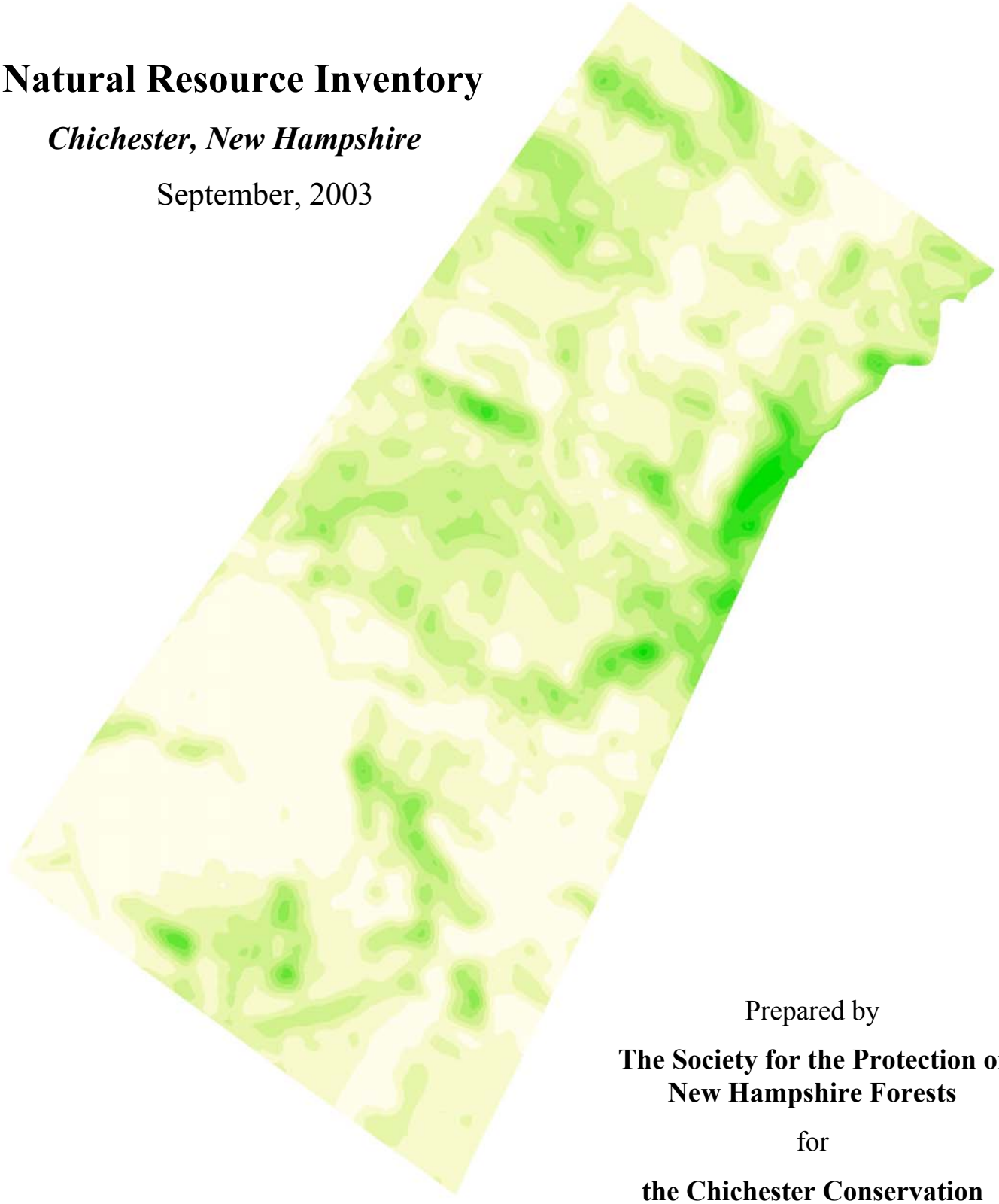
# Natural Resource Inventory

***Chichester, New Hampshire***

September, 2003



Prepared by

**The Society for the Protection of New Hampshire Forests**

for

**the Chichester Conservation Commission**

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## *EXECUTIVE SUMMARY*

This report details the findings of the 2003 natural resource inventory for the Chichester Conservation Commission (CCC), Chichester, New Hampshire. Geographic information systems analysis allowed Society for the Protection of New Hampshire Forests staff to map natural resources and develop recommendations for conservation options. Project goals were to:

- Map and describe significant natural resources;
- Identify areas of high ecological value;
- Examine the land-use / natural resource relationship; and
- Develop strategic options for natural resource protection.

These goals were achieved through the creation of seven maps, including:

1. Base Map
2. Historic and Cultural Features
3. Unfragmented Lands
4. Wildlife Habitat
5. Water Resources
6. Scenic Resources
7. Co-occurrence Model

Additionally, two transparent overlays including a Zoning Districts Map and a 2003 Tax Map were created. From the tax map, parcel-based co-occurrence analyses were derived.

Wildlife habitat management is assessed and several recommendations are made. The existing network of conservation lands and town-owned open space in the south part of the town, despite having only moderate upland habitat values, creates a base for new conservation projects. Also, three wildlife habitat conservation focus areas are proposed around Lynxfield Pond, the Suncook River, and Perry Brook. Each of these has unique wildlife qualities and should be considered for conservation priority. Linking Chichester wildlife habitat is possible in some of the large unfragmented blocks extending from Chichester into surrounding towns. Likewise, there is potential to link existing protected lands across town boundaries.

The land-use natural resource relationship is assessed primarily by comparing the current soils-based zoning districts with the natural resource values as assessed in this study. Generally, the conservation oriented districts (Open Space Wetlands, Open Space Steeplands, and Rural Agricultural) hold the higher value natural resource areas. Conversely, the more development intensive districts (Residential, Commercial / Industrial) hold a smaller percentage of high value natural resource areas. High value natural resource areas which fall in development intensive districts are identified and described in the report findings.

For the purposes of conservation planning, four focus areas are identified and mapped. More narrowly drawn priority areas mark exceptionally high-value areas where conservation efforts might begin or field work might be completed (e.g. habitat inventory). The Suncook Valley focus area holds valuable aquifer, floodplain, agricultural, and wetland factors. Drinking water protection potential exists here with neighboring Epsom, as does wildlife habitat protection.

The Perry Brook focus area is driven in part by wetland / wildlife values, and also by agricultural and scenic values. Wildlife habitat protection is recommended here, with the potential to collaborate with NH Fish and Game. Agricultural protection is another potential, with assistance from the NRCS or the American Farmland Trust.

The Lynxfield Pond focus area has similar values to the Perry Brook Area. In addition to much wildlife value, it has several scenic areas and the largest unfragmented block occurring completely within the town's boundaries. Wildlife habitat conservation is the recommended strategy here.

The Plausawa highlands focus area holds the majority of the town's open space properties. Achieving conservation status for unprotected parcels and expanding on this open space network is an obvious next step in the town's conservation process.

Recommendations for further study include a prime wetlands study, updating of soils data (for updated zoning particularly), forest resources study, and further conservation commission research into conservation methods in publications such as those by the Center for Land Conservation Assistance (CLCA), the Land and Community Heritage Investment Program (LCHIP), and the Trust for Public Land (TPL).

***Summary of Recommendations:***

- Conservation Planning: Carry out through a combination of prioritized focus areas and through the use of parcel-based co-occurrence ranks.
    1. Suncook Valley: highest priority area, resource area of regional significance, recommend working with regional land trusts, Town of Epsom, Central New Hampshire Regional Planning Commission
    2. Perry Brook: wildlife oriented conservation potential in and around Perry Marsh, recommend working with New Hampshire Fish and Game; agricultural conservation in and around Pleasant Street, recommend working with Natural Resources Conservation Service and American Farmland Trust
    3. Lynxfield Pond: recommend wildlife habitat oriented conservation, similar to Perry Marsh
    4. Plausawa Highlands: recommend pursuing protected status for town-owned open space lands; create linkages through upland habitat protection
- Secure conservation status for unprotected town-owned lots
- Further research / prioritization on historic preservation
- Protect scenic resources through the conservation of high value scenic areas as well as viewpoints areas. Further scenic road designations would aid here as well.
- Plan for protection of water resources, specifically the wellhead protection areas and potentially favorable gravel well areas
- Pursue wildlife habitat and water resources related conservation with the Town of Epsom; for landscape scale planning (inter-municipal projects) collaboration with the Central New Hampshire Regional Planning Commission will be critical.
- Consider more detailed field work in "priority areas" to gain information on high-value resource areas.
- Further study:
    - Prime wetlands study
    - Updated soils data (for zoning update and important soils mapping)
    - Forest resources study
    - Specific conservation tactics can be found in the publications of CLCA, TPL, and LCHIP

## *INTRODUCTION*

This report details the findings of the 2003 natural resource inventory for the Chichester Conservation Commission (CCC), Chichester, New Hampshire. The project was carried out by the Society for the Protection of New Hampshire Forests (SPNHF), GIS Services. The project's goals were to:

- Map and describe significant natural resources;
- Identify areas of high ecological value based on the location of significant natural features;
- Examine the land use / natural resource relationship; and
- Develop strategic options for natural resource protection.

These goals were achieved primarily through geographic information systems (GIS) analysis and mapping. In addition to techniques developed by SPNHF GIS services staff, the methods from two key natural resource publications were used in this study. These publications include: *Natural Resource Inventories: A Guide for New Hampshire Communities and Conservation Groups* (2001) and *Identifying and Protecting New Hampshire's Significant Wildlife Habitat: A Guide for Towns and Conservation Groups* (2001).

SPNHF staff collaborated with CCC members who provided relevant town reports, developed mapping and methodologies, and provided regular feedback through a series of draft map review sessions. The CCC also organized public presentations to inform town residents of the project and to solicit public input. The Central New Hampshire Regional Planning Commission provided a number of data-sets for the project.

### Context

Chichester is located in central New Hampshire in Merrimack County, and covers approximately 13,628 acres. It is traversed by the Route 4 / 9 / 202 and Route 28 travel corridors; and lies just east of the Interstate 93 corridor. Chichester has been a rural town through much of its history, with active agriculture and forestry being important aspects of the town's economy and character for a long time. The town is now a rural suburb of Concord, NH, and threatened by increasing sprawl pressure.

The town lies in the highlands to the east of the Merrimack River valley. Underlying bedrock is primarily granitic, with soils varying from steep, stony soils in the hills, to swampy bottomland, to deep loams in the river valleys. The town is framed on the south-west by the Soucook River, and in the north-east by the Suncook River. The Suncook River valley cradles deep, glacially deposited soils and a stratified drift aquifer; a potentially valuable source of ground water for the town. Wetlands connected by many stream corridors knit together an extensive complex of wildlife habitat.

These natural and human resources are described in more detail in the following sections. This report is divided into two major sections: the first section (from pages 6-23) focuses on interpretations of the analyses as presented on the various maps. The second section (pages 24-40) deals with the findings of the project and presents recommendations for the CCC.

## *GIS ANALYSES and MAPS*

### Base Map

The main purpose of the *Base Map* is to orient the viewer to the town, and to give an overall sense for the landscape. Aerial photography serves as an excellent introduction to an area for the unfamiliar viewer. The photo-mosaic shown on this map is a high resolution orthographic photograph (1 meter pixels), which has been adjusted to have the geometric qualities of a map.

The photo tells the viewer a bit about the land cover of the town. It should be immediately obvious that the majority of the town is forested and relatively undeveloped. Chichester has roughly 10,270 acres[1] of forested land, or about 75% of the town's area; comparable to Merrimack County as a whole, at about 76%. Agricultural fields, another clearly visible feature of the photo-mosaic, cover about 1,320 acres, or about 10% of the town's area. Developed lands (structures and roads) are a smaller factor still, at about 970 acres, or 7% of the town's area. See *Table 1: Land Cover Types for Chichester and Merrimack County, NH* for individual class acreages.

