in Guilford along the western border. Discharges to the Sound via the Branford River.

- ***Beaver Head Swamp*** - constitutes the headwaters of this basin; (public water supply water shed area); drains to Lake Gaillard
- ***Munger Brook*** - headwaters in Guilford; drains west into North Branford
- ***West Lake*** - outlets at northwest part of Lake; drains to Clear Lake
- ***Clear Lake*** - (western portion of Lake lies in North Branford); outlet is at north part of Lake-drains to the northwest to Munger Brook
- ***Notch Hill Brook*** - headwaters in Guilford; drains west to North Branford discharging to Branford River, and hence, to the Sound

West River Basin (#5110)- with the exception of a few acres in Durham, this basin lies entirely within Guilford.

- ***Bartlett Pond*** - (public water supply watershed area); drains to Branch Brook
- ***Branch Brook*** - (public water supply watershed area); drains to Lake Menunkatuc
- ***Lake Menunkatuc*** - (public water supply storage reservoir); diverted to SCCRWA aqueduct; overflow to Menunkatuc River
- ***Menunkatuc River*** - discharges to West River
- ***Rusconi Pond*** - drains to Sucker Brook

- ***Sucker Brook*** - discharges to Lake Quonnipaug
- ***Quonnipaug Pond*** - (common name for swampy northern end of Lake Quonnipaug); flows under Route 77 to Lake Quonnipaug
- ***Lake Quonnipaug*** - (major recreational water body); outlet at southern end begins the West River
- ***Schoolhouse Brook*** - (flows through ravine along Hemlock Avenue); discharges to West River
- ***Baldwin Dudley Pond*** - (bisected by Ledge Hill Road)
- ***Ivy Swamp*** - drains to West River
- ***Unnamed swamp and stream*** - drain to Endres Pond
- ***Endres Pond*** - outlets to Spinning Mill Brook
- ***Thirsty Lake*** - outlets to West River
- ***Witch Hazel Mill Pond*** - an impoundment of West River
- ***Bishops Pond*** - outlets to unnamed brook west of Cox Elementary School, which drains to West River
- ***Town Millpond*** - an impoundment of a branch of the West River
- ***Spinning Mill Brook*** - discharges to West River (at Long Hill Road near Route 1)
- ***West River and West River Tidal Marshes*** - discharge to Guilford Harbor, part of the Sound

East River Basin (#5108) - half this basin lies within Guilford and half within Madison.

- ***Little Meadow Brook*** - (headwaters begin just over the Madison line); (public water supply watershed area); drains south, diverted to SCCRWA Genesee Tunnel Aqueduct; ... undiverted flow continues south, discharging to Capello Pond
- ***Hall Lot Brook*** - (parallels Hoop Pole Road, to the east); joins Little Meadow Brook
- ***Kelsey Pond*** - an impoundment of Hall Lot Brook
- ***Malley's Pond*** - (just south of Route 80); an impoundment of Little Meadow Brook
- ***Iron Stream*** - (headwaters in Madison); discharges to Laurel Lake (northern-most Guilford Lake)
- ***Maupus Pond*** - (west side of Maupus Road)-drains via unnamed stream to third Guilford Lake
- ***Two unnamed ponds*** - (west side of Maupus Road)
- ***Guilford Lakes*** - a lake system which drains south from Laurel Lake, to Middle Lake, to Lower Lake; outlet drains south to Capello Pond
- ***Capello Pond*** - (in Nut Plains); outlet begins the East River
- ***Three unnamed ponds*** - (former gravel pits); drain to East River
- ***Old Scroggie Pond*** - (east side of Clapboard Hill Road); outlets south via unnamed stream to East River marshes
- ***East River*** - (a freshwater-brackish-tidal river; near I-95, a segment of river forms Guilford/Madison boundary line); (original drainage altered by Amtrak construction) basin boundary is the Amtrak bed (south of this point river and marshes flow directly into Sound, part of the South Central Shoreline Basin - see below)

Neck River Basin (#5107) - small section of basin lies within Guilford. Majority of basin flows through Madison, discharging to the East River at the town line at Grass Island.

- ***Neck River*** - (river segment from Podunk Road area to Opening Hill Road just south of Gould's Pond; river forms town boundary between Guilford and Madison here; headwaters and balance of river lie in Madison; discharges to East River at town line at Grass Island)
- ***Gould's Pond*** - (bisected by town line); an impoundment of Neck River

Sluice Creek Basin (#5109) - basin lies entirely within Guilford.

- ***Unnamed stream*** - drains freshwater marsh (west of Goose Lane) to the south
- ***Unnamed stream*** - (draining area to the west); joins above stream

- ***Unnamed stream*** - flows under Route 1 and Route 146 to tidal marsh (just east of Leete Elementary School)
- ***Sluice Creek*** - (headwaters just west of Fairgrounds); discharges to Guilford Harbor, part of the Sound
- ***Unnamed pond*** - drains to tidal marsh, and hence, to confluence with Sluice Creek

South Central Coast Major Basin (#5) /South Central Shoreline (#50)

(The latter division is a regional grouping of a series of small local coastal sub-basins from Milford to Old Saybrook that drain directly - primarily overland - to the Sound.)

South Central Shoreline Basin (#5000) - (only overland areas and water bodies within Guilford are listed for this sub-basin.)

- ***East River*** (lower, tidal stretch) - discharges to Guilford Harbor, part of the Sound
- ***Guilford Point area*** - drains to Sound
- ***Mulberry Point area*** - drains to Sound
- ***Long Cove*** - drains to Indian Cove, part of the Sound
- ***Indian Point area*** - drains to Sound
- ***Sachem Head area*** - drains to Sachem Head Harbor and the Sound
- ***Beattie Pond*** - (lies between Amtrak bed and Route 146)
- ***Lost Lake*** (a tidal marsh) - drains to Great Harbor Marsh
- ***Great Harbor Marsh*** (and "The Sluice") - drain to Joshua Cove, part of the Sound
- ***Leetes Island*** - drains to Sound
- ***Leetes Island Tidal Marsh*** - drains to Island Bay, part of the Sound
- ***Wolf Swamp*** - drains south to Towner Swamp
- ***Kneuer Pond*** (near Guilford/Branford town line, southern side of Route 1); drains west into Branford, then east into Guilford, to Towner Swamp
- ***Towner Swamp*** - drains to Hoadley Creek
- ***Hoadley Creek*** - drains to Sound
- ***Hoadley Neck area*** - drains to Sound

Wetland Soil Categories

Because land use activities within wetland areas are regulated in Connecticut, wetland areas have been officially delineated for this purpose by soil type, as per statute. Guilford's official map, "Designated Inland Wetlands and Watercourses of the Town of Guilford, CT", depicts the inland wetland soil categories in Guilford which are poorly drained soils, very poorly drained soils, and alluvial soils as designated by the National Cooperative Soil Survey (See *Map A.4)* and as defined below.

> Poorly drained soils have a water table at or near the surface from late fall to early spring. These soils occupy nearly level and very gently sloping areas. The soils are dominantly gray throughout the subsoil. Some brown mottles may be present. Surface soils are commonly dark grayish brown or very dark brown.

Poorly drained soils are scattered as a mosaic throughout the Town.

> Very poorly drained soils have a water table which remains at or above the surface most of the time. These soils occupy level or depressed areas. The soils are usually gray throughout. Some brown mottles may be present in the substratum. Surface soils are generally thick and very dark gray or black.

These soils are scattered throughout Guilford with major locations in South Guilford below I-95, near the East River estuary, in West Guilford, near the mid-section of the East and West Rivers, and in Beaver Swamp and in other parts of North Guilford.

> Alluvial soils formed in sediments deposited by water on flood plains. They occupy nearly level areas subject to stream flooding. These soils range from very poorly drained to excessively drained. The soils are relatively young and there is little or no evidence of soil development.

Alluvial soil types are scattered throughout Guilford. They are especially concentrated along major rivers and in the coastal areas and the Town Center.

Examples of common Guilford wetland soils as named and catalogued in the Soil Survey are: "Adrian muck", "Leicester fine sandy loam", and "Ridgebury, Leicester, and Whitman extremely stony fine sandy loams".

Water Protection Agencies in Guilford

Guilford's Department of Health (DOH) has jurisdiction only over residential and small community wells. The Town DOH issues certificates of approval before new wells can be used. Although not responsible for routine testing of privately held wells, the Director of Health responds to complaints of possible well water contamination. DOH must approve the design of new and revised septic systems before they can be installed. When septic systems design flows are between 2,000 and 5,000 gallons per day, the Connecticut DOH has jurisdiction. Beyond this limit, Connecticut's Department of Environmental Protection (DEP) has jurisdiction. NOTE: DEP approval is needed for all community septic systems and/or package treatment plants.

In addition to regulating septic system design flows, the Connecticut DOH is also responsible for overseeing public water supply systems that serve more than 25 homes per community well. The state DOH also approves the mandated water supply plans for all water utilities which project water supply needs for a given projected service area for the next 50 years.

Guilford's Water Pollution Control Authority (WPCA) only relates to private septic systems and ground water quality. It is responsible for preventing residential septic systems from polluting private wells. WPCA does not have responsibility for dealing with pollution from any other source and there is no other town agency which does.

Connecticut's Department of Environmental Protection (DEP). Except for large septic systems and package treatment plants, the CT DEP has no direct authority over residential water issues within Guilford. Their guidelines and recommendations are only advisory. However, before a water company can do business, the company must get certain permits from the CT DEP.

Connecticut Water Company (CWC) serves about one-fourth of town residents (about 6,000 persons) primarily from the town well near Exit 58. The CT DEP limits the maximum volume of water CWC can draw from each Town well. It requires routine testing of water from Town wells to confirm that the water is fit for consumers to drink. And the CT DEP mandates the establishment of aquifer maps.

Guilford's Groundwater Protection Districts (GPD) were revised in July 2004 and expanded land use regulations within those Districts are now in force.

APPENDIX D-1

Birds of Guilford, Connecticut - list provided by Noble S. Proctor Ph. D

The following 315 species have been recorded in the town of Guilford, Connecticut over a 40 year period (from 1964 to 2004) by Noble S. Proctor Ph D. Annotations are made for certain species concerning distinct change in status or abundance. Underlined species are those that have occurred on an infrequent basis (from 1 to 5 times) and are not expected to occur on a regular basis or perhaps not again.