This map also displays Chichester's open space lands. These include protected conservation lands as well as unprotected town-owned parcels (see *Table 2: Chichester Open Space* for a detailed listing of these parcels). These unprotected parcels could be subject to development by the town. *Securing protected status for these unprotected town-owned parcels should be a high priority.*

Chichester has a relatively small percentage of conserved lands at approximately 350 acres or about 2.6% of the town's area. This is a relatively small percentage when compared to it's relatively urban neighbor Concord, at 10.5%, or to the statewide average of about 23%, or 25% in Merrimack County[2].

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[1] Acreage figures are derived from the 2001 New Hampshire Landcover Data – see **Appendix 1.** for a detailed description of the data.

[2] Statewide and county wide conservation acreage developed from GRANIT conservation lands data-layer, and includes level 1 protection status only.

# Town of Chichester

*New Hampshire*

***Map Disclaimer***

This map is one of a series of maps that was produced as part of a town-wide natural resource inventory for the Town of Chichester. It is intended to be used for planning purposes only. Any representations of property lines on this map are one interpretation of available data and should not be construed as binding or conclusive evidence of ownership.

## KEY

***Political Boundaries***
- Neighboring Town Lines
- Chichester Town Line

***Conservation & Public Lands ****
- Conservation lands: town-owned
- Conservation easements - private
- Conservation lands - other towns
- Town buildings / facilities
- Town open space
- Town forest

***Roads***
- I 393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails
- Utility Lines

***Streams***
- Perennial
- Seasonal

***Topography***
- Contours (20' interval)

***Other Features***
- Village, settlement
- Summit
- Fairgrounds
- Campground
- Cemetery
- Gravel pit - active / inactive
- Natural feature
- School

** Conservation & Public Lands: Only the conservation lands displayed in shades of green z-hatch have permanent protection from development.*

## DATA SOURCES

***NH GRANIT Data***

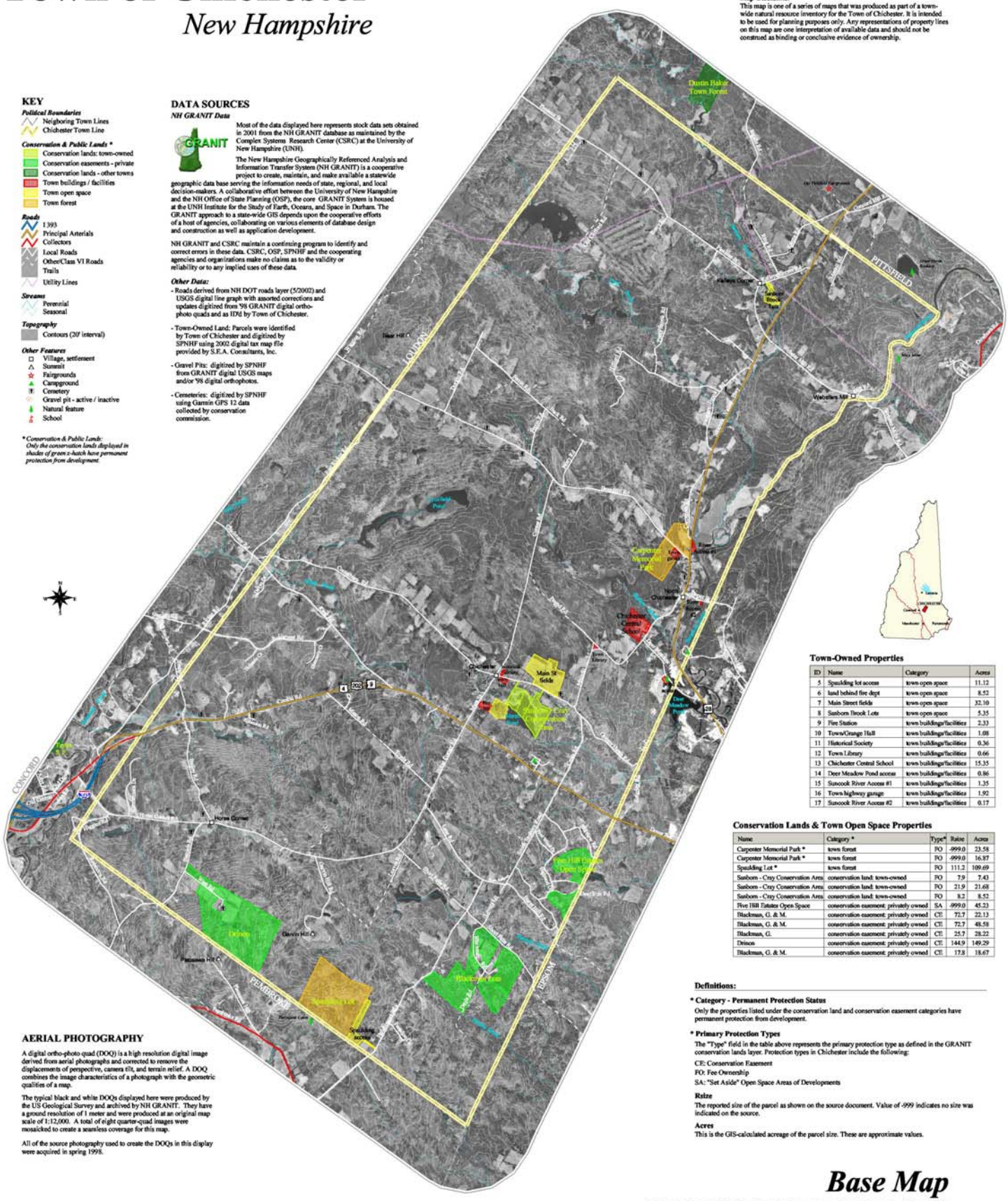
Most of the data displayed here represents stock data sets obtained in 2001 from the NH GRANIT database as maintained by the Complex Systems Research Center (CSRC) at the University of New Hampshire (UNH).

The New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) is a cooperative project to create, maintain, and make available a statewide geographic data base serving the information needs of state, regional, and local decision-makers. A collaborative effort between the University of New Hampshire and the NH Office of State Planning (OSP), the core GRANIT System is housed at the UNH Institute for the Study of Earth, Oceans, and Space in Durham. The GRANIT approach to a state-wide GIS depends upon the cooperative efforts of a host of agencies, collaborating on various elements of database design and construction as well as application development.

NH GRANIT and CSRC maintain a continuing program to identify and correct errors in these data. CSRC, OSP, SPNHF and the cooperating agencies and organizations make no claims as to the validity or reliability or to any implied uses of these data.

***Other Data:***

- Roads derived from NH DOT roads layer (5/2002) and USGS digital line graph with assorted corrections and updates digitized from '98 GRANIT digital ortho-photo quads and as ID'd by Town of Chichester.
- Town-Owned Land: Parcels were identified by Town of Chichester and digitized by SPNHF using 2002 digital tax map file provided by S.E.A. Consultants, Inc.
- Gravel Pits: digitized by SPNHF from GRANIT digital USGS maps and/or '98 digital orthophotos.
- Cemeteries: digitized by SPNHF using Garmin GPS 12 data collected by conservation commission.




### Town-Owned Properties

| ID | Name | Category | Acres |
|---|---|---|---|
| 5 | Spaulding lot access | town open space | 11.12 |
| 6 | land behind fire dept | town open space | 8.52 |
| 7 | Main Street fields | town open space | 32.10 |
| 8 | Sanborn Brook Lots | town open space | 5.35 |
| 9 | Fire Station | town buildings/facilities | 2.33 |
| 10 | Town/Grange Hall | town buildings/facilities | 1.08 |
| 11 | Historical Society | town buildings/facilities | 0.36 |
| 12 | Town Library | town buildings/facilities | 0.66 |
| 13 | Chichester Central School | town buildings/facilities | 15.35 |
| 14 | Deer Meadow Pond access | town buildings/facilities | 0.86 |
| 15 | Suncook River Access #1 | town buildings/facilities | 1.35 |
| 16 | Town highway garage | town buildings/facilities | 1.92 |
| 17 | Suncook River Access #2 | town buildings/facilities | 0.17 |

### Conservation Lands & Town Open Space Properties

| Name | Category * | Type* | Raize | Acres |
|---|---|---|---|---|
| Carpenter Memorial Park * | town forest | FO | -999.0 | 23.58 |
| Carpenter Memorial Park * | town forest | FO | -999.0 | 16.87 |
| Spaulding Lot * | town forest | FO | 111.2 | 109.69 |
| Sanborn - Cray Conservation Area | conservation land: town-owned | FO | 7.9 | 7.43 |
| Sanborn - Cray Conservation Area | conservation land: town-owned | FO | 21.9 | 21.68 |
| Sanborn - Cray Conservation Area | conservation land: town-owned | FO | 8.2 | 8.52 |
| Five Hill Estates Open Space | conservation easement: privately owned | SA | -999.0 | 45.23 |
| Blackman, G. & M. | conservation easement: privately owned | CE | 72.7 | 22.13 |
| Blackman, G. & M. | conservation easement: privately owned | CE | 72.7 | 48.58 |
| Blackman, G. | conservation easement: privately owned | CE | 25.7 | 28.22 |
| Drinon | conservation easement: privately owned | CE | 144.9 | 149.29 |
| Blackman, G. & M. | conservation easement: privately owned | CE | 17.8 | 18.67 |

**Definitions:**

*** Category - Permanent Protection Status**

Only the properties listed under the conservation land and conservation easement categories have permanent protection from development.

*** Primary Protection Types**

The "Type" field in the table above represents the primary protection type as defined in the GRANIT conservation lands layer. Protection types in Chichester include the following:

CE: Conservation Easement

FO: Fee Ownership

SA: "Set Aside" Open Space Areas of Developments

**Raize**

The reported size of the parcel as shown on the source document. Value of -999 indicates no size was indicated on the source.

**Acres**

This is the GIS-calculated acreage of the parcel size. These are approximate values.

## AERIAL PHOTOGRAPHY

A digital ortho-photo quad (DOQ) is a high resolution digital image derived from aerial photographs and corrected to remove the displacements of perspective, camera tilt, and terrain relief. A DOQ combines the image characteristics of a photograph with the geometric qualities of a map.

The typical black and white DOQs displayed here were produced by the US Geological Survey and archived by NH GRANIT. They have a ground resolution of 1 meter and were produced at an original map scale of 1:12,000. A total of eight quarter-quad images were mosaicked to create a seamless coverage for this map.

All of the source photography used to create the DOQs in this display were acquired in spring 1998.

Scale - 1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

# *Base Map*

Prepared by the Society for the Protection of NH Forests - July 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

*GIS Services*
*54 Portsmouth Street, Concord, NH 03301*

*(603) 224 - 9945 www.spnhf.org*

**Table 1: Land Cover Types for Chichester and Merrimack County, NH[3]**

| Class | Chichester (acres) | Chichester % | Merrimack Cty (acres) | Merrimack Cty. (%) |
|---|---|---|---|---|
| Residential, commercial, or industrial | 228.4 | 1.7 | 11,927.5 | 2.0 |
| Transportation | 739.4 | 5.4 | 33,772.1 | 5.5 |
| **"Developed" subtotal** | **967.8** | **7.1** | **45,699.6** | **7.5** |
| Row crops | 32.3 | 0.2 | 3,226.0 | 0.5 |
| Hay/rotation/permanent pasture | 1,288.1 | 9.5 | 32,672.1 | 5.3 |
| Fruit orchards | 0.0 | 0.0 | 762.2 | 0.1 |
| **"Agricultural" subtotal** | **1,320.4** | **9.7** | **36,660.3** | **6.0** |
| Beech/oak | 3,551.7 | 26.1 | 132,955.0 | 21.8 |
| Paper birch/aspen | 79.5 | 0.6 | 4,907.1 | 0.8 |
| Other hardwoods | 773.9 | 5.7 | 37,503.8 | 6.1 |
| White/red pine | 2,119.4 | 15.6 | 73,509.8 | 12.0 |
| Spruce/fir | 260.1 | 1.9 | 16,763.1 | 2.7 |
| Hemlock | 297.2 | 2.2 | 30,709.6 | 5.0 |
| Pitch pine | 0.0 | 0.0 | 30.9 | 0.0 |
| Mixed forest | 3,166.2 | 23.3 | 162,982.3 | 26.7 |
| Forested wetlands | 20.7 | 0.2 | 3,973.4 | 0.7 |
| **"Forested" subtotal** | **10,268.7** | **75.5** | **463,334.9** | **75.8** |
| Open water | 206.1 | 1.5 | 19,606.3 | 3.2 |
| Non-forested wetlands | 253.9 | 1.9 | 15,047.8 | 2.5 |
| **"Wetlands" subtotal** | **460.0** | **3.4** | **34,654.1** | **5.7** |
| Disturbed | 20.9 | 0.2 | 2,349.2 | 0.4 |
| Bedrock/vegetated | 0.0 | 0.0 | 33.5 | 0.0 |
| Cleared/other open | 592.1 | 4.4 | 28,424.5 | 4.7 |
| **"Other" subtotal** | **612.9** | **4.5** | **30,807.1** | **5.0** |
| **Total** | **13,608.9** | **100.0** | **611,156.1** | **100.0** |

[3] Acreage figures developed from GRANIT 2001 Landcover data (not mapped as a part of this project).