Species:

Red-throated Loon - *Gavia stellata*
Common Loon - *Gavia immer*
Pied-billed Grebe - *Podilymbus podiceps*
Horned Grebe - *Podiceps auritus* - numbers have dropped dramatically over last ten years.
Eared Grebe - *Podiceps nigricollis* - one record
Red-necked Grebe - *Podiceps grisegena*
American White Pelican - *Pelecanus erythrorhynchos* - 3 records- sightings increasing along N.E. coast over last five years
Northern Gannet - *Morus bassanus* - sightings have increased dramatically over the last ten years.
Double-crested Cormorant - *Phalacrocorax auritus* first Connecticut nesting occurred on Goose Rocks
Great Cormorant - *Phalacrocorax carbo*
Great Blue Heron - *Ardea herodius*
Little Blue Heron - *Egretta caerulea*
Tricolored Heron - *Egretta tricolor* - still a rare species
Great Egret - *Ardea alba* - numbers dramatically increased in last ten years
Snowy Egret - *Egretta thula*
Cattle Egret - *Bulbulcus ibis* - sightings have dropped due to lack of farmland
Black-crowned Night Heron - *Nycticorax nycticorax*
Yellow-crowned Night Heron - *Nyctanassa violacea*
Green Heron - *Butorides virescens*
Least Bittern - *Ixobrychus excilis* - sightings have dropped dramatically with loss of cattail marshes
American Bittern - *Botaurus lentiginosus* - populations of this species have declined throughout the Northeast over last 15 years
Glossy Ibis - *Plegadis falcinellus* - sightings have increased over last 7 years
White Ibis - *Plegadis chihi* 1 record, summer 2004
Sandhill Crane - *Grus canadensis* - 5 sightings - all overhead migrants
Mute Swan - *Cygnus olor*
Tundra Swan - *Cygnus columbianus* - still rare
Snow Goose - (white and blue morph) - *Chen caerulescens*
Greater White-fronted Goose - *Anser albifrons* - 1 record
Canada Goose - *Branta canadensis*
Brant - *Branta bernicla*
American Black Duck - *Anas rubripes*
Gadwall - *Anas strepera*
Mallard - *Anas platyrhynchos*
Northern Pintail - *Anas acuta*
American Wigeon - *Anas americana*

Wood Duck - *Aix sponsa*
Northern Shoveler - *Anas clypeata*
Blue-winged Teal - *Anas discors*
Green-winged Teal - *Anas crecca carolinensis*
White-winged Scoter - *Melanitta fusca*- numbers have dropped dramatically over past 15 years
Surf Scoter - *Melanitta perspicillata*- numbers have dropped dramatically over past 15 years
Black Scoter - *Melanitta nigra*
Long-tailed Duck - *Clangula hymalis*
King Eider - *Somateria spectabilis* - 3 records
Common Eider - *Somateria mollissima* - 3 records
Canvasback - *Aythya valisineria* - dramatic decline in numbers in last ten years
Redhead - *Aythya americana* - still rare
Ring-necked Duck - *Aythya collaris*
Lesser Scaup - *Aythya affinis*
Greater Scaup - *Aythya marila* - dramatic drop in numbers in last 15 years
Common Goldeneye - *Bucephala clangula*
Bufflehead - *Bucephala albeola*
Ruddy Duck - *Oxyura jamaicensis* - dramatic rise in number 1995 to 2002
Common Merganser - *Mergus merganser*
Red-breasted Merganser - *Mergus serrator*
Hooded Merganser - *Lophodytes cucullatus*
Turkey Vulture - *Cathartes aura* - great increase in numbers and wintering birds from 1980.
Black Vulture - *Coragyps atratus* - increasing in numbers throughout the state. Now seen yearly.
Sharp-shinned Hawk - *Accipiter striatus*
Cooper's Hawk - *Accipiter cooperii*- rapid increase in numbers in last five years. Now yearly nester.
Northern Goshawk - *Accipiter gentilis*
Red-tailed Hawk - *Buteo jamaicensis*
Swainson's Hawk - *Buteo swainsoni,* one record
Rough-legged Hawk - *Buteo lagopus*
Red-shouldered Hawk - *Buteo lineatus*
Broad-winged Hawk - *Buteo platypterus*
Northern Harrier - *Circus cyaneus*
Bald Eagle - *Haliaeetus leucocephalus*
Golden Eagle - *Aquila chrysaetos*
Osprey - *Pandion haliaetus* - the dramatic recovery of this species continues
American Kestrel - *Falco sparverius* - widespread plunge in numbers of this species throughout the state over last 15 years
Merlin - *Falco columbarius*
Peregrine Falcon - *Falco peregrinus* - numbers continue to increase over last 10 years
Wild Turkey - *Meleagris gallopavo* - an explosion of this species over last 10 years
Ruffed Grouse - *Bonasa umbellus* - once common, it has all but disappeared from the woodlands over past 15 years
Ring-necked Pheasant - *Phasianus colchicus*
Northern Bobwhite - *Colinus virginianus* - now rare
American Coot - *Fulica americana*
Common Moorhen - *Gallinula chloropus* - now rare
Virginia Rail - *Rallus limicola*
King Rail - *Rallus elegans* - numbers have dropped with loss of cattail marshes

Clapper Rail - *Rallus longirostris*
Sora - *Porzana carolina*
Yellow Rail - *Coturnicops noveboracensis* - three records
Black-bellied Plover - *Pluvialis squatarola*
American Golden Plover - *Pluvialis dominica*
Semipalmated Plover - *Charadrius semipalmatus*
Piping Plover - *Charadrius melodius* - no longer nests
Killdeer - *Charadrius vociferus*
American Woodcock - *Scolopax minor* - many of its display fields now gone
Common Snipe - *Gallinago gallinago*
Short-billed Dowitcher - *Limnodromus griseus*
Long-billed Dowitcher - *Limnodromus scolopaceus* - still rare
Hudsonian Godwit - *Limosa haemastic* - still uncommon
Marbled Godwit - *Limosa fedoa* - rare
Whimbrel - *Numenius phaeopus*
American Oystercatcher - *Haematopus palliatus* - can now be seen year round
Black-necked Stilt - *Himantopus mexicanus* - one record
Willet - *Catoptrophorus semipalmatus* - now a common nester in salt marshes
Greater Yellowlegs - *Tringa melanoleuca*
Lesser Yellowlegs - *Tringa flavipes*
Solitary Sandpiper - *Tringa solitaria*
Ruddy Turnstone - *Arenaria interpres*
Purple Sandpiper - *Calidris maritima*
Red Knot - *Calidris canutus*
Spotted Sandpiper - *Actitis macularia*
Dunlin - *Calidris alpina*
Curlew Sandpiper - *Calidris ferruginea* - 1 record
Sanderling - *Calidris alba*
Stilt Sandpiper - *Calidris himantopus*
Buff-breasted Sandpiper - *Tryngites subruficollis* - uncommon
Upland Sandpiper - *Bartramia longicauda* - loss of open farmlands has brought a decrease to migration stops of this species
Ruff - *Philomachus pugnax* - a very rare species that has not appeared on a regular basis since 1980. Prior, 1 record every 2 years.
White-rumped Sandpiper - *Calidris fusicollis*
Baird's Sandpiper - *Calidris bairdii* - uncommon
Pectoral Sandpiper - *Calidris melanotos*
Least Sandpiper - *Calidris minutilla*
Semipalmated Sandpiper - *Calidris pusilla*
Western Sandpiper - *Calidris mauri*
Wilson's Phalarope - *Phalaropus tricolor*
Parasitic Jaeger - *Stercorarius parasiticus* - 2 records
Glaucous Gull - *Larus hyperboreus* - drop in records with close of open dumping in the state
Iceland Gull - *Larus glaucoides* - drop in records with close of open dumping in the state, always more sightings of this species than Glaucous.
Herring Gull - *Larus argentatus*
Ring-billed Gull - *Larus delawarensis*
Great Black-backed Gull - *Larus marinus*
Lesser Black-backed Gull - *Larus fuscus* - one record

Laughing Gull - *Larus atricilla*
Black-headed Gull - *Larus ridibundus* - 2 records
Bonaparte's Gull - *Larus philadelphia*
Gull-billed Tern - *Larus nilotica* - one record
Royal Tern - *Sterna maxima* - 2 records
Caspian Tern - *Sterna caspia* - 3 records
Least Tern - *Sterna antillarum*
Common Tern - *Sterna hirundo*
Forster's Tern - *Sterna forsteri*
Roseate Tern - *Sterna dougalli*
Sooty Tern - *Sterna fusca* - 2 records
Bridled Tern - *Sterna anaethetus* - 1 record
Black Skimmer - *Rynchops niger*
Mourning Dove - *Zenaida macroura*
Rock Pigeon - *Columa livia*
Monk Parakeet - *Myiositta monachus* - invasion continues along CT coast with increased nesting in Guilford over last five years.
Yellow-billed Cuckoo - *Coccyzus americanus*
Black-billed Cuckoo - *Coccyzus erythropthalmus*
Short-eared Owl - *Asio flammeus*
Eastern Screech Owl - *Megascops asio*
Long-eared Owl - *Asio otus*
Great Horned Owl - *Bubo virginianus*
Barred Owl - *Strix varia*
Barn Owl - *Tyto alba* - numbers have dropped with disappearance of old farm and abandoned buildings.
Snowy Owl - *Bubo scandiacus*
Northern Saw-whet Owl - *Aegolius acadicus*
Whip-poor-will - *Caprimulgus vociferus* - loss of field/wood edge has seen numbers drop (but increase in state over past five years)
Chuck-will's Widow - *Caprimulgus carolinensis* 3 records
Common Nighthawk - *Chordeiles minor* - has disappeared as rooftop nester
Ruby-throated Hummingbird - *Archilochus colubris*
Rufous Hummingbird - *Selasphorus rufus* - one record
Belted Kingfisher - *Ceryle alcyon*
Red-headed Woodpecker - *Melanerpes erythrocephalus* - rare migrant and winter vistor
Pileated Woodpecker - *Drycopus pileatus* - numbers have increased in last 10 years
Northern Flicker - *Colaptes auratus*
Red-bellied Woodpecker - *Melanerpes carolinus* - this "invader from the south" is now our most common oak woods woodpecker.
Yellow-bellied Sapsucker - *Sphyrapicus varius*
Downy Woodpecker - *Picoides pubescens*
Hairy Woodpecker - *Picoides villosus* - numbers have dropped since the "invasion" of the Red-bellied Woodpecker
Black-backed Woodpecker - *Picoides arcticus* - 1 record
Scissor-tailed Flycatcher - *Tyrannus forficatus* - 1 record
Eastern Kingbird - *Tyrannus tyrannus*
Western Kingbird - *Tyrannus verticalis*
Great-crested Flycatcher - *Myiarchus crinitus*
Eastern Phoebe - *Sayornis phoebe*