**Table 2: Chichester Open Space**

**2a. Protected Open Space**

| Property Name | Protection Status | Class | Acres |
|---|---|---|---|
| Blackman, G. | Conservation Easement | conservation (easements/covenants, privately owned) | 28.2 |
| Blackman, G. & M. | Conservation Easement | conservation (easements/covenants, privately owned) | 22.1 |
| Blackman, G. & M. | Conservation Easement | conservation (easements/covenants, privately owned) | 48.6 |
| Blackman, G. & M. | Conservation Easement | conservation (easements/covenants, privately owned) | 18.7 |
| Drinon | Conservation Easement | conservation (easements/covenants, privately owned) | 149.3 |
| Five Hill Estates Open Space | "Set Aside" land | conservation (easements/covenants, privately owned) | 45.2 |
| Cray | Fee Owned | conservation (town-owned) | 7.4 |
| Sanborn | Fee Owned | conservation (town-owned) | 8.5 |
| Sanborn | Fee Owned | conservation (town-owned) | 21.7 |
| | | **Total** | **349.7** |

**2b. Unprotected Open Space and Town-owned Lands**

| Property Name | Protection Status | Class | Acres |
|---|---|---|---|
| Carpenter Memorial Park | Unprotected | town forest | 23.6 |
| Carpenter Memorial Park | Unprotected | town forest | 16.9 |
| land behind fire dept | Unprotected | town open space | 8.5 |
| Main Street fields | Unprotected | town open space | 32.1 |
| Sanborn Brook Lots | Unprotected | town open space | 5.3 |
| Spaulding lot | Unprotected | town open space | 109.7 |
| Spaulding lot access | Unprotected | town open space | 11.1 |
| | | **Open Space Subtotal** | **207.2** |
| Chichester Central School | Unprotected | town buildings/facilities | 15.4 |
| Deer Meadow Pond access | Unprotected | town buildings/facilities | 0.9 |
| Fire Station | Unprotected | town buildings/facilities | 2.3 |
| Historical Society | Unprotected | town buildings/facilities | 0.4 |
| Suncook River Access #1 | Unprotected | town buildings/facilities | 1.4 |
| Suncook River Access #2 | Unprotected | town buildings/facilities | 0.2 |
| Town/Grange Hall | Unprotected | town buildings/facilities | 1.1 |
| Town highway garage | Unprotected | town buildings/facilities | 1.9 |
| Town Library | Unprotected | town buildings/facilities | 0.7 |
| | | **Total** | **231.5** |

## Historic and Cultural Features

The *Historic and Cultural Features* map, through the display of unique man-made features, gives an indication of Chichester's cultural history. The point features were selected with help from the Chichester Historical Society and acquired by CCC members using a hand-held GPS unit. *Table 3: Historic and Cultural Features* shows detailed information on each feature.

Throughout its history, Chichester has been a rural town; its economy relying primarily on farming and forestry. Agricultural lands are included as a part of this map. These fields were delineated on aerial photographs by members of the CCC and are

# Town of Chichester

*New Hampshire*

Municipal Boundaries
Utility Lines
Contour Lines (20 ft)

Streams
- Perennial
- Seasonal

Surface Waters
Wetlands (NWI)

NH DOT Roads
- I393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails

Historic Features
- bridge
- building
- cannon
- cemetery
- church
- hall
- mill site
- school
- site
- store

Conservation and Public Lands
- conservation (F.O. town-owned)
- conservation (easements/covenants privately owned)
- conservation lands - neighboring towns
- town forest

Town Owned Lands
- town buildings/facilities
- town open space

Agricultural Lands
- Crop fields
- Pasture

Regional Environmental / Cultural Features
- fairgrounds
- campground
- gravel pit - active
- gravel pit - inactive
- natural feature
- school
- village, settlement
- summit

Data provided by NH GRANIT. Information on additional data is as follows:

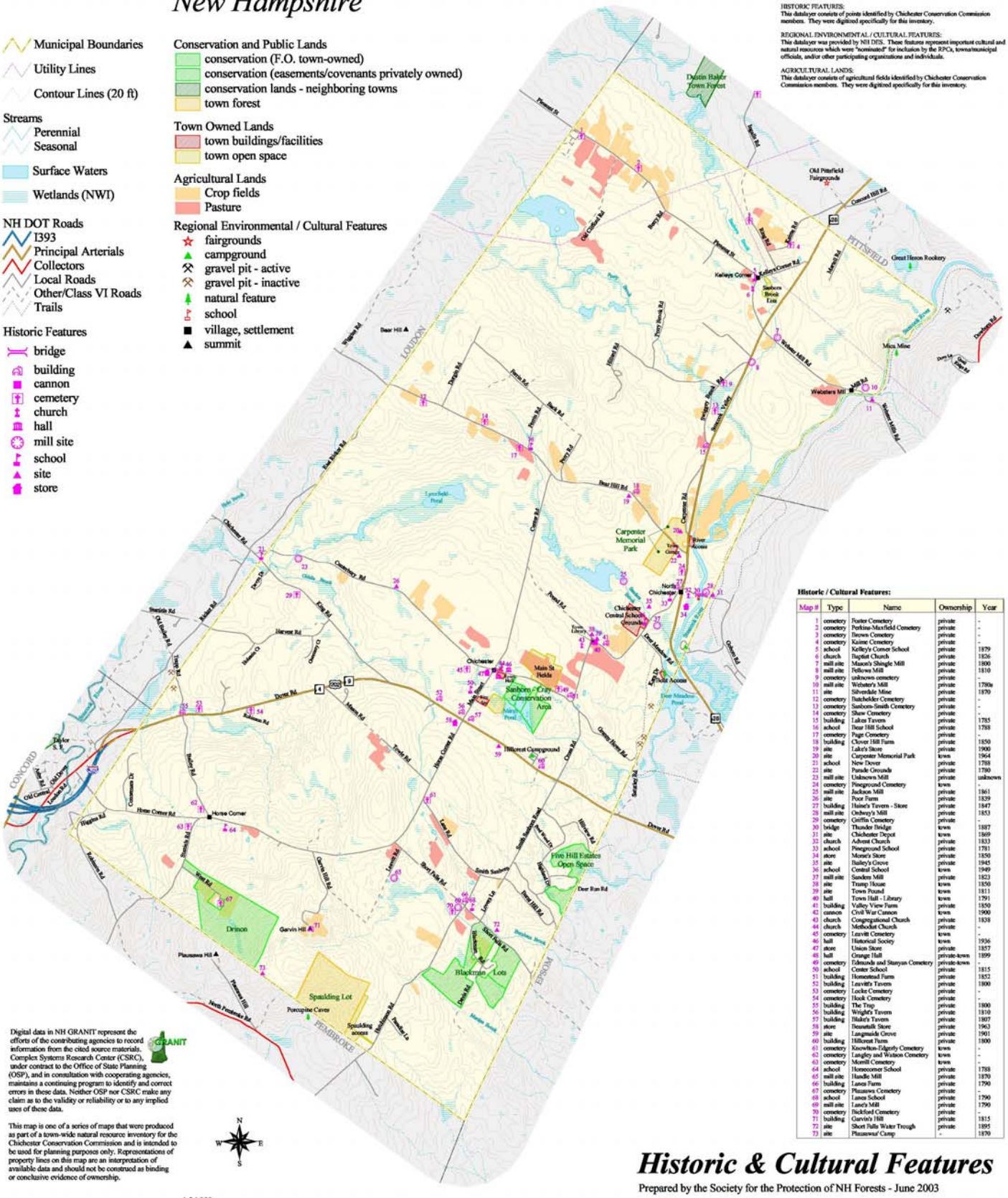
ROADS:
This datalayer was derived from NH DOT roads layer (May, 2002), the USGS Roads datalayer, with additions and corrections from the Chichester Conservation Commission.

TOWN-OWNED LAND:
Parcels were identified by Town of Chichester and digitized using 2002. digital tax map file provided by S.E.A. Consultants, Inc.

HISTORIC FEATURES:
This datalayer consists of points identified by Chichester Conservation Commission members. They were digitized specifically for this inventory.

REGIONAL ENVIRONMENTAL / CULTURAL FEATURES:
This datalayer was provided by NH DES. These features represent important cultural and natural resources which were "nominated" for inclusion by the RPCs, towns/municipal officials, and/or other participating organizations and individuals.

AGRICULTURAL LANDS:
This datalayer consists of agricultural fields identified by Chichester Conservation Commission members. They were digitized specifically for this inventory.




Historic / Cultural Features:

| Map # | Type | Name | Ownership | Year |
|---|---|---|---|---|
| 1 | cemetery | Foster Cemetery | private | - |
| 2 | cemetery | Perkins-Maxfield Cemetery | private | - |
| 3 | cemetery | Brown Cemetery | private | - |
| 4 | cemetery | Kaime Cemetery | private | - |
| 5 | school | Kelley's Corner School | private | 1879 |
| 6 | church | Baptist Church | private | 1826 |
| 7 | mill site | Mason's Shingle Mill | private | 1800 |
| 8 | mill site | Fellows Mill | private | 1810 |
| 9 | cemetery | unknown cemetery | private | - |
| 10 | mill site | Webster's Mill | private | 1790s |
| 11 | site | Silverdale Mine | private | 1870 |
| 12 | cemetery | Batchelder Cemetery | private | - |
| 13 | cemetery | Sanborn-Smith Cemetery | private | - |
| 14 | cemetery | Shaw Cemetery | private | - |
| 15 | building | Lakes Tavern | private | 1785 |
| 16 | school | Bear Hill School | private | 1788 |
| 17 | cemetery | Page Cemetery | private | - |
| 18 | building | Clover Hill Farm | private | 1850 |
| 19 | site | Lake's Store | private | 1900 |
| 20 | site | Carpenter Memorial Park | town | 1964 |
| 21 | school | New Dover | private | 1788 |
| 22 | site | Parade Grounds | private | 1780 |
| 23 | mill site | Unknown Mill | private | unknown |
| 24 | cemetery | Pineground Cemetery | town | - |
| 25 | mill site | Jackson Mill | private | 1861 |
| 26 | site | Poor Farm | private | 1839 |
| 27 | building | Haine's Tavern - Store | private | 1847 |
| 28 | mill site | Ordway's Mill | private | 1853 |
| 29 | cemetery | Griffin Cemetery | private | - |
| 30 | bridge | Thunder Bridge | town | 1887 |
| 31 | site | Chichester Depot | town | 1869 |
| 32 | church | Advent Church | private | 1833 |
| 33 | school | Pineground School | private | 1781 |
| 34 | store | Morse's Store | private | 1850 |
| 35 | site | Bailey's Grove | private | 1945 |
| 36 | school | Central School | town | 1949 |
| 37 | mill site | Sanders Mill | private | 1823 |
| 38 | site | Tramp House | town | 1850 |
| 39 | site | Town Pound | town | 1811 |
| 40 | hall | Town Hall - Library | town | 1791 |
| 41 | building | Valley View Farm | private | 1850 |
| 42 | cannon | Civil War Cannon | town | 1900 |
| 43 | church | Congregational Church | private | 1838 |
| 44 | church | Methodist Church | private | - |
| 45 | cemetery | Leavitt Cemetery | town | - |
| 46 | hall | Historical Society | town | 1936 |
| 47 | store | Union Store | private | 1857 |
| 48 | hall | Grange Hall | private-town | 1899 |
| 49 | cemetery | Edmunds and Stanyan Cemetery | private-town | - |
| 50 | school | Center School | private | 1815 |
| 51 | building | Homestead Farm | private | 1852 |
| 52 | building | Leavitt's Tavern | private | 1800 |
| 53 | cemetery | Locke Cemetery | private | - |
| 54 | cemetery | Hook Cemetery | private | - |
| 55 | building | The Trap | private | 1800 |
| 56 | building | Wright's Tavern | private | 1810 |
| 57 | building | Blake's Tavern | private | 1807 |
| 58 | store | Beanstalk Store | private | 1963 |
| 59 | site | Langmaide Grove | private | 1901 |
| 60 | building | Hillcrest Farm | private | 1800 |
| 61 | cemetery | Knowlton-Edgerly Cemetery | town | - |
| 62 | cemetery | Langley and Watson Cemetery | town | - |
| 63 | cemetery | Morrill Cemetery | town | - |
| 64 | school | Horsecorner School | private | 1788 |
| 65 | mill site | Handle Mill | private | 1870 |
| 66 | building | Lanoa Farm | private | 1790 |
| 67 | cemetery | Plausawa Cemetery | private | - |
| 68 | school | Lanoa School | private | 1790 |
| 69 | mill site | Lanoa Mill | private | 1790 |
| 70 | cemetery | Bickford Cemetery | private | - |
| 71 | building | Garvin's Hill | private | 1815 |
| 72 | site | Short Falls Water Trough | private | 1895 |
| 73 | site | Plausawa/ Camp | - | 1870 |

Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of State Planning (OSP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. Neither OSP nor CSRC make any claim as to the validity or reliability or to any implied uses of these data.

This map is one of a series of maps that were produced as part of a town-wide natural resource inventory for the Chichester Conservation Commission and is intended to be used for planning purposes only. Representations of property lines on this map are an interpretation of available data and should not be construed as binding or conclusive evidence of ownership.

N W E S

1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

# *Historic & Cultural Features*

Prepared by the Society for the Protection of NH Forests - June 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

*GIS Services*
*54 Portsmouth Street, Concord, NH 03301*
*(603) 224 - 9945 www.spnhf.org*

displayed here as crop fields (hay, corn, berries, etc.) or pasture. Also, several historic farm houses are included as part of the historic point features.

The growth of industry and rail transport along with the decline of agricultural practices in the northeast during the mid-nineteenth century brought numerous small industries to Chichester. There were many saw mills and grist mills, and a shingle mill on the various streams in town. These exist only as historic sites now. The shoemaking business was important in town as well, shipping their product to Concord and on to Boston.

Around the turn of the century, as New Hampshire began to become a popular tourist destination, hotels and boarding houses sprang up in town. Several of these still exist and are included on the map.

Chichester's character changed significantly during the twentieth century. Agricultural practice declined further as did the cottage industries which sprang up with the advent of rail travel. As automobile travel has increased in the last 50 years, Concord has crept ever closer, making Chichester an attractive rural suburb. Homes are distributed along the town's quiet roads, while businesses are primarily concentrated along the commuting corridors of route 4 / 9 / 202 and 28.

The agricultural lands, old school houses, and wooded cemeteries all combine to describe a unique and rich history. Many of these sites are privately owned and protected solely by the interest of caring land-owners. *Preservation of these historic resources in the context of this natural resource inventory will be an important aspect of maintaining the town's rural character and collective memory of Chichester's past.*

Specific recommendations on historic preservation are outside the scope of this study, however, there are many agencies and organizations which can provide information and assistance here. The New Hampshire Division of Historical Resources facilitates the conservation of historic, cultural, and archaeological resources, and is a good resource for information on preservation[4]. The New Hampshire Preservation Alliance[5] and the National Trust for Historic Preservation[6] are non-profit organizations which provide grants and direct assistance with preservation projects.

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[4] http://www.state.nh.us/nhdhr/
[5] http://www.nhpreservation.org/
[6] http://www.nationaltrust.org/

**Table 3: Historic and Cultural Features**

| Map # | Type | Ownership | Name | Year | Notes |
|---|---|---|---|---|---|
| 1 | cemetery | private | Foster Cemetery | - | |
| 2 | cemetery | private | Perkins-Maxfield Cemetery | - | |
| 3 | cemetery | private | Brown Cemetery | - | |
| 4 | cemetery | private | Kaime Cemetery | - | |
| 5 | school | private | Kelley's Corner School | 1879 | built at a cost of $655 |
| 6 | church | private | Baptist Church | 1826 | sold in 1964 to be used as a storage building |
| 7 | mill site | private | Mason's Shingle Mill | 1800 | shingle mill on Gilmanton Brook, Webster Mills Road |
| 8 | mill site | private | Fellows Mill | 1810 | saw mill on Gilmanton Road opposite Hilliard Road |
| 9 | cemetery | private | unknown cemetery | - | |
| 10 | mill site | private | Webster's Mill | 1780s | early mills: saw milll, grist mill, shingles, wagons, foundry, log dam |
| 11 | site | private | Silverdale Mine | 1870 | site of old silver mine - little silver found - some mica found in 1940s |
| 12 | cemetery | private | Batchelder Cemetery | - | |
| 13 | cemetery | private | Sanborn-Smith Cemetery | - | |
| 14 | cemetery | private | Shaw Cemetery | - | |
| 15 | building | private | Lakes Tavern | 1785 | one of oldest homes in Chichester, early tavern-stage stop |
| 16 | school | private | Bear Hill School | 1788 | believed to be only remaining school as originally built |
| 17 | cemetery | private | Page Cemetery | - | |
| 18 | building | private | Clover Hill Farm | 1850 | farm and tourist home |
| 19 | site | private | Lake's Store | 1900 | Lake and Kelley split partnership, Lake built store on Bear Hill Road |
| 20 | site | town | Carpenter Memorial Park | 1964 | recreation and athletic fields, Old Home Day, bean pit |
| 21 | school | private | New Dover | 1788 | in Loudon, school was in union with Loudon School District |
| 22 | site | private | Parade Grounds | 1780 | militia training parade grounds, known as Chichester Parade |
| 23 | mill site | private | Unknown Mill | unknown | dam site and sluiceway on Munsey Brook, type of mill unknown |
| 24 | cemetery | town | Pineground Cemetery | - | |
| 25 | mill site | private | Jackson Mill | 1861 | circular saw mill on same brook upstream from Sanders Mill |
| 26 | site | private | Poor Farm | 1839 | Poor Farm 1839 - 1850 sold to private owner |
| 27 | building | private | Haine's Tavern - Store | 1847 | built as a trading post then became tavern, now a country store, post office |
| 28 | mill site | private | Ordway's Mill | 1853 | saw mill, clapboards, grist mill, sawed boards for Advent Chapel |

**Table 3, continued**

| Map # | Type | Ownership | Name | Year | Notes |
|---|---|---|---|---|---|
| 29 | cemetery | private | Griffin Cemetery | - | |
| 30 | bridge | town | Thunder Bridge | 1887 | iron bridge over Suncook River built by Berline Iron Bridge Company |
| 31 | site | town | Chichester Depot | 1869 | In Epsom, Chichester Railroad Depot on old site of Suncook Valley Railroad |
| 32 | church | private | Advent Church | 1833 | Sold to Geo Flaines in 1884 to become part of carriage business |
| 33 | school | private | Pineground School | 1781 | first town meeting held in the school on Gilmanton Road, 1781 |
| 34 | store | private | Morse's Store | 1850 | early store closed about 1850, moved 1954 for new road, now private home |
| 35 | site | private | Bailey's Grove | 1945 | second site for Old Home Day, bean hole pit |
| 36 | school | town | Central School | 1949 | new 4 room school replaced all former |
| 37 | mill site | private | Sanders Mill | 1823 | operated a shingle mill, cooperage tannery, bark mill, stone house |
| 38 | site | town | Tramp House | 1850 | small camp (10x14') for housing tramps |
| 39 | site | town | Town Pound | 1811 | Town Pound located behind Town Hall |
| 40 | hall | town | Town Hall - Library | 1791 | first meeting house, Town Hall 1845-1972; library 1860 to present |
| 41 | building | private | Valley View Farm | 1850 | dairy farm tourist home with view of Suncook Valley |
| 42 | cannon | town | Civil War Cannon | 1900 | two surplus cannons bought for town display |
| 43 | church | private | Congregational Church | 1838 | replaced first meeting house which became town hall |
| 44 | church | private | Methodist Church | - | original building now First United Methodist Church |
| 45 | cemetery | town | Leavitt Cemetery | - | |
| 46 | hall | town | Historical Society | 1936 | first fire house rebuilt 1954, historical society 1996 to present |
| 47 | store | private | Union Store | 1857 | country store and post office closed 1957, now private home |
| 48 | hall | private-town | Grange Hall | 1899 | Grange Hall 1899 to 1972, then became Town Hall |
| 49 | cemetery | private-town | Edmunds and Stanyan Cemetery | - | |
| 50 | school | private | Center School | 1815 | first school built on Canterbury Road, 1788, second school on Main Street, 1815 |
| 51 | building | private | Homestead Farm | 1852 | farm, tourist home including cider mill |
| 52 | building | private | Leavitt's Tavern | 1800 | tavern and toll house, first New Hampshire turnpike, visited by President Monroe 1817, burned 1933 |
| 53 | cemetery | private | Locke Cemetery | - | |
| 54 | cemetery | private | Hook Cemetery | - | |
| 55 | building | private | The Trap | 1800 | Early tavern named The Trap as it's reputation for robbing patrons |
| 56 | building | private | Wright's Tavern | 1810 | tavern on first New Hampshire turnpike |
| 57 | building | private | Blake's Tavern | 1807 | built in 1807, burned and rebuilt 1868, was central office for telephone company |

**Table 3, continued**

| Map # | Type | Ownership | Name | Year | Notes |
|---|---|---|---|---|---|
| 58 | store | private | Beanstalk Store | 1963 | new store built on corner of Horse Corner Road and Dover Road, torn down 1996 |
| 59 | site | private | Langmaids Grove | 1901 | site of first Old Home Day, beanhole pit, bowling alley |
| 60 | building | private | Hillcrest Farm | 1800 | dairy farm, later tourist home and present campground |
| 61 | cemetery | town | Knowlton-Edgerly Cemetery | - | |
| 62 | cemetery | town | Langley and Watson Cemetery | - | |
| 63 | cemetery | town | Morrill Cemetery | - | |
| 64 | school | private | Horse Corner School | 1788 | original school burned, rebuilt 1840 |
| 65 | mill site | private | Handle Mill | 1870 | small undershot wheel mill for making wooden handles |
| 66 | building | private | Lanes Farm | 1790 | large dairy farm and mill, later a popular tourist home, telephone office |
| 67 | cemetery | private | Plausawa Cemetery | - | |
| 68 | school | private | Lanes School | 1790 | original school moved to corner of Lane Road and Short Falls Road |
| 69 | mill site | private | Lane's Mill | 1790 | pond dammed for saw mill and cider mill, later converted to creamery |
| 70 | cemetery | private | Bickford Cemetery | - | |
| 71 | building | private | Garvin's Hill | 1815 | Only brick home in town, 165 acre farm became hotel about 1880 |
| 72 | site | private | Short Falls Water Trough | 1895 | site of Old Short Falls Road watering trough, hand made from log |
| 73 | site | - | Plausawas' Camp | 1870 | site of old indian Plauswas' camp |

## Unfragmented Lands

The *Unfragmented Lands* map displays the degree of "natural resource fragmentation" in the town. Undeveloped land becomes fragmented over time as new roads and intensive human land use convert the natural landscape. This data-layer was created in several steps. First, traveled roadways were identified (those roads which are paved or in regular use: Discontinued and class 6 roads were not included as their effects on wildlife habitat are assumed to be negligible). Next, a 500-foot buffer was applied to the identified roads to account for frontage development and traffic impacts (noise, pollution, etc.). These buffers were then erased from the surrounding land mass. Any remaining areas of developed land cover (missed by the GIS analysis) were identified through aerial photo interpretation and then removed from the unfragmented blocks.

The result is unbroken "blocks" of land, largely in natural land cover including forests, agricultural lands, wetlands, or open water. These blocks provide important habitat to a variety of species ranging from large mammals like bear, moose, and bobcat to forest interior birds such as certain thrushes and warblers.

Large undisturbed expanses of land also play a role in maintaining the hydrologic cycle by maintaining water quality (through natural filtering processes) and water quantity (by recharging underlying aquifers). These are important considerations for maintaining existing municipal water supplies or locating future ones.

The unfragmented blocks also serve as a visual aid to interpreting the degree and extent of development in the town. Where large blocks of unfragmented land are found, development is obviously not as widespread, and thus, human disturbances in the natural landscape are minimized.

Seven large blocks larger than 1000 acres fall within the town's boundaries. The Perry Brook block is the largest at 4,108 acres, extending into the town from Loudon. The Suncook River and Marden Brook blocks to the east are also large, extending into the town from Epsom. These blocks have significant conservation potential as no protected conservation lands fall on them (see *Table 4: Unfragmented Lands*). These large blocks could serve as points through which neighboring towns could collaborate on conservation projects. The Lynxfield Pond block is the largest block existing entirely within the town; its location, wetland complexes and unprotected status warrant its consideration as a conservation project area as well.

**Table 4: Unfragmented Lands**

| Name | Acres | Protected Acres | % Protected | Acres in Chichester | Protected acres in Chichester | % Protected in Chichester |
|---|---|---|---|---|---|---|
| Perry Brook | 4,107.5 | 0.0 | 0.0 | 1,775.8 | 0.0 | 0.0 |
| Marden Brook | 2,241.9 | 73.6 | 3.3 | 488.1 | 73.6 | 15.1 |
| Suncook River | 2,194.0 | 0.0 | 0.0 | 413.1 | 0.0 | 0.0 |
| Sanborn Brook | 1,834.4 | 36.5 | 2.0 | 437.0 | 0.0 | 0.0 |
| Garvin Hill | 1,322.0 | 115.2 | 8.7 | 968.7 | 115.2 | 11.9 |
| Lynxfield Pond | 1,157.0 | 0.0 | 0.0 | 1,157.0 | 0.0 | 0.0 |
| Webster Mills | 1,052.6 | 0.0 | 0.0 | 364.5 | 0.0 | 0.0 |
| Horse Corner | 687.5 | 0.0 | 0.0 | 687.5 | 0.0 | 5.1 |
| Sanders Brook | 567.9 | 0.0 | 0.0 | 567.9 | 0.0 | 0.0 |
| Deer Meadow Pond | 420.0 | 0.0 | 0.0 | 136.8 | 0.0 | 0.0 |
| Smith Sanborn | 241.3 | 0.0 | 0.0 | 241.3 | 0.0 | 0.0 |
| Giddis Brook East | 232.7 | 0.0 | 0.0 | 232.7 | 0.0 | 0.0 |
| Harvest Road | 144.5 | 0.0 | 0.0 | 143.8 | 0.0 | 0.0 |
| Staniels Road | 136.6 | 0.0 | 0.0 | 131.4 | 0.0 | 0.0 |
| Marsh Pond | 114.3 | 34.8 | 30.4 | 114.3 | 34.8 | 30.4 |

## Wildlife Habitat

This map displays Chichester's wildlife habitat features (see map, *Wildlife Habitat*). Each layer indicates an aspect of some unique habitat; the combination of the various features describes those areas most likely to have a diversity of common and uncommon flora and fauna. Several special data sets were used or derived for this map including:

- Gravel Pits (inactive)
- Deer Yards
- Undeveloped Riparian Zones (300')
- Pass Points
- Ridge Line Corridors (300' buffer)
- Open Lands and Early Successional Habitat
- Agricultural Lands
- Steep Slopes (>25%)
- South-facing Slopes (>10%)
- National Wetlands Inventory (NWI wetlands)

*Gravel pits* were derived from the NH DES data layer "point pollution sources". Inactive and abandoned quarries and gravel pits were displayed on this map as a point feature. These man-made features offer important nesting habitat for reptiles and breeding habitat for amphibians due to the presence of open soils and sands, and pools of water.

*Deer yards* were digitized for this study from paper maps produced by the NH Fish and Game Department. Deer yards are areas where deer herds over-winter and

# Town of Chichester

## *New Hampshire*

### KEY

***Political Boundaries***
- Neighboring Town Lines
- Chichester Town Line

***Unfragmented Blocks by Acreage***
- 100 - 1,000 acres
- 1,000 - 2,000
- > 2,000

***Conservation & Public Lands ****
- Conservation lands: town-owned
- Conservation easements - private
- Conservation lands - other towns
- Town buildings / facilities
- Town open space
- Town forest

***Roads***
- I393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails
- Utility Lines

***Hydrography***
- Perennial
- Seasonal
- Lakes / Ponds / Rivers
- Wetlands (NWI / USGS)

***Topography***
- Contours (20' interval)

***Other Features***
- Village, settlement
- Summit
- Fairgrounds
- Campground
- Cemetery
- Gravel pit - active / inactive
- Natural feature
- School

** Conservation & Public Lands: Only the conservation lands displayed in shades of green x-hatch have permanent protection from development.*

### DATA SOURCES

***NH GRANIT Data***

Most of the data displayed here represents stock data sets obtained in 2001 from the NH GRANIT database as maintained by the Complex Systems Research Center (CSRC) at the University of New Hampshire (UNH).

The New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) is a cooperative project to create, maintain, and make available a statewide geographic data base serving the information needs of state, regional, and local decision-makers. A collaborative effort between the University of New Hampshire and the NH Office of State Planning (OSP), the core GRANIT System is housed at the UNH Institute for the Study of Earth, Oceans, and Space in Durham. The GRANIT approach to a state-wide GIS depends upon the cooperative efforts of a host of agencies, collaborating on various elements of database design and construction as well as application development.

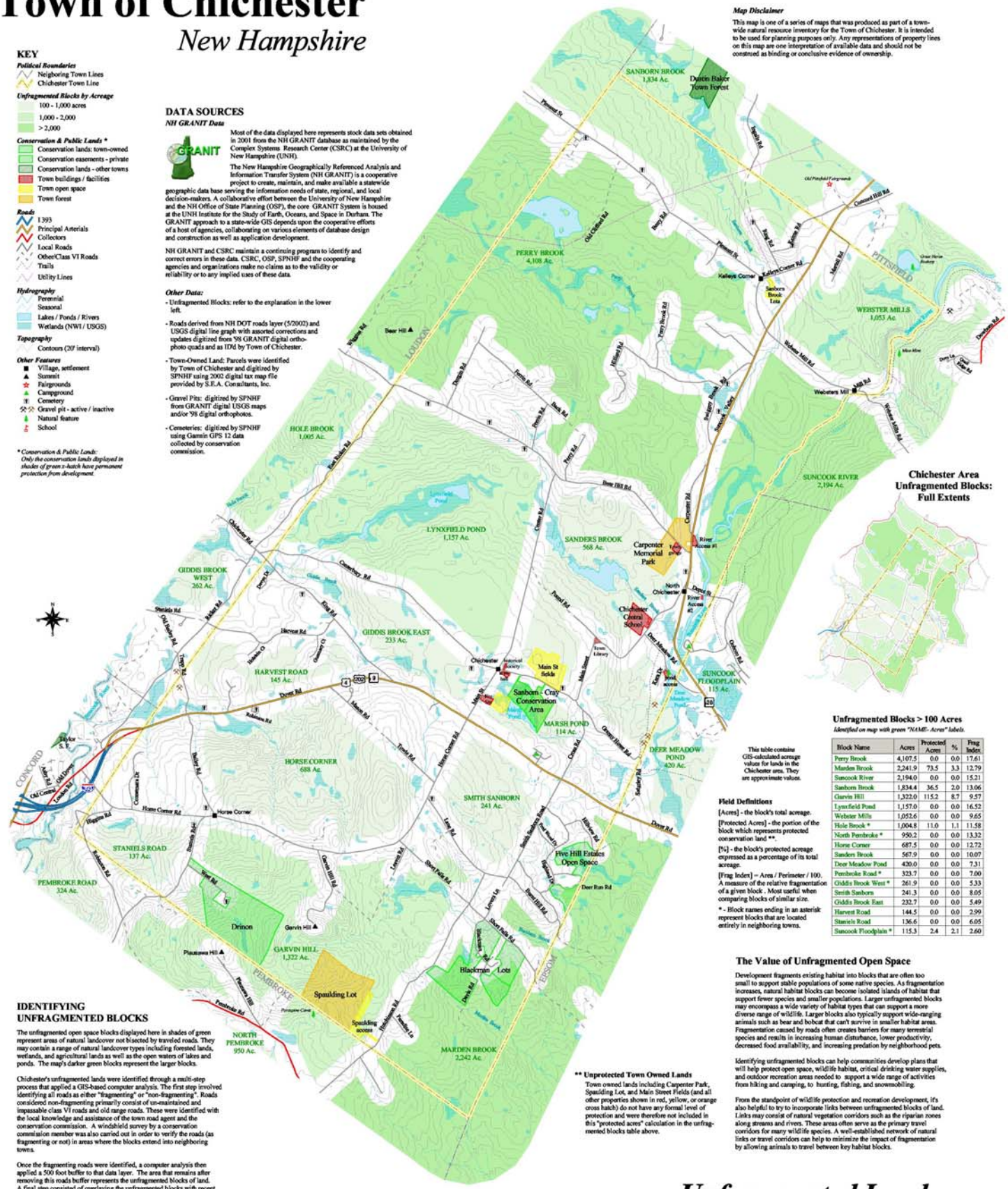
NH GRANIT and CSRC maintain a continuing program to identify and correct errors in these data. CSRC, OSP, SPNHF and the cooperating agencies and organizations make no claims as to the validity or reliability or to any implied uses of these data.

***Other Data:***

- Unfragmented Blocks: refer to the explanation in the lower left.
- Roads derived from NH DOT roads layer (5/2002) and USGS digital line graph with assorted corrections and updates digitized from '98 GRANIT digital ortho-photo quads and as ID'd by Town of Chichester.
- Town-Owned Land: Parcels were identified by Town of Chichester and digitized by SPNHF using 2002 digital tax map file provided by S.E.A. Consultants, Inc.
- Gravel Pits: digitized by SPNHF from GRANIT digital USGS maps and/or '98 digital orthophotos.
- Cemeteries: digitized by SPNHF using Garmin GPS 12 data collected by conservation commission.

***Map Disclaimer***

This map is one of a series of maps that was produced as part of a town-wide natural resource inventory for the Town of Chichester. It is intended to be used for planning purposes only. Any representations of property lines on this map are one interpretation of available data and should not be construed as binding or conclusive evidence of ownership.




### Chichester Area Unfragmented Blocks: Full Extents



### Unfragmented Blocks > 100 Acres

*Identified on map with green "NAME- Acres" labels.*

| Block Name | Acres | Protected Acres | % | Frag Index |
|---|---|---|---|---|
| Perry Brook | 4,107.5 | 0.0 | 0.0 | 17.61 |
| Marden Brook | 2,241.9 | 73.5 | 3.3 | 12.79 |
| Suncook River | 2,194.0 | 0.0 | 0.0 | 15.21 |
| Sanborn Brook | 1,834.4 | 36.5 | 2.0 | 13.06 |
| Garvin Hill | 1,322.0 | 115.2 | 8.7 | 9.57 |
| Lynxfield Pond | 1,157.0 | 0.0 | 0.0 | 16.52 |
| Webster Mills | 1,052.6 | 0.0 | 0.0 | 9.65 |
| Hole Brook * | 1,004.8 | 11.0 | 1.1 | 11.58 |
| North Pembroke * | 950.2 | 0.0 | 0.0 | 13.32 |
| Horse Corner | 687.5 | 0.0 | 0.0 | 12.72 |
| Sanders Brook | 567.9 | 0.0 | 0.0 | 10.07 |
| Deer Meadow Pond | 420.0 | 0.0 | 0.0 | 7.31 |
| Pembroke Road * | 323.7 | 0.0 | 0.0 | 7.00 |
| Giddis Brook West * | 261.9 | 0.0 | 0.0 | 5.33 |
| Smith Sanborn | 241.3 | 0.0 | 0.0 | 8.05 |
| Giddis Brook East | 232.7 | 0.0 | 0.0 | 5.49 |
| Harvest Road | 144.5 | 0.0 | 0.0 | 2.99 |
| Staniels Road | 136.6 | 0.0 | 0.0 | 6.05 |
| Suncook Floodplain * | 115.3 | 2.4 | 2.1 | 2.60 |

This table contains GIS-calculated acreage values for lands in the Chichester area. They are approximate values.