Eastern Wood-Pewee - *Contopus virens*
Olive-sided Flycatcher - *Contopus cooperi*
Acadian Flycatcher - *Empidonax virescens* - numbers increased in last 10 years
Yellow-bellied Flycatcher - *Empidonax flaviventris*
Least Flycatcher - *Empidonax minimus*
Willow Flycatcher - *Empidonax traillii*
Alder Flycatcher - *Empidonax alnorum*
Horned Lark - *Eremophila alpestris*
American Pipit - *Anthus rubescens*
Purple Martin - *Progne subis*
Cliff Swallow - *Petrochelidon pyrrhonota*
Cave Swallow - *Petrochelidon fulva* - 2 records—a recent fall accidental
Barn Swallow - *Hirundo rustica*
Tree Swallow - *Tachycineta bicolor*
Northern Rough-winged Swallow - *Stelgidopteryx serripennis*
Bank Swallow - *Riparia riparia* - nesting colonies have disappeared in many areas due to change in sand pit development.
Chimney Swift - *Chaetura pelagica*
Black-capped Chickadee - *Poecile atricapillus*
Boreal Chickadee - *Poecile hudsonica* - 3 records
Tufted Titmouse - *Baeolophus bicolor*
White-breasted Nuthatch - *Sitta carolinensis*
Red-breasted Nuthatch - *Sitta canadensis*
Brown Creeper - *Certhia americana*
House Wren - *Troglodytes aedon*
Winter Wren - *Trogolodytes troglodytes*
Carolina Wren - *Thryothorus ludovicianus*
Marsh Wren - *Cistothorus palustris*
Sedge Wren - *Cistothorus platensis* - 2 records
Ruby-crowned Kinglet - *Regulus calendula*
Golden-crowned Kinglet - *Regulus satrapa*
Blue-gray Gnatcatcher - *Polioptila caerulea*
Eastern Bluebird - *Sialia sialis*
Mountain Bluebird - *Sialia currocoides* - 1 record (only record for Connecticut)
American Robin - *Turdus migratorius*
Northern Wheatear - *Oenanthe oenanthe* - 3 records
Gray-cheeked Thrush - *Catharus minimus*
Swainson's Thrush - *Catharus ustulatus*
Hermit Thrush - *Catharus guttatus*
Veery - *Catharus fuscescens*
Wood Thrush - *Hylocichla mustelina*
Brown Thrasher - *Toxostoma rufum*
Gray Catbird - *Dumetella carolinensis*
Northern Mockingbird - *Mimus polyglottos*
Blue Jay - *Cyanocitta cristata*
Fish Crow - *Corvus ossifragus*
American Crow - *Corvus brachyrhyncos*
Common Raven - *Corvus corax* - expanding throughout the state in last 10 years. In 2003 nested in Guilford.

Northern Shrike - *Lanius excubitor*
Loggerhead Shrike - *Lanius ludovicianus* - has virtually disappeared from Eastern North America. No Guilford sightings in 20 years.
Cedar Waxwing - *Bombycilla cedrorum*
Red-eyed Vireo - *Vireo olivaceus*
Warbling Vireo - *Vireo gilvus*
Philadelphia Vireo - *Vireo philadelphicus* - still a rare to uncommon migrant
Yellow-throated Vireo - *Vireo flavifrons*
White-eyed Vireo - *Vireo griseus*
Blue-headed Vireo - *Vireo solitarius*
Nothern Parula - *Parula americana*
Yellow-throated Warbler - *Dendroica dominica* - still a rare migrant
Black-throated Green Warbler - *Dendroica virens*
Prothonotary Warbler - *Protonotaria citrea* - still a rare spring species
Black and White Warbler - *Mniotilta varia*
Blackpoll Warbler - *Dendroica striata*
Black-throated Blue Warbler - *Dendroica caerulescens*
Cerulean Warbler - *Dendroica cerulea* - last 10 years has seen an increase in this once rare warbler.
Magnolia Warbler - *Dendroica magnolia*
Yellow-rumped Warbler - *Dendroica coronata*
Canada Warbler - *Wilsonia canadensis*
Cape May Warbler - *Dendroica tigrina*
Chestnut-sided Warbler - *Dendroica pensylvanica*
Bay-breasted Warbler - *Dendroica castanea*
Blackburnian Warbler - *Dendroica fusca*
American Redstart - *Setophaga ruticilla*
Pine Warbler - *Dendroica pinus*
Prairie Warbler - *Dendroica discolor*
Palm Warbler - *Dendroica palmarum*
Blue-winged Warbler - *Vermivora pinus* - both hybrids have been recorded in Guilford, Brewster's - 5 records and Lawrence's - 2 records
Yellow Warbler - *Dendroica petechia*
Worm-eating Warbler - *Limnothlypis swainsonii*
Tennessee Warbler - *Vermivora peregrina*
Orange-crowned Warbler - *Vermivora celata* - still an uncommon migrant
Wilson's Warbler - *Wilsonia pusilla*
Hooded Warbler - *Wilsonia citrina*
Golden-winged Warbler - *Vermivora chrysoptera* - now a rare migrant as the Blue-winged Warbler pushes the species farther north in the East.
Nashville Warbler - *Vermivora ruficapilla*
Connecticut Warbler - *Oporornis agilis*-still an uncommon fall migrant
Mourning Warbler - *Oporornis philadelphia*
Kentucky Warbler - *Oporornis formosus* - 5 records
Common Yellowthroat - *Geothlypis trichas*
Yellow-breasted Chat - *Icteria virens* - has disappeared as a nesting species with loss of old field conditions.
Northern Waterthrush - *Seiurus noveboracensis*
Louisiana Waterthrush - *Seiurus motacilla*
Ovenbird - *Seiurus aurocapilla*
Summer Tanager - *Piranga rubra* - still rare

Scarlet Tanager - *Piranga olivacea*
Northern Cardinal - *Cardinalis cardinalis*
Red Crossbill - *Loxia curvirostra* - sporadic
White-winged Crossbill - *Loxia leucoptera* - sporadic
Rose-breasted Grosbeak- *Pheucticus ludovicianus*
Black-headed Grosbeak - *Pheucticus melanocephalus* - one record
Eastern Towhee - *Pipilio erythrophthalmus*
Blue Grosbeak - *Guiraca caerule a*- three records
Indigo Bunting - *Passerina cyanea*
Dickcissel - *Spiza americana* - uncommon "overhead" fall migrant- rare at winter feeders
Evening Grosbeak - *Coccothraustes vespertinus* - sporadic in occurrence, several years common, then gone for several years
American Goldfinch - *Carduelis tristis*
Pine Siskin - *Carduelis pinus*
Common Redpoll - *Carduelis flamme*a - sporadic in occurrence-in the 70's flocks in excess of 1,000 birds were seen
House Finch - *Carpodacus mexicanus*
Purple Finch - *Carpodacus purpureus*
Pine Grosbeak - *Pinicola enuncleator* - sporadic in occurrence
White-throated Sparrow - *Zonotrichia albicollis*
Harris's Sparrow - *Zonotrichia querula* - 1 record
White-crowned Sparrow - *Zonotrichia leucophrys*
Chipping Sparrow - *Spizella passerina*
Field Sparrow - *Spizella pusilla*
Swamp Sparrow - *Melospiza georgiana*
American Tree Sparrow - *Spizella arborea*
Lark Sparrow - *Chondestes grammacus* - 3 records
Clay-colored Sparrow - *Spizella pallida* - 3 records
Grasshopper Sparrow - *Ammodramus savannarum* - rare passage migrant, no longer nests due to loss of fields
Fox Sparrow - *Passerella iliaca*
Song Sparrow - *Melospiza melodia*
Vesper Sparrow - *Pooecetes gramineus* - extremely rare breeder now due to loss of fields
Lincoln's Sparrow - *Melospiza lincolnii*
Savannah Sparrow - *Passerculus sandwichensis* - "Ipswich" subspecies recorded on a yearly basis
Henslow's Sparrow - *Ammodramus henslowii* - 2 records
Saltmarsh Sharp-tailed Sparrow - *Ammodramus caudacutus* - all three of the saltmarsh sparrows are in serious trouble as our shoreline marshes disappear. Protection of saltmarshes in Guilford is needed to assure the protection of these three species.
Nelson's Sharp-tailed Sparrow - *Ammodramus nelsoni* - occurs as a migrant through saltmarsh areas. Totally dependant on that habitat during this migration.
Seaside Sparrow - *Ammodramus maritimus* - see comments under Salt marsh Sharp-tailed Sparrow
Dark-eyed Junco - *Junco hyemalis*
Snow Bunting - *Plectrophenax nivialis*
Lapland Longspur - *Calcarius lapponicus*
Rusty Blackbird - *Euphagus carolinus*
Common Grackle - *Quiscalus quiscula*
Red-winged Blackbird - *Agelaius phoeniceus*
Yellow-headed Blackbird - *Xanthocephalus xanthocephalus* - three records
Bobolink - *Dolichonyx oryzivorus* - now all but gone as a nesting species due to open field loss.

European Starling - *Sturnus vulgaris*
Eastern Meadowlark- *Sturnella magna* - all but gone as a nesting species due to open field loss
Brown-headed Cowbird - *Molothrus ater*
Orchard Oriole - *Icterus spurius* - numbers increasing since 1990
Baltimore Oriole - *Icterus galbula*
House Sparrow - *Passer domesticus*

Total Species - 315

Appendix D-2

KEY

LIFEFORMS

T = tree
S = shrub
V = vine
H = herbaceous plant
G = grass
A = aquatic

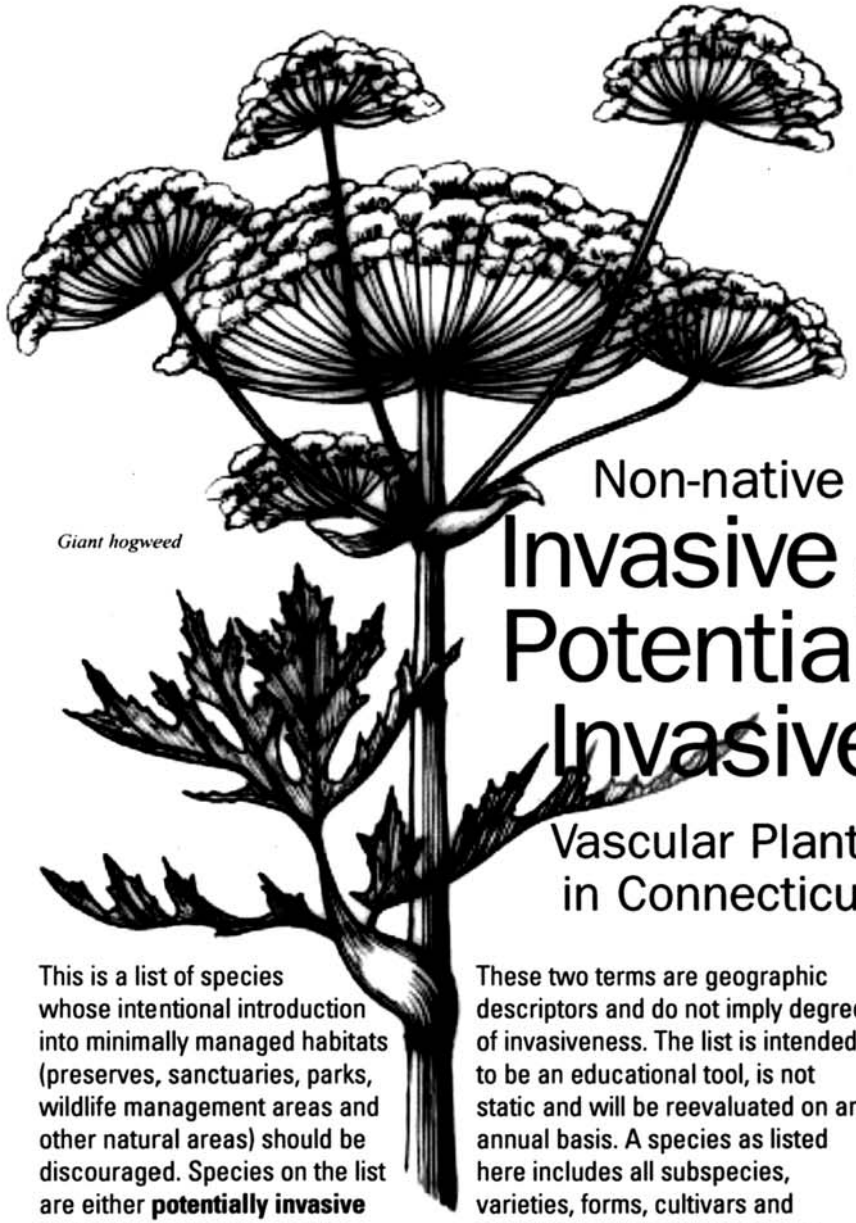
HABITATS

U = uplands (all upland habitats including closed-canopy forests, second-growth woods, fields, grasslands, ridge tops, sand barrens, pitch pine scrublands etc.)
O = open areas (fields, grasslands, sand barrens, dry meadows etc.)
W = wetlands (swamps, marshes, wet meadows, fens, bogs, flood plains, flood plain forests, pond and stream shores)
L = lakes (ponds, in impounded water)
R = rivers (streams, in running water)
C = coast (sand dunes, rocky headlands, upper edges of salt water tidal marshes)

This list and the criteria for listing were developed by the George Safford Torrey Herbarium, University of Connecticut, in conjunction with the State Geological and Natural History Survey of Connecticut and the Connecticut Invasive Plant Working Group. For a copy of the Criteria, please visit the Invasive Plant Working Group web page **http://www.hort.uconn.edu/cipwg**.

For more information on these species visit the New England Invasive Plant Atlas web page **http://invasives.eeb.uconn.edu/ipane**.

This list should be cited: Mehrhoff, L.J., K.J. Metzler, & E.E. Corrigan. 2003. Non-native and potentially invasive vascular plants in Connecticut. Center for Conservation and Biodiversity, University of Connecticut, Storrs.



Giant hogweed

Non-native Invasive and Potentially Invasive

Vascular Plants in Connecticut

This is a list of species whose intentional introduction into minimally managed habitats (preserves, sanctuaries, parks, wildlife management areas and other natural areas) should be discouraged. Species on the list are either **potentially invasive** or **invasive**. Invasive species are either **widespread** or have a **restricted** range in Connecticut.

These two terms are geographic descriptors and do not imply degree of invasiveness. The list is intended to be an educational tool, is not static and will be reevaluated on an annual basis. A species as listed here includes all subspecies, varieties, forms, cultivars and synonyms. Life forms and broad habitat descriptors for habitats that are primarily threatened are noted.

JANUARY 2003

WIDESPREAD AND INVASIVE

SCIENTIFIC NAME	COMMON NAME	LIFEFORM	HABITAT
Ailanthus altissima (Mill.) Swingle	Tree-of-heaven	T	U
Alliaria petiolata (Bieb.) Cavara & Grande	Garlic Mustard	H	U
Berberis thunbergii DC.	Japanese Barberry	S	U
Cardamine impatiens L.		H	U
Celastrus orbiculatus Thunb.	Asiatic Bittersweet	V	U
Centaurea maculosa Lam. Syn. Centaurea biebersteinii DC.	Spotted Knapweed	H	O
Cynanchum Louiseae Kartesz & Gandhi Syn. Vincetoxicum nigrum (L.) Moench	Black Swallow-wort	H, V	U
Cynanchum rossicum (Kleo.) Borhidi Syn. Vincetoxicum rossicum (Kleo.) Barb.	Swallow-wort	H, V	U
Elaeagnus umbellata Thunb.	Autumn Olive	S	O
Euonymus alatus (Thunb.) Sieb.	Winged Euonymus	S	U
Euphorbia cyparissias L.	Cypress Spurge	H	O
Fallopia japonica (Houtt.) Decraene Syn. Polygonum cuspidatum Sieb. & Zucc.	Japanese Knotweed	H	U, W
Frangula alnus Mill. Syn. Rhamnus frangula L.	European Buckthorn	S	U
Froelichia gracilis (Hook.) Moq.	Cottonweed	H	O
Hesperis matronalis L.	Dame's Rocket	H	U
Iris psueudacorus L.	Yellow Iris	H	W
Lonicera X bella Zabel	Bella Honeysuckle	S	U, W
Lonicera japonica Thunb.	Japanese Honeysuckle	V	U, W
Lonicera morrowii A. Gray	Morrow's Honeysuckle	S	U, W
Lythrum salicaria L.	Purple Loosestrife	H	W
Microstegium vimineum (Trin.) A. Camus	Japnese Stilt Grass	G	U
Myosotis scorpioides L.	Forget-me-not	H	W
Nasturtium offinale R. Br.	Watercress	H	W
Phragmites australis (Cav.) Trin.	Common Reed	G	U, W
Potamogeton crispus L.	Crispy-leaved Pondweed	A	R, L
Rhamnus cathartica L.	Buckthorn	S	U
Robinia pseudoacacia L.	Black Locust	T	U
Rosa multiflora Thunb.	Multiflora Rose	S	U

RESTRICTED AND INVASIVE

SCIENTIFIC NAME	COMMON NAME	LIFEFORM	HABITAT
Ampelopsis brevipedunculata (Maxim.)	Porcelain berry	V	U
Cabomba caroliniana A. Gray	Fanwort	A	L, R
Egeria densa Planchon	Brazilian Water-weed	A	L, R
Humulus japonicus Sieb. & Zucc	Japanese Hops	H, V	W, U
Hydrilla verticillata (L. f.) Royle	Hydrilla	A	L, R
Lepidium latifolium L.	Tall Pepperwort	H	C, O
Lonicera maackii (Rupr.) Maxim.	Amur Honeysuckle	S	U
Lysimachia vulgaris L.	Garden Loosestrife	H	W
Myriophyllum heterophyllum Michx.	Variable Water-milfoil	A	L, R
Myriophyllum spicatum L.	European Water-milfoil	A	L, R
Polygonum perfoliatum L..	Mile-a-minute vine	V, H	U
Ranunculas ficaria L..	Lesser celandine	H	UW
Rubus phoenicolasius Maxim.	Wineberry	S	U
Trapa natans L.	Water chestnut	A	L, R
Tussilago farfara L.	Coltsfoot	H	U, W

POTENTIALLY INVASIVE

SCIENTIFIC NAME	COMMON NAME	LIFEFORM	HABITAT
Acer ginnala L.	Amur Maple	T	U
Acer platanoides L.	Norway Maple	T	U
Acer pseudoplatanus L.	Sycamore Maple	T	U
Aegopodium podagraria L.	Goutweed	H	W
Aira caryophyllea L.	Silver Hairgrass	G	O
Allium vineale L.	Wild Garlic	H	U
Amorpha fruticosa L.	False Indigo	S	W
Arthraxon hispidus (Thunb.) Makino		G	O, W
Berberis vulgaris L.	Barberry	S	U
Bromus tectorum L.	Drooping Brome-grass	G	O
Butomus umbellatus L.	Flowering-rush	H	W
Callitriche stagnalis Scop.		A	R, W
Cirsium arvense (L.) Scop.	Canada Thistle	H	O
Datura stramonium L.	Jimson-weed	H	C
Elaeagnus angustifolia L.	Russian Olive	S	U
Elsholtzia ciliata (Thunb.) Hylander	Elsholtzia	H	U
Euphorbia esula L.	Leafy Spurge	H	O
Fallopia sachalinensis (F. Schmidt ex Maxim.) Dcne. Syn. Polygonum sachalinense F. Schmidt ex Maxim.	Giant Knotweed	H	U
Geranium napalense Sweet	Napalese Crane's-bill	H	U
Glechoma Hederacea L.	Gill-over-the-ground	H	W
Glyceria maxima (Hartman) Holmburg	Tall mannagrass	G	W
Heracleum mantegazzianum Sommier & Levier	Giant Hogweed	H	U
Impatiens glandulifera Royle	Tall impatiens	H	W
Kochia scoparia (L.) Schrader	Summer Cypress	H	C
Ligustrum obtusifolium Sieb. & Zucc.	Border Privet	S	U
Ligustrum ovalifolium Hassk.	California Privet	S	U
Ligustrum vulgare L.	European Privet	S	U
Lonicera tatarica L.	Tatarian Honysuckle	S	U
Lonicera xylosteum L.	European Fly-Honeysuckle	S	U
Lychnis flos-cuculi L.	Ragged Robin	H	O
Lysimachia nummularia L.	Moneywort	H	W
Marsilea quadrifolia L.	Water Shamrock	H	L
Miscanthus sinensis Anderss.	Eulalia	G	O
Myriophyllum aquaticum (Vell.) Verdc.	Parrotfeather	A	L
Nelumbo lutea (Willd.) Pers.	American Water Lotus	A	L
Najas minor Allioni	Eutrophic Water-nymph	A	L
Nymphoides peltata (Gmel.) Kuntze	Yellow Floating Heart	A	L
Onopordum acanthium L.	Scotch thistle	H	C
Ornithogalum umbellatum L.	Star of Bethlehem	H	U
Paulownia tomentosa (Thunb.) Steudel	Empress-tree	T	U, C
Phalaris arundinacea L.	Reed Canary-grass	G	W
Poa compressa L.	Canada Blue-grass	G	U
Polygonum caespitosum Blume		H	U
Populus alba L.	White Poplar	T	U
Pueraria lobata (Willd.) Owhi	Kudzu-vine	V	U
Rosa rugosa Thunb.	Japanese Rose	S	C
Rumex acetosella L.	Sheep Sorrel	H	U
Silphium perfoliatum L.	Cup-plant	H	U
Solanum dulcamara L.	Climbing Nightshade	H, V	U, W
Valeriana officinalis L.	Garden-heliotrope	H	U
Veronica beccabunga L.	Brooklime	H	W

APPENDIX E-1

Agricultural Products of Guilford

Guilford has a small agricultural economy based on goods grown and marketed (retail and wholesale) for the Town and out-of-town market. Guilford's agricultural products are listed below with produce and hay production predominating.

Produce

(Note: The listing below does not include the many backyard growers and temporary roadside stands.)