**Field Definitions**

[Acres] - the block's total acreage.

[Protected Acres] - the portion of the block which represents protected conservation land **.

[%] - the block's protected acreage expressed as a percentage of its total acreage.

[Frag Index] – Area / Perimeter / 100. A measure of the relative fragmentation of a given block . Most useful when comparing blocks of similar size.

* - Block names ending in an asterisk represent blocks that are located entirely in neighboring towns.

### IDENTIFYING UNFRAGMENTED BLOCKS

The unfragmented open space blocks displayed here in shades of green represent areas of natural landcover not bisected by traveled roads. They may contain a range of natural landcover types including forested lands, wetlands, and agricultural lands as well as the open waters of lakes and ponds. The map's darker green blocks represent the larger blocks.

Chichester's unfragmented lands were identified through a multi-step process that applied a GIS-based computer analysis. The first step involved identifying all roads as either "fragmenting" or "non-fragmenting". Roads considered non-fragmenting primarily consist of un-maintained and impassable class VI roads and old range roads. These were identified with the local knowledge and assistance of the town road agent and the conservation commission. A windshield survey by a conservation commission member was also carried out in order to verify the roads (as fragmenting or not) in areas where the blocks extend into neighboring towns.

Once the fragmenting roads were identified, a computer analysis then applied a 500 foot buffer to that data layer. The area that remains after removing this roads buffer represents the unfragmented blocks of land. A final step consisted of overlaying the unfragmented blocks with recent aerial photography (1998) in order to clip out any developed landcover areas missed in the preceding stage.

**** Unprotected Town Owned Lands**

Town owned lands including Carpenter Park, Spaulding Lot, and Main Street Fields (and all other properties shown in red, yellow, or orange cross hatch) do not have any formal level of protection and were therefore not included in this "protected acres" calculation in the unfragmented blocks table above.

### The Value of Unfragmented Open Space

Development fragments existing habitat into blocks that are often too small to support stable populations of some native species. As fragmentation increases, natural habitat blocks can become isolated islands of habitat that support fewer species and smaller populations. Larger unfragmented blocks may encompass a wide variety of habitat types that can support a more diverse range of wildlife. Larger blocks also typically support wide-ranging animals such as bear and bobcat that can't survive in smaller habitat areas. Fragmentation caused by roads often creates barriers for many terrestrial species and results in increasing human disturbance, lower productivity, decreased food availability, and increasing predation by neighborhood pets.

Identifying unfragmented blocks can help communities develop plans that will help protect open space, wildlife habitat, critical drinking water supplies, and outdoor recreation areas needed to support a wide range of activities from hiking and camping, to hunting, fishing, and snowmobiling.

From the standpoint of wildlife protection and recreation development, it's also helpful to try to incorporate links between unfragmented blocks of land. Links may consist of natural vegetation corridors such as the riparian zones along streams and rivers. These areas often serve as the primary travel corridors for many wildlife species. A well-established network of natural links or travel corridors can help to minimize the impact of fragmentation by allowing animals to travel between key habitat blocks.

Scale - 1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

# *Unfragmented Lands*

Prepared by the Society for the Protection of NH Forests - July 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

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# Town of Chichester

*New Hampshire*

- Municipal Boundaries
- Contours (20 foot)
- Utility Lines

NH DOT Roads
- I393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails

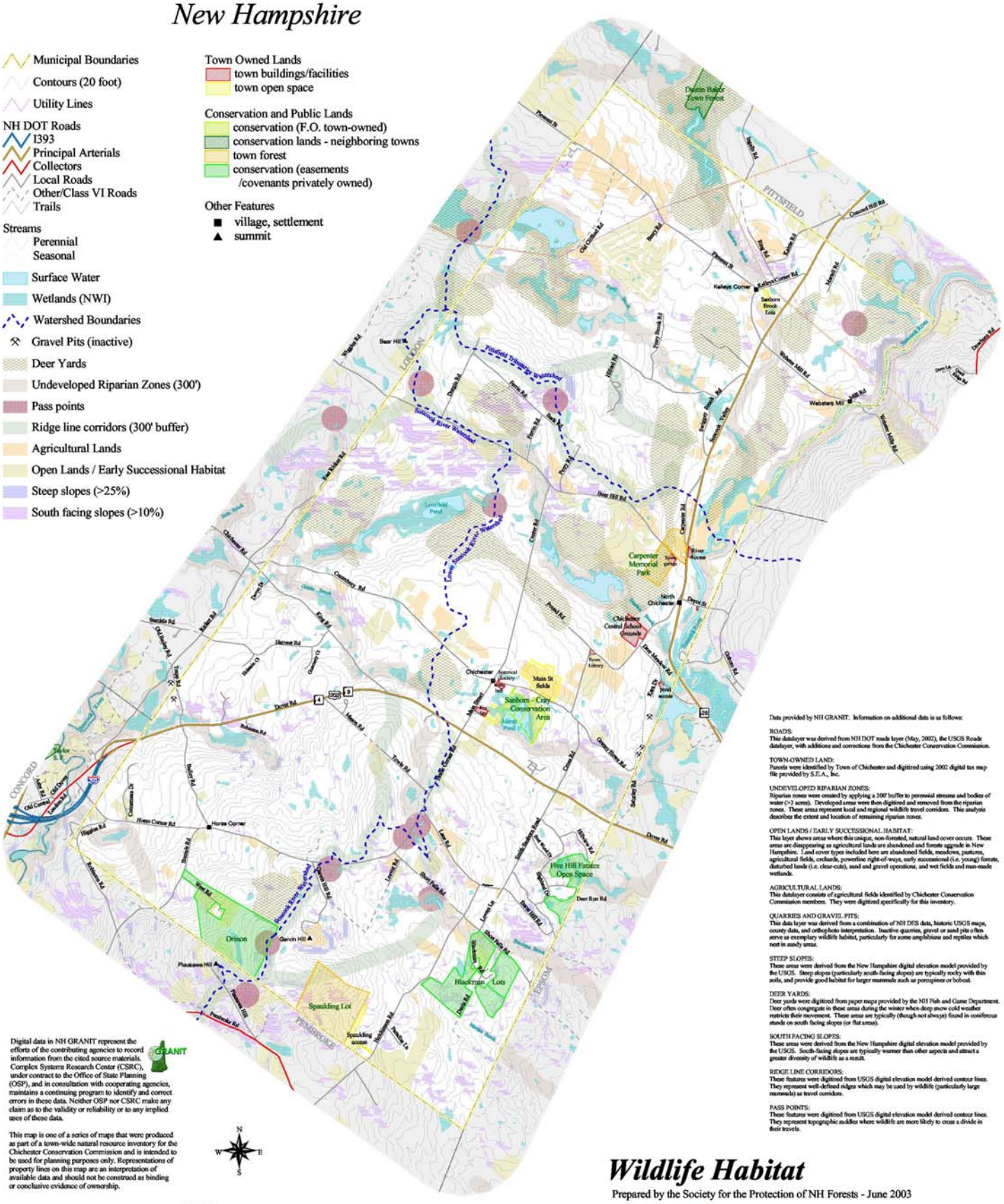
Streams
- Perennial
- Seasonal

- Surface Water
- Wetlands (NWI)
- Watershed Boundaries
- Gravel Pits (inactive)
- Deer Yards
- Undeveloped Riparian Zones (300')
- Pass points
- Ridge line corridors (300' buffer)
- Agricultural Lands
- Open Lands / Early Successional Habitat
- Steep slopes (>25%)
- South facing slopes (>10%)

Town Owned Lands
- town buildings/facilities
- town open space

Conservation and Public Lands
- conservation (F.O. town-owned)
- conservation lands - neighboring towns
- town forest
- conservation (easements /covenants privately owned)

Other Features
- village, settlement
- summit

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N W E S

1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

Data provided by NH GRANIT. Information on additional data is as follows:

ROADS:
This datalayer was derived from NH DOT roads layer (May, 2002), the USGS Roads datalayer, with additions and corrections from the Chichester Conservation Commission.

TOWN-OWNED LAND:
Parcels were identified by Town of Chichester and digitized using 2002 digital tax map file provided by S.E.A., Inc.

UNDEVELOPED RIPARIAN ZONES:
Riparian zones were created by applying a 300' buffer to perennial streams and bodies of water (>3 acres). Developed areas were then digitized and removed from the riparian zones. These areas represent local and regional wildlife travel corridors. This analysis describes the extent and location of remaining riparian zones.

OPEN LANDS / EARLY SUCCESSIONAL HABITAT:
This layer shows areas where this unique, non-forested, natural land cover occurs. These areas are disappearing as agricultural lands are abandoned and forests upgrade in New Hampshire. Land cover types included here are abandoned fields, meadows, pastures, agricultural fields, orchards, powerline right-of-ways, early successional (i.e. young) forests, disturbed lands (i.e. clear-cuts), sand and gravel operations, and wet fields and man-made wetlands.

AGRICULTURAL LANDS:
This datalayer consists of agricultural fields identified by Chichester Conservation Commission members. They were digitized specifically for this inventory.

QUARRIES AND GRAVEL PITS:
This data layer was derived from a combination of NH DES data, historic USGS maps, county data, and orthophoto interpretation. Inactive quarries, gravel or sand pits often serve as exemplary wildlife habitat, particularly for some amphibians and reptiles which nest in sandy areas.

STEEP SLOPES:
These areas were derived from the New Hampshire digital elevation model provided by the USGS. Steep slopes (particularly south-facing slopes) are typically rocky with thin soils, and provide good habitat for larger mammals such as porcupines or bobcat.

DEER YARDS:
Deer yards were digitized from paper maps provided by the NH Fish and Game Department. Deer often congregate in these areas during the winter when deep snow cold weather restricts their movement. These areas are typically (though not always) found in coniferous stands on south facing slopes (or flat areas).

SOUTH FACING SLOPES:
These areas were derived from the New Hampshire digital elevation model provided by the USGS. South-facing slopes are typically warmer than other aspects and attract a greater diversity of wildlife as a result.

RIDGE LINE CORRIDORS:
These features were digitized from USGS digital elevation model derived contour lines. They represent well-defined ridges which may be used by wildlife (particularly large mammals) as travel corridors.

PASS POINTS:
These features were digitized from USGS digital elevation model derived contour lines. They represent topographic saddles where wildlife are more likely to cross a divide in their travels.

## *Wildlife Habitat*

Prepared by the Society for the Protection of NH Forests - June 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

*GIS Services*
*54 Portsmouth Street, Concord, NH 03301*
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typically consist of coniferous forest cover type (especially hemlock groves) where they can find forage and shelter from snow.

*Undeveloped riparian zones* were developed by creating a 300 foot buffer around perennial streams, rivers, and lakes and ponds greater than 3 acres. These buffers represent areas where wildlife are likely to have adequate area for nesting, foraging, local migration, etc. Developed areas were delineated through the interpretation of digital aerial photographs and land cover data. Developed areas were relatively strictly defined here as areas upon which there was construction or paved surfaces, mowed grass or fields, power line right-of-ways, or agricultural lands. These developed areas were then removed from the 300' buffers to create a model of undeveloped riparian zones. These remaining areas provide unbroken wildlife corridors as well as quality riparian habitat.