- Bishop – The Bishop family farm began in 1871. Today it encompasses 320 acres in several parcels of which 300 are in family farm corporation ownership. They lease a strawberry field on Tanner Marsh Road. Products are sold locally at Bishop's Orchards Farm Market & Bakery, Boston Post Road, a retail farm market with a controlled atmosphere apple storage facility, a cider mill, a few animals, and a seasonal hay maze. Some produce, mainly apples, is sold at wholesale. The Bishop's cite diversity of crops as a failsafe strategy. Produce grown (with acreage figures) follows: apples (140 ac.), peaches (22 ac.), pears (8 ac.), strawberries (5 ac.), blueberries (9 ac.), raspberries (5 ac.), vegetables (15 ac.), and pumpkins (15 ac.)[1].
- Fonicello - in business for 70 years, Fonicello maintains approximately 60 acres in production with the five properties it owns in Town and the 30 acres it leases in Madison. Thirty kinds of vegetables and some cutting flowers are grown there. Straw (wheat or rye) is grown as a winter cover crop. Annuals, perennials, and hanging baskets are grown in the greenhouses on Union Street. Landscaping plants are brought in as a "grow on" product. All products are sold at retail at Fonicello's Garden Center on Boston Post Road.
- Seseske - Boston Post Road-grows and retails on-site: mums, ornamentals,.and vegetables
- Scranton - Durham Road-grows and retails on-site greenhouse-grown tomatoes
- Strawberry Hollow Farm, (Harvey Smith) - Boston Post Road - grows and retails unusual varieties of gourds and pumpkins, and over 50 varieties of chrysanthemums
- Dudley Farm Market - Durham Road and Route 80 - locally grown farm products seasonally grown by small growers, currently from one Guilford farm and several other out-of-town farms in the region.
- Sachem's Garden Center – Durham Road-retails produce grown on-site and produce from small, local growers
- Lakeside Farm - Hoop Pole Road - pears, apples, plums grown on-site and retailed at Lakeside Feed store on the premises.

Hay / Feed – ordered from south to north

(hay-growing unless noted otherwise)

- Guilford Keeping Society - Boston Street
- Leete - Leete's Island Road (Route 146) - hay, (formerly salt-hay as well)[2]
- Davis - Sunrise and Boston Post Road; salt-haying off Sawpit Road.
- Fonicello - several properties - straw (winter cover crop of wheat or rye)
- Vernon Dudley - Tanner Marsh Road-hay
- Helen Leslie - Clapboard Hill- hay, corn
- Offredi - Little Meadow

- Brierley - County Road
- Page - County Road and West Street (leases)
- Prout – Elm Street
- Potter - West Street
- Farren - Beaver Head Road
- Ridgeview Association (formerly Aronson) - Beaver Head Road
- Rusconi/Black - Great Hill Road
- South Central Regional Water Authority - Great Hill Road, Beaver Head Road, Durham Road, and by Menunketuc Dam[3]
- Bartlett - Great Hill Road
- Gozzi - Great Hill Road
- Rossiter - Great Hill Road
- Scranton - Durham Road
- Haggarty - Lake Drive and Hoop Pole Road
- Secondino - Lake Drive
- Chittenden - Durham Road
- Guilford Land Conservation Trust[4] - Durham Road/ Great Hill Road
- Landon - Durham Road
- Wheaton - Durham Road
- Charles Wimler - Durham Road
- Ray Wimler - Crooked Hill Road - hay, corn

Livestock / Poultry

- Beef Cattle[5] - Scranton, Marlowe, Chittenden, Goss, Bartlett, Offredi, and Landon.
- Buffalo – Bartlett
- Sheep - Chittenden, Lahner, Dudley, Offredi
- Goats - Lahner
- Llamas - Lakeside Farm (since 1995, operates CT's first llama club)
- Alpaca – Burgis Brook Alpacas, Burgis Lane
- Ostrich (eggs) - Lakeside Farm
- Doves - Lakeside Farm
- Rabbits - Lakeside Farm
- Exotic Livestock and fowl - Bartlett Farm, Lakeside Farm, Walston[6]
- Poultry, turkeys – Lakeside Farm, Lahner
- Eggs - Wetteman, Lahner, and numerous households
- Pigs - (not permitted by zoning)

Grapes

There are two non-commercial vineyards

Maple Syrup

- Maple Grove Farm (Scranton) - Durham Road
- Several other smaller sugaring operations in Town

Wool

- Lahner - sheep wool
- Lakeside Farm - retails raw and spun llama wool, conducts spinning classes

Dairy

There are no longer any operational dairy farms in Town, but Ray Wimler pastures dairy cows on Crooked Hill Road in Guilford.

Horses

Many households maintain horses afforded by large lot zoning.

Bees

The keeping of bees for honey and other products is termed apiculture. It is important to have a supply of bees for the pollination of certain crops (i.e., pumpkins) and orchards. Approximately 100 hives are moved into Guilford on a temporary basis to aid the pollination of apples, pears, and blueberries. According to Vincent Kay, commercial beekeeper, Guilford has quite a beekeeping population with about 75-100 resident hives. Honey is sold to regional stores.

Nursery Stock / Flowers

Nursery stock means trees and shrubs are "grow-on"- brought in and grown bigger. Flowers are potted annuals and perennials (grown in greenhouses):

- Fonicello's, on Union Street
- North Guilford Nursery, on Rockland Road
- Sachem's Garden Center, on Durham Road
- Wilbur & King Garden Center grows flowers and vegetable plants for retail in a greenhouse on its premises on Goose Lane
- Pinchbeck's, on Boston Post Road, grows roses and miscellaneous cut-flowers. It is the only grower of roses in New England and has the largest single-span greenhouse in the country. Flowers are sold retail on site and wholesale to the New York City market and throughout Connecticut.

Christmas Trees

There are several registered "Cut-Your-Own" Christmas Tree Farms in Guilford:

- Smith's Tree Farm, Long Hill Road
- New England Forest, Great Hill Road
- Wetteman's, West Street
- Pinchbeck's Tree Farm, State Street

In addition, Christmas Hill Tree Farm, Elm Street sells "Cut Your Own", and Pinchbeck's sells trees grown on the Boston Post Road premises wholesale, but not "Cut Your Own"

Endnotes

1 Data from Bishop's website, www.bishopsorchards.com., as dated 10/03

2 Changes in the marsh conditions have hampered traditional salt-haying operations

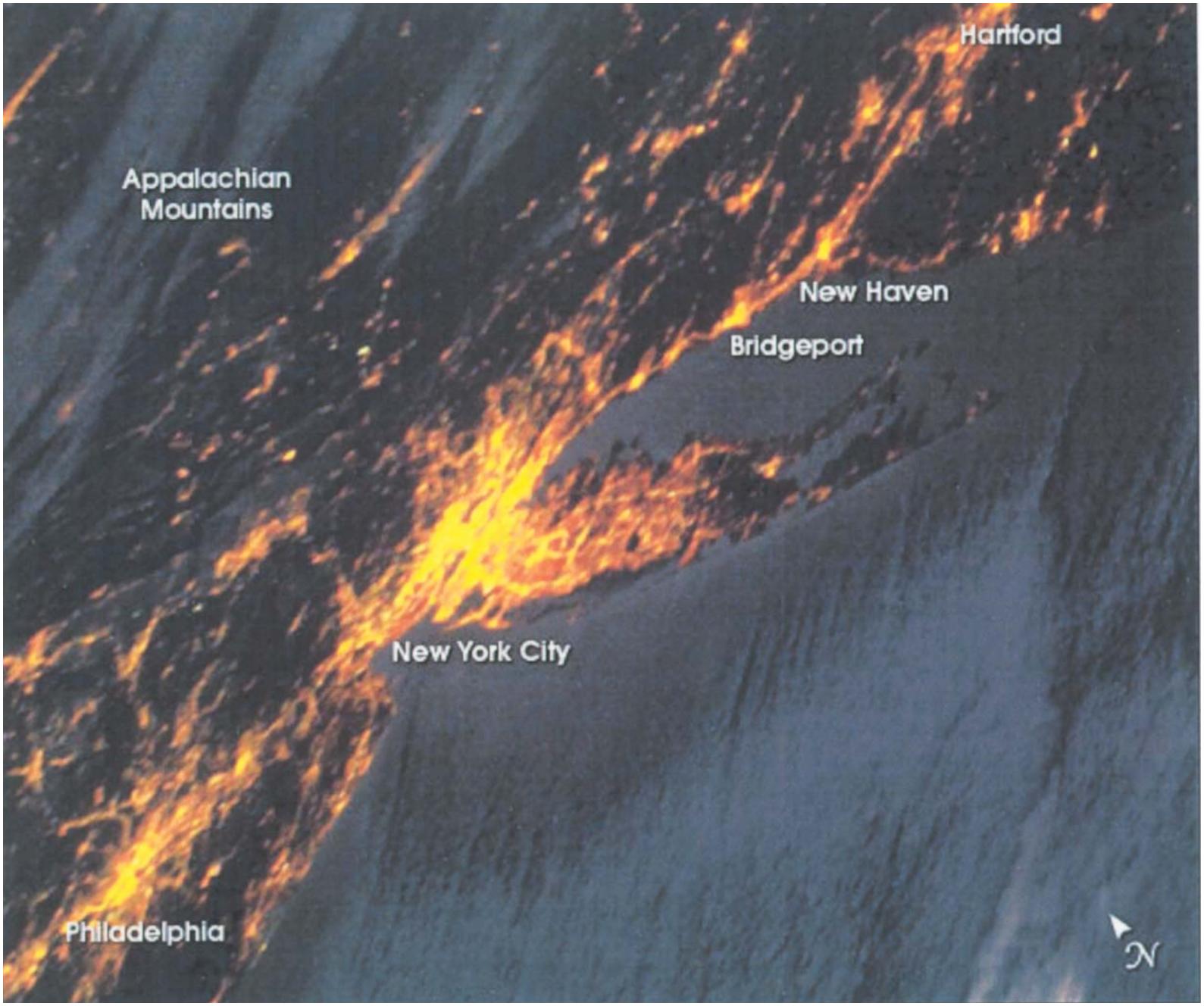
3 SCCRWA maintains approximately 43 acres in agricultural use in Guilford, as per John Hudak, SCCRWA, 1-8-04

4 Formerly Rusconi; Rusconi retains right to hay property

5 There is the potential for small scale cattle breeding to supply local restaurants

6 Scotch Highlander cattle

F-1 NEW YORK METROPOLITAN AREA AT NIGHT



APPENDIX G-1

Natural Scenic Resources

Comparison of NRIAC's "Natural Scenic Resources" with LAC's "Areas of Conservation Interest" and GPA's "Favorite Scenes and Places"

Guilford's natural beauty has inspired the recognition of the Town's scenic areas in many documents. Below is a rudimentary comparison of the Natural Resource Inventory's "Natural Scenic Resources" with the Land Acquisition Committee's (LAC) "Areas of Conservation Interest" and Guilford Preservation Alliance's (GPA) "Favorite Scenes and Places" with the respective subject lists following below.

It should be noted for clarification purposes, that the latter two lists also appear in the *2002 Town of Guilford, Connecticut Plan of Conservation and Development (POCD)*, the former as *Appendix 3* therein, and the latter in the text, under Policy A: Preserve Guilford's Character and Cultural Landscape", page 29. In the *POCD*, the Planning and Zoning Commission is directed to "develop a range of strategies and zoning regulations to preserve and protect (these) 17 favorite scenes and views and special places" and the Board of Selectmen is directed to continue purchase of open space identified in the LAC report.

Each of these lists was generated in response to different issues. Each has application today in various planning efforts. The comparison was completed primarily to demonstrate how the NRIA natural scenic resources list is distinct. Many of the areas we all know to be "scenic" are listed in each of these three lists—there is much cross-over—however, the objective behind each listing effort differs fundamentally.