*Pass points* represent low-points (saddles) on ridges. The points were manually digitized through the interpretation of contour lines, and buffered for visual interpretation. These are areas where wildlife are more likely to travel, i.e. the path of least resistance during local migration. Many animals travel along streams and gullies. As they follow the streams to their origin and past, they pass over the ridge and down onto the other side through these saddles.

*Ridge Line Corridors*, similar to pass points, represent topographic wildlife travel features. These were also manually digitized through the interpretation of contour lines; 300 foot buffers allow for ridge breadth and meandering paths. Animals, again taking the path of least resistance, travel these corridors gaining the advantage of an easier route and higher ground.

*Open lands and early successional forests* are made up of agricultural lands, meadows, and young forests. These areas were delineated on stereo, color-infrared aerial photos, then transferred to digital form[7]. A table showing the definitions of the various field and forest types is shown in Appendix 3. These lands represent the most rapidly disappearing habitat type in New Hampshire (< 4% of New Hampshire land cover). As forests mature and as agricultural lands either reforest or are developed, early successional forest and open land acreage shrinks. Species such as the New England Cottontail Rabbit and the Golden-winged Warbler rely on early-successional forests.

Slope data were derived from a digital elevation model of northern New England produced by the US Geological Survey. *Steep slopes* were considered to be any slopes over 25%. Steep slopes are typically rocky and provide good habitat for species such as bobcat and porcupine, especially where the land cover on south-facing slopes is hardwood forest. *South facing slopes* were considered to be any south or southwest facing slopes with a gradient over 10%. These areas are generally sunny (and warm) and thus preferred by wildlife (such as wild turkey and white-tailed deer), especially in the winter.

The wildlife habitat map is relatively complex, showing many data-layers and imparting a large amount of information. Looking at general patterns however, one can see that there are some areas of significant habitat concentration. The northern portion of the town, particularly towards the north and west, has some large, relatively undeveloped areas with varied habitat types. The three large wetlands complexes around Lynxfield Pond and in the Perry, Sanborn, and Sanders Brooks watersheds are each surrounded by a

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[7] The specific methodology for assessing this data layer is given in **Appendix 2: Open Lands and Early Successional Habitat Mapping**

diversity of habitat. These areas are connected by a network of ridgelines and stream corridors, as well as undeveloped forest land. The Suncook River Valley also shows a high concentration of habitat factors and may be another area on which to focus. The southern habitat zones are sparser, drier, and separated by the Route 4 / 9 / 202 corridor. Habitat-minded conservation planning might be best concentrated in these northern wetland complexes (see **Wildlife Habitat Management**, page 24).

## Water Resources

The *Water Resources* map shows water resources, water resource protection areas, and a range of point features representing known or potential threats to water quality. In this analysis, water resources were considered to be surface waters (such as ponds, streams, and rivers), aquifers, potentially favorable gravel well areas, wetlands, and 100 foot wetland buffers.

The aquifers displayed here represent gravel aquifers or "stratified drift aquifers", as opposed to bedrock aquifers. They are layered glacial and alluvial deposits of sand and gravel. Typically, they have very high water storage capacity and transmission rates and therefore contain areas suitable for the development of large municipal or commercial water supplies.

Potentially favorable gravel well areas represent the portions of the aquifer with the greatest potential for having water yield and quality sufficient to serve as large public water supplies. They are areas sufficiently distant from potential water contamination sources (as defined by the New Hampshire Department of Environmental Services, NH DES). These sources might include roads, surface water bodies, and a wide range of man-made sources of potential contamination (displayed on the map as point features, see also *Table 5: Potential Threats to Ground Water Quality*).

Water resource protection areas are in close proximity to public drinking water supply sources and thus warrant a higher level of protection. Various NH DES regulations apply to these zones ranging from land cover specifications to land use, business, and building restrictions. The two classes of protection are sanitary radii and wellhead protection areas. Sanitary radii are 150 to 400 foot zones immediately surrounding public water supply sources. NH DES specifies that they be kept entirely in natural land cover. The larger wellhead protection areas often encompass a larger drainage area around the water intake point of municipal water supplies.

There are approximately 14.5 acres of sanitary radii in Chichester, none of which are protected; approximately 3.3 acres of these (about 23%) are in non-natural cover[8]. The well head protection area surrounding the Chichester Central School is approximately 121.9 acres, none of which is protected by existing conservation lands. Ideally, sanitary radii should be protected from development and maintained entirely as natural land cover. *Wellhead protection areas should have land use and building restrictions as recommended by the best management practices for municipal supplies and NH DES regulations.*

Potential threats to ground water quality include groundwater hazards (such as known leaking storage tanks), facilities generating hazardous waste, aboveground and underground storage tanks, automobile salvage yards, and point/non-point pollution

[8] as interpreted from digital aerial photography

sources. For the most part these features fall on or around the Route 4 / 9 / 202 corridors and to a lesser extent along Route 28 and the town's other main roads. These point features are listed in **Table 5: Potential Threats to Ground Water Quality**.

**Table 5: Potential Threats to Ground Water Quality**

**5a. Point/Non-point Pollution Sources**

| Map # | DES ID | Name |
|---|---|---|
| 19 | 138-01 | Town Shed |
| 28 | 137-01 | NH DOT Maintenance Shed |
| 34 | 152-02 | |
| 66 | 151-01 | Pike Gravel Co |
| 69 | 151-02 | |
| 80 | 151-03 | |

**5b. Aboveground Storage Tanks**

| Map # | DES ID | Name |
|---|---|---|
| 3 | 930229A | Pleasant View Gardens |
| 32 | 960726A | NH DOT PS 503 |
| 48 | 000515A | Concord Sand & Gravel |
| 71 | 990734A | Goose Bay Sawmill |
| 74 | 960755A | Rymes Heating Oils Inc |
| 75 | 010217A | MTS Environmental |
| 79 | 931007A | Raymond Brothers |
| 84 | 971035A | Johnson & Dix Fuel Corp |

**5c. Underground Storage Tanks**

| Map # | DES ID | Name |
|---|---|---|
| 1 | 0112804 | Pleasant View Gardens |
| 10 | 0114556 | Old Clarks Grain Store |
| 12 | 0114556 | Old Clarks Grain Store |
| 13 | 0114367 | Landry & Reeves Trucking |
| 15 | 0114893 | Cornucopia Inc |
| 20 | 0112349 | Chichester Country Store |
| 25 | 0110251 | Chichester Central School |
| 30 | 0113181 | NH DOT PS 503 |
| 36 | 0113163 | Chichester Mobil |
| 40 | 0220060 | Phillips Auto Sales |
| 49 | 0112550 | Mr. Mikes Sunoco |
| 52 | 0113817 | Hess Station 29201 |

**5d. Sites Generating Hazardous Waste**

| Map # | DES ID | Name | Status |
|---|---|---|---|
| 5 | NHD510120389 | Northeast Wholesale | Active |
| 9 | NHD500003496 | Pittsfield Printing | Inactive |
| 23 | NHD510122807 | R & W Towing | Inactive |
| 29 | NHD500021712 | NH DOT District 5 | Active |
| 33 | NHD510131170 | Hilltop Equipment & Mill Supply Inc | Active |
| 35 | NHD178152070 | Motion Motors Inc | Inactive |
| 39 | NHD500022595 | Blanchard Auto Body & Equipment LLC | Active |
| 41 | NHD510124910 | Phillips Auto Sales Inc | Inactive |
| 42 | NHD500019799 | Ultimate Auto Repair | Inactive |
| 44 | NHD500022587 | Farland D D S P A | Active |
| 45 | NHD510125578 | Gary's RV | Active |
| 46 | NHD510160088 | Ultimate Auto Repair | Active |
| 57 | NHD510123870 | Oxy Gon Industries Inc | Inactive |
| 58 | NHD986472785 | M & M Ford Inc | Active |
| 61 | NHD982199648 | Pike Industries Inc | Inactive |
| 65 | NHD986485860 | E Mott & Son | Active |
| 77 | NHD982200172 | Bobcat Of New Hampshire | Active |
| 82 | NHD510115413 | Cherry Car Care | Inactive |
| 83 | NHD500021241 | White Mountain Cable Const Co | Active |
| 85 | NHD510106933 | Alstart | Active |

**5e. Groundwater Hazards**

| Map # | DES ID | Name | Description |
|---|---|---|---|
| 2 | 199302029 | Pleasant View Gardens | Leaking underground fuel storage |
| 4 | 199302029 | Pleasant View Gardens | Leaking heating oil tank |
| 6 | 200109004 | Ron's Garage | Underground injection control |
| 11 | 199604009 | Old Clarks Grain Store | Leaking underground fuel storage |
| 14 | 199212035 | Landry & Reeves Trucking | Underground injection control |
| 16 | 199210020 | Marston Farms | Leaking underground fuel storage |
| 17 | 199210020 | Marston Farms | Non-petroleum contamination |
| 18 | 199905012 | Chichester DPW Shed | Underground injection control |
| 27 | 198808018 | R S Audley Inc | Stump or demolition dump |
| 31 | 199607026 | NH DOT PS 503 | |
| 37 | 199102044 | Chichester Mobil | |
| 38 | 199102044 | Chichester Mobil | Leaking underground fuel storage |
| 43 | 200209043 | Gary's RV | Holding tank registration |
| 47 | 199203040 | Whitehead Residence | |
| 50 | 199011031 | Mr. Mikes Sunoco | Leaking underground fuel storage |
| 53 | 199809068 | Hess Station 29201 | Leaking underground fuel storage |
| 55 | 199809068 | Hess Station 29201 | Initial response spill |
| 59 | 200012041 | M & M Ford Inc | Leaking motor oil storage tank. |
| 62 | 199809068 | Hess Station 29201 | Holding tank registration |
| 67 | 198808010 | Burlshire Kennel | Holding tank registration |
| 72 | 199010031 | Phelps Aerial Lift | Underground injection control |
| 73 | 199103008 | MTS Environmental | Groundwater release detect. permit |
| 76 | 200002030 | Gorham Tractor & Equipment | Holding tank registration |
| 78 | 199111009 | White Mountain Cable Const Corp | Holding tank registration |
| 81 | 199310007 | Raymond Brothers | Leaking underground fuel storage |

In terms of this analysis, the town's most significant water resources are the town's only stratified drift aquifer on the Suncook River and the ponds in the central part of the town. The aquifer is small (approximately 71.1 acres) when compared to the resources of other New Hampshire towns, however, there are extant areas (approximately 3.4 acres) potentially favorable for gravel wells (as shown in dark lavender on the map). These areas (as defined) are not yet subject to groundwater threats, however, in the future they may be as development continues along the route 28 corridor and within the immediate watershed. Like the protection areas, this potential public water supply area is unprotected by existing conservation lands.

Lynxfield Pond (approximately 16.9 acres) and the Sander's Brook Ponds (approximately 33.7 acres combined) are potential public water sources as their surrounding watersheds are relatively undeveloped. The Sander's Brook Pond watershed, however is traversed by several roads and thus threatened by the inevitable associated development. Given their additional wildlife habitat quality, these areas are potentially significant resources for the town and merit consideration for protected status.

Very little currently exists in the way of wetlands protection. *Table 6: Wetland Acreage and Protection Status* illustrates the amount of protected wetland features in Chichester. A prime wetlands survey was outside the scope of this study, but probably an appropriate next step for the CCC. The water resources map could be a useful tool for field surveys and wetlands planning and evaluation. Prime wetlands designations, combined with the 2003 wetlands protection bylaw (specifying 100 foot setbacks) will afford more potential for wetlands conservation in Chichester.

**Table 6: Wetland Acreage and Protection Status**

| | Acreage | Protected Acreage | % Protected |
|---|---|---|---|
| Surface Water | 183.0 | 11.8 | 6.4 |
| NWI Wetlands | 552.7 | 28.3 | 5.1 |
| Total Wetlands | 735.7 | 40.1 | 5.5 |
| | | | |
| Wetlands Buffers (100 feet) | 866.8 | 30.3 | 3.5 |

## Scenic Resources

The *Scenic Resources* map shows those areas of Chichester which are most valuable in terms of natural aesthetics. These areas include scenic roads (as designated by the Town or by the State), scenic viewpoints, and areas which can be seen from scenic viewpoints.