Additionally, it is important to point out a cross-over of purpose between these efforts. For example, several sites identified in the LAC document list as areas to be preserved (e.g. shellfish beds) may not appear listed in the NRIA as a "natural scenic resource", but may be identified elsewhere in the NRIA document as an important ecological or open space resource.

GPA Document:

DESCRIPTION: A survey sponsored by the GPA in 1984, resulted in a listing of 16 of the respondents' favorite scenes and places in order of preference in the document, *A Visual Analysis of Guilford, Connecticu*t, by Lori Ann Regis, which was referenced in the GPA *Master Plan for Preservation and Scenic Conservation,* 1986, as revised 1995. This list, (with the addition of a seventeenth area, Faulkner's Island) is included in the *POCD* and these areas are identified by location and photograph on *Map 3,* "Guilford: Locations of Special Places"; *Town of Guilford: Maps for the Plan of Conservation and Development*, (undated), a companion to the *POCD.*

BASIS FOR LISTING: This list indicates areas of special significance to townspeople who were survey respondents without regard to criteria based on objective scenic qualities or natural resource value or function and without regard to preservation status of the geographic area or feature. It should be noted because survey returns were limited, scoring was based on a small sample, and e.g., "the view of fields from Great Hill Road near Cooks Lane to the northwest" was placed on the List by virtue of the 9 votes it had received for favorite place.

LAC Document:

DESCRIPTION: "Areas of Conservation Interest", a list of nineteen areas, found in the *Plan for Open Space and Municipal Land Needs,* completed by LAC, 1999, as revised 2001.

BASIS FOR LISTING: This list delineates areas recommended for top priority for open space preservation by the Town. They are not in priority order, but rather geographic order, from north to south. Criteria considered for listing effort included a stated historic interest in addition to open space and natural resource interests.

NRIA Document:

DESCRIPTION: As per the text of the NRIA document, the NRIA Natural Scenic Resources includes Guilford's scenic areas and scenic views, scenic roads, mature trees, stone walls, ridgelines and hillsides, coastline and water resources, and pastoral landscapes (agricultural land and pasture) in addition to the discrete list of specific notable locales termed "scenic areas and scenic views" (the latter, included for easy reference, below). These resources are depicted on Group A- *Map 2*, "Natural Scenic Resources" to the extent that the resource has been identified by the NRIAC. Identification of ridgetops, for example, has yet to be completed for inclusion on *Map 2*.

BASIS FOR LISTING: The basis for the NRIA approach is the understanding that Guilford's notable beauty is attributable to the prevalence of these different types of scenic features, the value of which is augmented when perceived in the context of the whole. To this extent, the scenic resources listed for the purposes of the NRIA are generic in nature with resource areas types identified both Town-wide and site specifically (in regards to the scenic view category) in contrast to the specific sites listed in the GPA and LAC lists.

The emphasis for inclusion was the natural resource's appearance rather than its functional value and, generically, its contribution to the overall appearance of Guilford. In contrast to the GPA and LAC listings, the scenic resources presented in this inventory, are notable for their natural features exclusive of man-made structures (any structures located within are incidental). Their status in terms of preservation/protection was not a criterion as it was in the LAC list. Their inclusion was the choice of the NRIAC, rather than by popular vote as in the case of the GPA list. Historic value or significance was not a parameter for inclusion, as in the LAC effort.

Comparative Example:

Using Westwoods to illustrate the differences in criteria between the three lists, GPA List lists "Westwoods Trails" as a favorite place; LAC List lists "Private in-holdings in Westwoods" as a priority area for preservation; and NRIA lists "Westwoods" dually as a scenic area and as a public vantage point affording a scenic view of woodlands and marshes.

This example demonstrates that neither the geographic area nor the basis for the listing is identical on any of the three lists. No doubt Westwoods scores as a favorite place due in large part to its scenic qualities. The NRIA Natural Scenic list identifies this area for its scenic qualities. The NRIA document endorses the LAC priority to protect the in-holdings in Westwoods through acquisition. But in this instance, NRIA's endorsement is not based on perceived need for scenic protection, but rather on the NRIA stated objective to preserve, maintain and enhance the ecological integrity and open space value of existing committed open space.

NRIA Natural Scenic Resources includes a host of resource types. Here is a list of one type, scenic views:

NRIA's *Listing of Scenic Views From Public Vantage Points and Scenic Areas*

PUBLIC VANTAGE POINT	SCENIC VIEW
Bluff Head*	Panoramic views of North Guilford, Broomstick Ledges, Hartford, and Long Island Sound
Bridge on Clapboard Hill Road	East River Marshes Estuary
Great Hill Road	Fields looking west and east and northwest near Cook'sLane
Westwoods*	Woodlands and marshes
East Woods off Podunk Road	Woodlands
Guilford Town Marina	Grass Island, marshes, Long Island Sound and Faulkner's Island
Route 77 North	Bluff Head, Broomstick Ledges, and ridges to the west
Route 77 and Lake Drive	Lake Quonnipaug and ridges to the north and west
Route 77, North of Route 80	Fields and woods
Chaffinch Island*	West River inlet, Guilford coast & Long Island Sound
Indian Cove*, Sachem's Hd.*, Mulberry Pt.*	Town beaches, coast and the Sound
Joshua Cove*, Vineyard Point*	Town beaches, coast and Long Island Sound
Route 146 at Shell Beach Road	Leetes' Island, and tidal flats
Route 146 at Lost Lake	Great Harbor marshes and Westwoods
Olmstead's Outlook*, River Street	West River marshes
Chittenden Park*	Marshes
Scenic View Road	fields, Lake Quonnipaug and Quonnipaug Mountain
Long Island Sound*	Guilford coast, coves and ridgetops
West Street	Totoket Mountain
Overlook Road	Totoket Mountain
Hemlock Avenue	Ravine on south side of Hemlock Avenue
North Madison Road	Guilford Lakes
Route 77	West River valley

* a public vantage point which is also a scenic area or view in its own right

"These open space preservation priorities are the result of historic, open space, and natural resource planning by the Guilford Land Conservation Trust, Guilford Conservation Commission, Guilford Inland Wetlands Commission, Guilford Preservation Alliance, and Scenic Roads Advisory Board, as well as input from the current Land Acquisition Committee and the commissions, advisory boards, and non-profit organizations that are on that committee. Areas of conservation interest that should receive top priority by the town for preservation are listed in order from north to south".

Bluff Head/ Totoket Mountain

Preserve integrity of the Blue Trail System

Broomstick Ledges

Open Fields along Great Hill Road/ Vista from Meetinghouse Hill

Beaver Head Road

Working farms throughout Guilford

Bartlett parcel north of Town parcel on Lake Quonnipaug

Parcels abutting Timberlands – town forest

East River meadows and woodland areas

Trolley bed from North Branford to near West Lake Avenue

Riparian buffer strip along West River from Route 80 to Bittner Park to Flat Meadow

Private in-holdings in WestWoods

Connecting protected land from Branford open space east to West Woods

Connecting protected land north from Route 146 across (GLCT) preserve to Branford/Guilford trails

Agricultural Society Fairgrounds

Views of salt marsh and woodland from GLCT preserve known as the Olmsted Outlook on River Street

Routes 77 and 146 scenic corridors

Leete Farm

Shellfish beds along Long Island Sound

Town Gateways

1. The Green
2. Bluff Head
3. Westwoods Trails
4. Guilford Harbor/Town Dock
5. Lake Quonnipaug
6. Meeting House Hill
7. Chaffinch Island
8. View from Route 146 of Leetes Island: Leete Farm, Shell Beach Road, Shell Beach, and Meadows
9. East River Estuary from Clapboard Hill Road Bridge
10. View from Route 146 of Great Harbor Marshes and Tidal Flats
11. Fair Street
12. Sachem's Head
13. Olmstead's Outlook (Broad Street looking west to West River)
14. Route 77 between Route 80 and Lake Quonnipaug
15. Broad Street
16. View of Fields from Great Hill Road looking northwest, near Cook's Lane
17. Faulkner's Island*

* (*added subsequently)*

APPENDIX G-2 a

Natural Resource Inventory's Natural Scenic Resource Elements Applied to GPA's Favorite Scenes and Places

Natural Scenic Resource Elements

GPA List (a "view" below is treated solely as a view, not as an area)	scenic area	scenic view	ridge top	water resource (not coastal)	farmland	coastal	not "natural"	not rated/ not a locale/ not a view
The Green							x	
Bluff Head	x	x	x					
Westwood Trails	x	x		x				
Guilford Harbor / Town Dock		x				x	dock	
Lake Quonnipaug	x	x		x				
Meeting House Hill	x	x			x			
Chaffinch Island	x	x				x		
View from Route 146 of Leete's Island: Leete Farm, Shell Beach Road, Shell Beach, and Meadows	x	x			salt hay	x		
East River Estuary from Clapboard Hill Road Bridge		x		x		x		
View from Route 146 of Great Harbor Marshes and Tidal Flats	x	x				x		
Fair Street							x	
Sachem's Head		x				x	residential area	
Olmstead's Outlook (Broad Street looking to West River)	x	x				x	street area	west
Route 77 between Route 80 and Lake Quonnipaug		x	x	x	x			
Broad Street							x	
View of fields from Great Hill Road looking northwest, near Cook's Lane	x	x	x		x			
Faulkner's Island	x	x				x		

APPENDIX G-2b

Natural Resource Inventory's Natural Scenic Resource Elements Applied to LAC's Areas of Conservation Interest

Natural Scenic Resource Elements

GPA List (a "view" below is treated solely as a view, not as an area)	scenic area	scenic view	ridge top	water resource (not coastal)	farmland	coastal	not "natural"	not rated/ not a locale/ not a view
Bluff Head	x	x	x					
Totoket Mountain	x	x	x					
Preserve integrity of the Blue Trail System	x	x	x					
Broomstick Ledges	x	x	x		x			
Open fields along Great Hill Road	x	x	x		x			
Vista from Meetinghouse Hill	x	x			x			
Beaver Head Road	x	x		x	x			
Working farms throughout Guilford	x	x		x	x			
Bartlett parcel north of Town parcel on Lake Quonnipaug	x	x	x					
Parcels abutting Timberlands Town forest	x	x				x		
East River meadows and woodland areas	x	x				x		
Trolley bed from North Branford to near West Lake Ave				x			(not known)	
Riparian buffer strip along West River from Route 80 to Bittner Park to Flat Meadow	x	x		x				
Private in-holdings in West Woods	x	x		x				
Connecting protected land from Branford open space east to West Woods								(not known)
Connecting protected land north from Route 146 across (GLCT) preserve to Branford/Guilford trails								(not known)
Agricultural Society Fairgrounds							x	
Views of salt marsh & woodland from GLCT preserve known as the Olmstead Outlook on River Street	x	x				x		
Routes 77 and 146 scenic corridors		x	x	x	x	x (Rte.146)		
Leete Farm	x	x			x	x		
Shellfish beds along Long Island Sound								not a view
Town Gateways								not rated

dated: 4-26-04

APPENDIX G-3

Guilford's Town Owned Scenic Roads

A Sample Assessment

LOCATIONS ALL PAVED ROADS	CRITERIA Stone walls	Mature trees ie > 24" diam.	Narrow ie <20'	Scenic views	Water features	Tree Canopies Arch Over Road	Winding	Hills	Special features
Clapboard Hill Rd									
Exit 59 to TM Rd	x	x							
TM Rd to East River	x								
ER to Podunk Rd	x	x		x	x	x	x	x	East River / marshes
Moose Hill Road									
Rte 1 to Granite Rd									
GR to Peddler's	x	x							
Peddler's to Landon's	x			x		x	x	x	
L. to Leetes Island Rd	x	x							
West Street									
County to Wilbur's Lane		x	x	x		x	x	x	
WL to Beaver Head	x	x		x		x	x	x	Fields
County Road									
Rte 77 to LHRd		x		x	x	x	x	x	Barns
LHRd to West Street		x	x	x	x	x	x	x	Fields
Beaver Head Road		x	x	x	x	x	x	x	Field/Meadows
									WPA stone bridges
Great Hill Rd									
Rte 77 to Cook's Lane		x	x		x	x	x	x	Fields / View of Totoket Mtn
CL to Beaver Head	x	x	x	x	x	x	x	x	Fields / Barns
BH to Hemlock	x	x	x	x	x	x	x	x	
H. to Wilbur's Lane		x	x			x	x	x	* NRHP / Fields
Elm Street		x		x		x	x	x	Fields/barns

* NRHP - National Register of Historic Places

APPENDIX G-4

Guilford's Notable Trees

As listed in"Connecticut Notable Trees" as published by the CT Botanical Society, Connecticut College Arboretum and the CT Urban Forest Council:

COMMON NAME	SCIENTIFIC NAME	YEAR MEASURED	PTS*	CIRCUMFERENCE
Ailanthus	Albizia julibrissin	1987	85	39
Ash, White **	Fraxinus americana	1998	286	164
Oak, White **	Quercus alba	1995	251	185
Redwood, Dawn	Metasequoia glyptostroboides	1998	248	150
Cypress, Bald	Taxodium distichum	1998	235	143
Cherry, Black **	Prunus serotina	1998	235	102
Horsechestnut, Baumann	Aesculus hippocastanum 'Baumannii'	1987	207	115
Willow, Dragon-Claw	Sailx matsudana 'Tortuosa'	1998	205	131
Coffeetree, Kentucky	Gymnoccladus dioicus	1987	195	101
Oak, Red **	Quercus rubra	1987	193	105
Beech, European Cutleaf	Fagus sylvatica 'Laciniata'	1989	192	117
Fir, Nikko	Abies homolepis	1993	186	92
Fir, Nikko	Abies homolepis	1993	176	87
Cedar of Lebanon	Cedrus libani	1998	173	84
Red Cedar, Eastern **	Juniperus virginiana	1987	171	108
Oak, Chestnut **	Quercus prinus	1991	144	54
Persimmon ***	Diospyros virginiana	1987	131	62

* PTS = the sum of the circumference, height and average crown spread (figure in feet x 0.25)
** NRIA input: these trees are species native to Guilford and Connecticut
*** species probably not native to Guilford although there are a few native Persimmon trees documented on the Connecticut coast

APPENDIX H-1

A Compilation of Guilford's Open Space Data

Land Category	# of acres	% Classified Open Space	% Total Land Area	Notes
CLASSIFIED OPEN SPACE:				
Committed Open Space by Owner				Dedicated, "permanently" protected
SCCRWA	2,723	30.9%		Class I and II Water Company land
Guilford Land Conservation Trust	2,246	25.5%		Meets Class A definition
State of Connecticut	1,236	14.0%		Requires additional data for verification
Town of Guilford	993	11.3%		Meets Class A definition
National Audubon Society	89	1.0%		Meets Class A definition
Sub-Total	7,287			
Uncommitted Open Space by Owner				Not dedicated or "permanently" protected
Town of Guilford	633	7.2%		"Class B and C defined" land and built land
Institutions	185	2.1%		"Class B and C defined" land and built land
Wallingford Water Company	182	2.1%		Requires additional data for verification
SCCRWA	505	5.7%		Class III water co. land
Connecticut Water Company	21	0.2%		Requires additional data for verification
Sub-Total	1,526			
Total Classified Open Space	8,813	100.0%	28.9%	
Unclassified Open Space	7,188		23.6%	Private undeveloped land
TOTAL OPEN SPACE	**16,001**			
Developed Land	14,463		47.5%	
Total Land Area	30,464		100.0%	

APPENDIX H-2a

Metacomet Ridge Conservation Compact Document and Map

The following text is keyed to a map of the Metacomet Ridge (See second page) that depicts the ridge and the 16 municipalities that signed the compact (Guilford, Farmington, North Branford, Simsbury, Bloomfield, Berlin, Middletown, Durham, Middlefield, Suffield, Plainville, Avon, West Hartford, Meriden, Wallingford, East Haven, Branford), which follows below. A copy of the map document can also be found in Town Hall South, Boston Street, Guilford, Connecticut.

"WE THE SIGNATORIES RECOGNIZE THAT: Our Conservation Commissions hereby enter into a Compact with our neighboring Conservation Commissions for the purpose of protecting the Metacomet Ridge ecosystem. The Metacomet Ridge Conservation Compact affirms our commitment to protect the natural resources of the Metacomet Ridge. FURTHERMORE, WE UNDERSTAND THAT: As the Commissions concerned with the conservation of the natural resources within our respective municipalities, we play a key role in encouraging our municipality's commitment to the spirit of this compact. THEREFORE, WE ENTER INTO THIS VOLUNTARY INTER-COMMISSION COMPACT TO AFFIRM OUR COMMITMENT TO:

- *Conduct a natural resource inventory of our portion of the Metacomet Ridge that identifies priority areas for protection, and incorporate those areas into our Open Space Plan and call for their protection.*
- *Assist and work with our Planning and Zoning Commission to update our Plan of Conservation and Development to incorporate protection of the identified priority areas of Metacomet Ridge.*
- *Assist and work with out Planning and Zoning Commission to update Zoning and Subdivision Regulations to promote the retention of the natural landscape, maintain and enhance recreational opportunities, minimize forest fragmentation and avoid visual pollution on or near the Metacomet Ridge.*
- *Encourage and/or sponsor educational programs aimed at informing the public about the important value of the Metacomet Ridge.*

Approved by individual votes of the participating Conservation Commissions and ratified on this Earth day, April 22, 1998."

First Selectman Samuel Bartlett and Environmental Planner Leslie Kane signed the document on behalf of the Guilford Conservation Commission.

Metacomet Ridge Conservation Compact

WE THE SIGNATORIES RECOGNIZE THAT:

Our Conservation Commissions hereby enter into a Compact with our neighboring Conservation Commissions for the purpose of protecting the Metacomet Ridge ecosystem.

The Metacomet Ridge Conservation Compact affirms our commitment to protect the natural resources of the Metacomet Ridge.

FURTHERMORE, WE UNDERSTAND THAT:

As the Commissions concerned with the conservation of the natural resources within our respective municipalities, we play a key role in encouraging our municipality's commitment to the spirit of this compact.

THEREFORE, WE ENTER INTO THIS VOLUNTARY INTER-COMMISSION COMPACT TO AFFIRM OUR COMMITMENT TO:

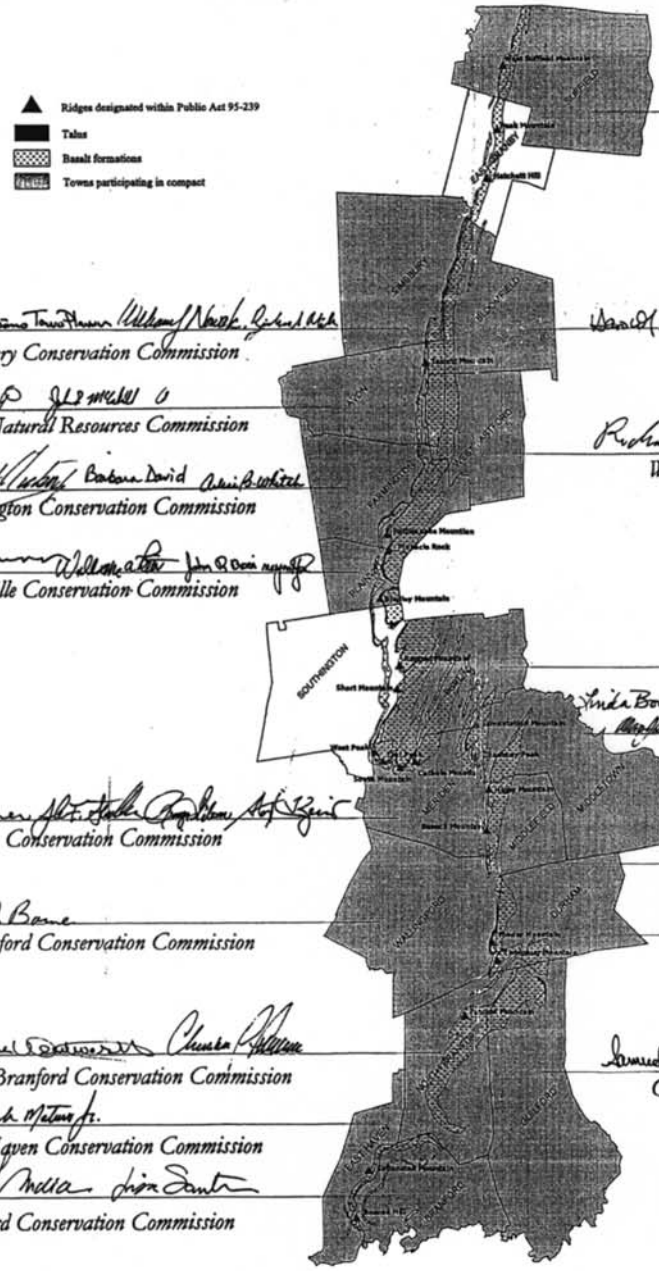
Conduct a natural resource inventory of our portion of the Metacomet Ridge that identifies priority areas for protection, and incorporate those areas into our Open Space Plan and call for their protection.

Assist and work with our Planning and Zoning Commission to update our Plan of Conservation and Development to incorporate protection of the identified priority areas of the Metacomet Ridge.

Assist with our Planning and Zoning Commission to update Zoning and Subdivision Regulations to promote the retention of the natural landscape, maintain and enhance recreational opportunities, minimize forest fragmentation and avoid visual pollution on or near the Metacomet Ridge.

Encourage and/or sponsor educational programs aimed at informing the public about the important value of the Metacomet Ridge.

APPROVED by individual votes of the participating Conservation Commissions and ratified on this Earth Day April 22, 1998.



Suffield Conservation Commission

Simsbury Conservation Commission

Bloomfield Conservation Commission

Avon Natural Resources Commission

West Hartford Conservation Commission

Farmington Conservation Commission

Plainville Conservation Commission

Berlin Conservation Commission

Middletown Conservation Commission

Meriden Conservation Commission

Middlefield Conservation Commission

Wallingford Conservation Commission

Durham Conservation Commission

North Branford Conservation Commission

Guilford Conservation Commission

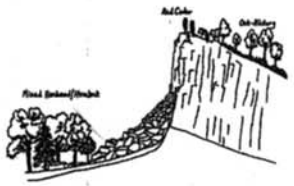
East Haven Conservation Commission

Branford Conservation Commission

With valued assistance provided by:

Senator Thomas P. Gaffey

Representative Mary M. Mushinsky



APPENDIX H-3

Public Act 490 Preferential Tax Assessment Program

In 1963, the Connecticut General Assembly passed what is commonly referred to as Public Act 490, a preferential tax assessment program. (Note: The term, "P.A. 490", is used herein for familiarity, but the statute was codified under the Connecticut General Statutes (CGS) Section 12-107e years ago.) The purpose of this program is stated in the Declaration of Policy:

> (a) that it is in the public interest to encourage the preservation of farm land, forest land and open space land . . .(b) that it is in the public interest to prevent the forced conversion of farm land, forest land and open space land to more intensive uses as the result of economic pressures caused by the assessment thereof for purposes of property taxation at values incompatible with their preservation as such farm land, forest land and open space land…

It should be noted that P.A. 490 was updated with the passage of P.A. 04-115 in May, 2004.

The P.A. 490 program uses include land owned by a private party (or non-tax exempt organization) that is assessed as farm, forest, or open space land under the Public Act 490 program. Land participating in this program is not dedicated open space since it could be sold or developed at some future date. Dedicated open space land is typically owned by a public or tax-exempt entity.

The P.A. 490 program reduces the assessment of parcels that meet certain criteria so that an increasing tax burden would be less of a factor in the sale and development of property. This program ends upon sale of the property. Since farmland, forest land, and open space land do not generate residents and school enrollments, a modest fiscal surplus results for the Town. Many farmers feel it has saved farmland's future. The Town Assessor maintains that peripheral benefits accrue to the Town as a whole from the P.A. 490 designated land: all enjoy the resulting scenic amenity and value is added to surrounding properties – while the Town provides no services for this "vacant" (i.e. un-built) land.

According to the Town Assessor, 10,180.65 acres[1], approximately 33 percent of the land in Town, currently receives preferential tax relief under Connecticut's Public Act 490 as forested land, farmland, or "open space" (each of these three categories of land have statutory definitions.)

- Total acreage of farmland under P.A. 490: 2,838.61
- Total acreage of forestland under P.A. 490: 5,676.57
- Total acreage of open space under P.A. 490: 1,665.47

Farmland

The Town Assessor is authorized by state statute to determine land's eligibility for classification as farmland under the P.A. 490 Program[2]. The Assessor must take into account, among other things, the acreage of such land, the portion of the land in actual use for farming or agricultural operations, the productivity of the land, the gross income derived from the land, the nature and value of the equipment used in connection with the farming activity, and the extent to which the tracts comprising such land are contiguous.

The Town Assessor's use definition for farm use is:

> an agricultural unit, including land and improvements, presently used primarily for the cultivation of the soil, dairying, raising or harvesting any agricultural or horticultural commodity, including the raising, shearing, feeding, caring for, training and management of livestock, including horses, bees, poultry, fur-bearing animals and wildlife, and the raising or harvesting of oysters, clams, mussels, and other molluscan shellfish; the production or harvesting of maple syrup or maple sugar, and of mushrooms. Majority of one's income is not required for classification.[3]

Forest land

To be eligible for forest classification under the P.A. 490 program, tracts have to be twenty-five acres or more in size bearing tree growth that meets certain standards as set by the State Forester as per statute.[4] Legislation passed in 2004, Public Act 04-115, updates P.A. 490 by requiring a forestry report prepared by a certified forester to be submitted with a property owner's application for forestry land classification to the Assessor on an annual basis. These lands can be managed for timber production. Forest land is uniformly assessed at 70 percent of $320/acre.

Open Space

Properties delineated in an adopted municipal open space plan as existing open space or proposed open space lands are eligible for preferential tax relief as "open space land" under Public Act 490, as provided in CGS 12-107 e. Additionally, land must be recommended for preservation as open space in a town plan of conservation and development, under a process provided for in CGS Section 12-107 e (a), in order to qualify under certain open space acquisition funding programs.

The classification of land as "open space land" is subject to some latitude at the discretion of the Assessor in a municipality. In Guilford, the Town Assessor further defines eligible open space as:

> all portions of tracts of land in Town that are, a) unencumbered by buildings or structures and related site improvements, and, b) are in excess of either 80,000 square feet in area or twice the minimum lot size for the zone district in which the parcel is located, whichever is less, provided however, that none of the following are designated open space:
>
> a. any building lot in an approved and filed subdivision
> b. all land area in an approved and recorded Planned Residential Development, except as such land may be unimproved and designated as Open Space on the approved Development Plan; and
> c. all land zoned for industrial or commercial uses on the Zoning Map of the Town of Guilford, CT.

Under the forest or farmland classification, a 10 percent conveyance tax (commonly referred to as a penalty) is exacted by the Town if the land is sold or the use changes within the first year of ownership or classification, whichever date is earlier, with the penalty declining by one percent over a ten year period. The same is true regarding open space land with the exception that only the date of classification applies. No conveyance tax is imposed if these lands are sold or the use changes at the end of the ten-year period. See CGS 12-504a-h for specifics.

Endnotes

1 figures used herein dated 8/6/03

2 CGS 12-107 c. Classification of land as farmland

3 Definition as per Guilford Town Assessor's *Numeric Land Use Codes*; under 6, Use Assessment; 6-1 Farm use

4 CGS Sec. 12-107 d. Classification of land as forestland as amended by P.A. 04-115

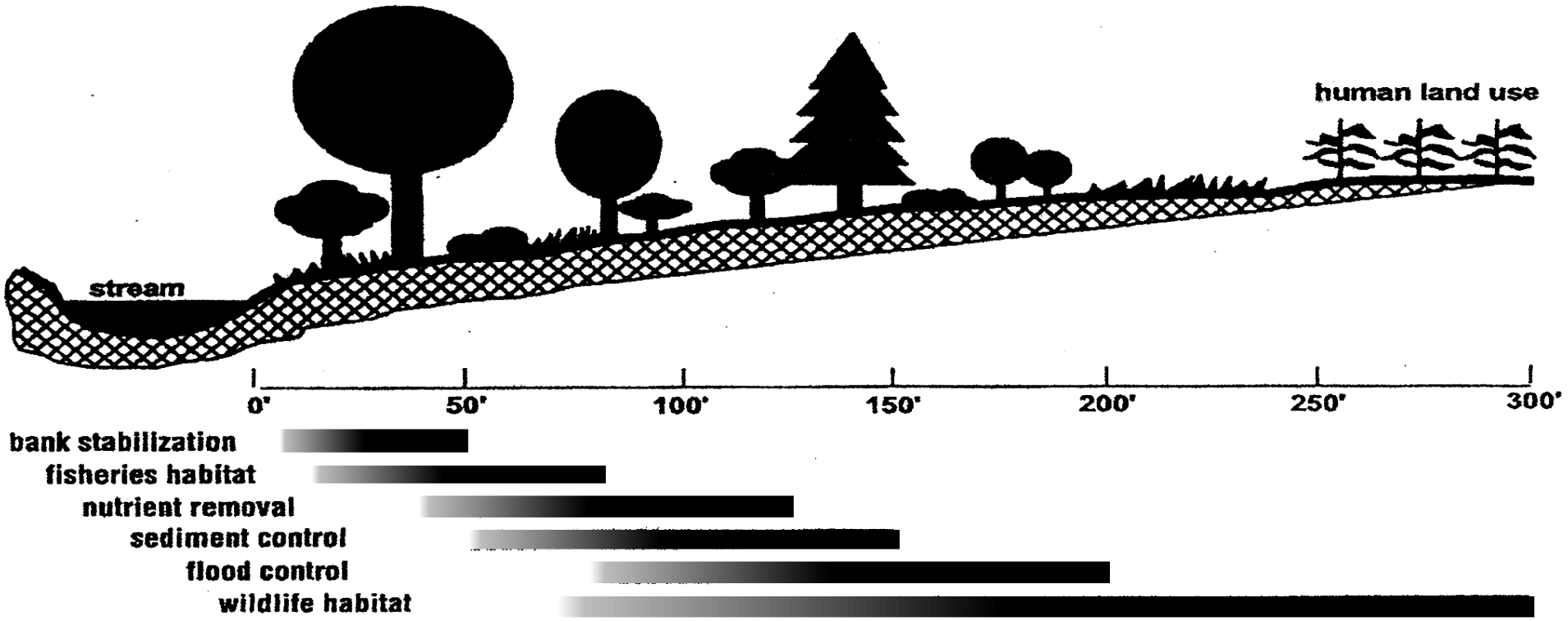
APPENDIX I-1

Recreational Facilities on Municipal Land

FACILITY PARK & REC. DEPT	ACRES	Softball	Baseball & Little League	Soccer	Lacrosse (Lax)	Field Hockey	Football	Tennis	Basketball	Play areas	Swimming	Other
Bittner Park	136	1	3 LL	1						1		Trails, rest rooms, skate park, ice rink.
Chaffinch Island	22											Picnic tables, grills, fishing, kayak access
Chittenden Park	14	1		1								4 bocci courts, access to Long Island Sound
Community Center	1.9											Activity & meeting rooms
Jacobs Beach	25									1	430'	Picnic shelter, volleyball, boat racks, bath hse beach
Lake Quonnipaug	41										314'	Picnic shelter, camping, fishing, bathhouse beach
Long Hill Park	10		1 BB	2	1	1	1					Picnic tables
Mill Pond	1											Skating, fishing
Nut Plains Park	23.4			1	1							Trails
Peddler's Park	30											Access to Westwoods
Police Department	9.8								2			
SCHOOLS												
Adams	18.2		1 BB+ 2 LL	1		1		2	1			Rest rooms
Baldwin	44		3 LL		1 practice			2				Practice areas: lax, soccer, field hockey, trails
Cox	21		1 LL	3					1	2		Covered basketball court
High School	34.5	2	1 BB	1	1	1	1	6				Track. Practice fields.
Guilford Lakes	12		1 LL	1				1		1		
Calvin Leete	19		1 LL	4	1				1	1		
Melissa Jones	10		1 LL							1		Playscape, basketball hoop
	158.7											
OTHER												
Shell Beach	0.5											Clamming
Timberlands	588.5											Trails, biking, skiing, horses
Braemore Preserve	95											Trails, skiing, horses
James Valley Preserve	70											Trails, skiing, horses
Guilford Golf Course	10											Scenic nine-hole golf course
Town Green	7.7											Monument, benches, events
Westwoods	100											Trails, hiking, biking, horses, x-country skiing
Grass Island	29.6											Fishing, bird watching,
Guilford Marina	2.4											Moorings, slips, fishing, water views

APPENDIX J-1

Benefits of Buffer by Width



Introduction to Riparian Buffers, River Banks & Buffers Technical Memorandum #1, Connecticut River Joint Commissions of NH & VT, September 2000