To identify areas visible from scenic viewpoints, a viewshed analysis was carried out. This analysis identifies the areas in town that are visible from 46 scenic viewpoints that were identified by CCC members. Viewsheds are delineated by determining the visibility between locations, determined by using elevation data (a model describing the surface of the earth). The viewshed analysis determines lines of sight as determined by topography, and thus, which areas can be seen from a given viewpoint. Those areas which are visible from many points are considered high value in this analysis, and are shown in increasingly dark colors on the map.

# Town of Chichester

*New Hampshire*

Municipal Boundaries
Utility Lines

NH DOT Roads
- I393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails

Conservation and Public Lands
- conservation (F.O. town-owned)
- conservation (easements/covenants privately owned)
- conservation lands - neighboring towns
- town forest

Town-owned Lands
- town buildings/facilities
- town open space

Streams
- Perennial
- Seasonal

Surface Waters
Watershed Boundaries
Wetland Buffer (100')
Wetlands (NWI)

Aquifers
- Transmissivity >= 500 ft2/day
- Potentially Favorable Gravel Well Areas

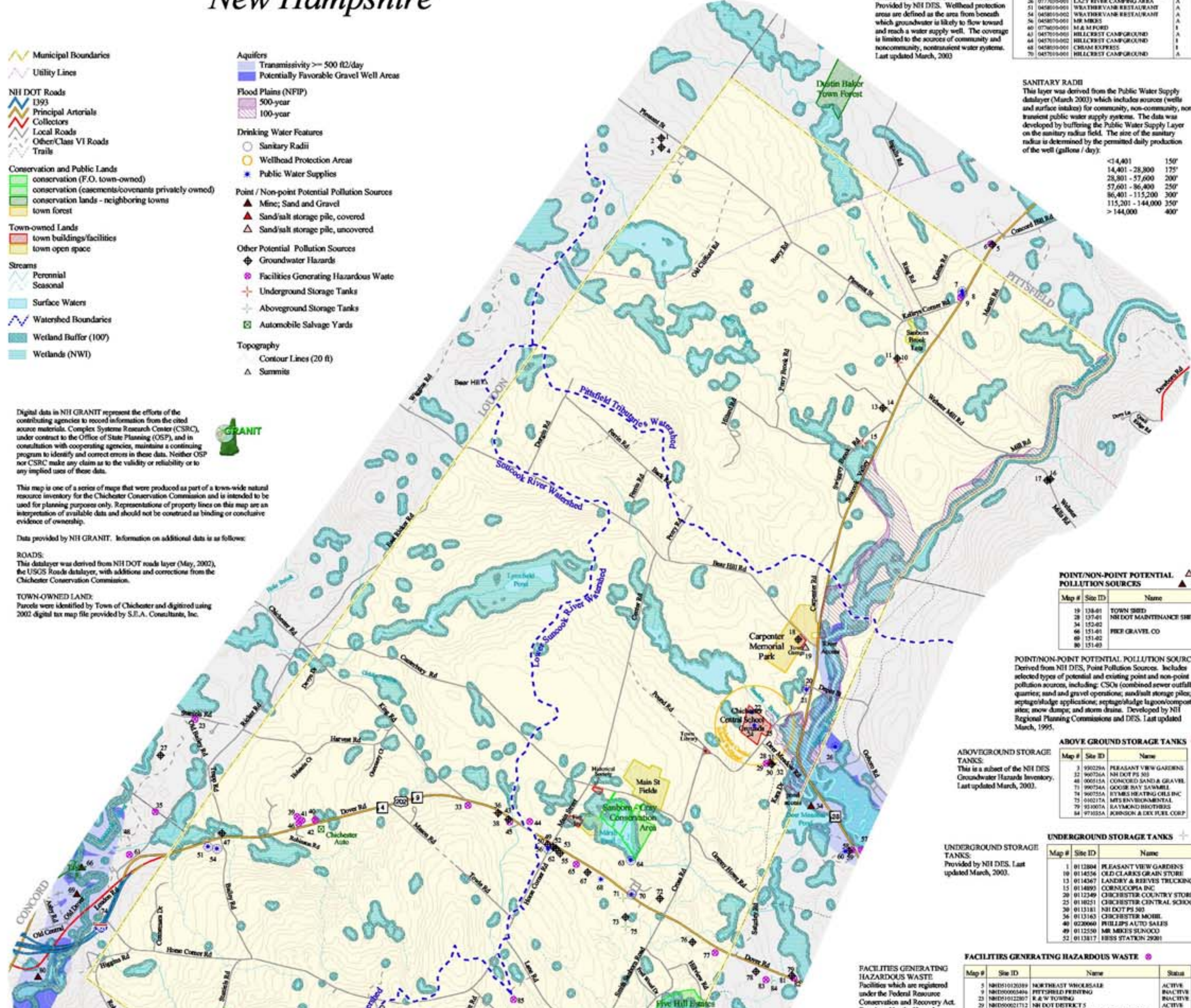
Flood Plains (NFIP)
- 500-year
- 100-year

Drinking Water Features
- Sanitary Radii
- Wellhead Protection Areas
- Public Water Supplies

Point / Non-point Potential Pollution Sources
- Mine; Sand and Gravel
- Sand/salt storage pile, covered
- Sand/salt storage pile, uncovered

Other Potential Pollution Sources
- Groundwater Hazards
- Facilities Generating Hazardous Waste
- Underground Storage Tanks
- Aboveground Storage Tanks
- Automobile Salvage Yards

Topography
- Contour Lines (20 ft)
- Summits




Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of State Planning (OSP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. Neither OSP nor CSRC make any claim as to the validity or reliability or to any implied uses of these data.

This map is one of a series of maps that were produced as part of a town-wide natural resource inventory for the Chichester Conservation Commission and is intended to be used for planning purposes only. Representations of property lines on this map are an interpretation of available data and should not be construed as binding or conclusive evidence of ownership.

Data provided by NH GRANIT. Information on additional data is as follows:

ROADS:
This datalayer was derived from NH DOT roads layer (May, 2002), the USGS Roads datalayer, with additions and corrections from the Chichester Conservation Commission.

TOWN-OWNED LAND:
Parcels were identified by Town of Chichester and digitized using 2002 digital tax map file provided by S.E.A. Consultants, Inc.

PUBLIC WATER SUPPLIES:
Provided by NH DES Sources (wells and surface intakes) for community, non-transient /non-community, and transient/non-community public water supply systems. Last updated March, 2003.

WELLHEAD PROTECTION AREAS:
Provided by NH DES. Wellhead protection areas are defined as the area from beneath which groundwater is likely to flow toward and reach a water supply well. The coverage is limited to the sources of community and noncommunity, nontransient water systems. Last updated March, 2003

**PUBLIC WATER SUPPLIES**

| Map # | Site ID | Name | Status |
|---|---|---|---|
| 7 | 0458060-001 | BLUEBERRY HILL | A |
| 8 | 0458050-001 | MARIAS PIZZA PASTA AND THINGS | A |
| 21 | 0458020-001 | CHICHESTER COUNTRY STORE | A |
| 22 | 0455010-002 | CHICHESTER CENTRAL SCHOOL | I |
| 24 | 0455010-001 | CHICHESTER CENTRAL SCHOOL | A |
| 26 | 0777030-001 | LAZY RIVER CAMPING AREA | A |
| 51 | 0458010-001 | WEATHERVANE RESTAURANT | A |
| 54 | 0458010-002 | WEATHERVANE RESTAURANT | A |
| 56 | 0458070-001 | MR MIKES | A |
| 60 | 0776030-001 | M & M FORD | I |
| 63 | 0457010-001 | HILLCREST CAMPGROUND | A |
| 64 | 0457010-002 | HILLCREST CAMPGROUND | I |
| 68 | 0458030-001 | CHIAM EXPRESS | I |
| 70 | 0457010-001 | HILLCREST CAMPGROUND | A |

SANITARY RADII
This layer was derived from the Public Water Supply datalayer (March 2003) which includes sources (wells and surface intakes) for community, non-community, non-transient public water supply systems. The data was developed by buffering the Public Water Supply Layer on the sanitary radius field. The size of the sanitary radius is determined by the permitted daily production of the well (gallons / day):

| | |
|---|---|
| <14,401 | 150' |
| 14,401 - 28,800 | 175' |
| 28,801 - 57,600 | 200' |
| 57,601 - 86,400 | 250' |
| 86,401 - 115,200 | 300' |
| 115,201 - 144,000 | 350' |
| > 144,000 | 400' |

**POINT/NON-POINT POTENTIAL POLLUTION SOURCES**

| Map # | Site ID | Name |
|---|---|---|
| 19 | 138-01 | TOWN SHED |
| 28 | 137-01 | NH DOT MAINTENANCE SHED |
| 34 | 152-02 | |
| 66 | 151-01 | PIKE GRAVEL CO |
| 69 | 151-02 | |
| 80 | 151-03 | |

POINT/NON-POINT POTENTIAL POLLUTION SOURCES:
Derived from NH DES, Point Pollution Sources. Includes selected types of potential and existing point and non-point pollution sources, including: CSOs (combined sewer outfalls); quarries; sand and gravel operations; sand/salt storage piles; septage/sludge applications; septage/sludge lagoon/composting sites; snow dumps; and storm drains. Developed by NH Regional Planning Commissions and DES. Last updated March, 1995.

ABOVEGROUND STORAGE TANKS:
This is a subset of the NH DES Groundwater Hazards Inventory. Last updated March, 2003.

**ABOVE GROUND STORAGE TANKS**

| Map # | Site ID | Name |
|---|---|---|
| 3 | 950229A | PLEASANT VIEW GARDENS |
| 32 | 960726A | NH DOT PS 503 |
| 48 | 000515A | CONCORD SAND & GRAVEL |
| 71 | 990734A | GOOSE BAY SAWMILL |
| 74 | 960755A | RYMES HEATING OILS INC |
| 75 | 010217A | MTS ENVIRONMENTAL |
| 79 | 931007A | RAYMOND BROTHERS |
| 84 | 971035A | JOHNSON & DIX FUEL CORP |

UNDERGROUND STORAGE TANKS:
Provided by NH DES. Last updated March, 2003.

**UNDERGROUND STORAGE TANKS**

| Map # | Site ID | Name |
|---|---|---|
| 1 | 0112804 | PLEASANT VIEW GARDENS |
| 10 | 0114536 | OLD CLARKS GRAIN STORE |
| 13 | 0114367 | LANDRY & REEVES TRUCKING |
| 15 | 0114893 | CORNUCOPIA INC |
| 20 | 0112349 | CHICHESTER COUNTRY STORE |
| 25 | 0110251 | CHICHESTER CENTRAL SCHOOL |
| 30 | 0113181 | NH DOT PS 503 |
| 36 | 0113163 | CHICHESTER MOBIL |
| 40 | 0220060 | PHILLIPS AUTO SALES |
| 49 | 0112550 | MR MIKES SUNOCO |
| 52 | 0113817 | HESS STATION 29201 |

FACILITIES GENERATING HAZARDOUS WASTE:
Facilities which are registered under the Federal Resource Conservation and Recovery Act. Developed by the Hazardous Waste Compliance Bureau. Last updated March 2003.

**FACILITIES GENERATING HAZARDOUS WASTE**

| Map # | Site ID | Name | Status |
|---|---|---|---|
| 5 | NHD510120389 | NORTHEAST WHOLESALE | ACTIVE |
| 9 | NHD500003494 | PITTSFIELD PRINTING | INACTIVE |
| 23 | NHD510122807 | R & W TOWING | INACTIVE |
| 29 | NHD500021712 | NH DOT DISTRICT 5 | ACTIVE |
| 33 | NHD510131170 | HILLTOP EQUIPMENT & MILL SUPPLY INC | ACTIVE |
| 35 | NHD178152070 | MOTION MOTORS INC | INACTIVE |
| 39 | NHD500022595 | BLANCHARD AUTO BODY & EQUIPMENT LLC | ACTIVE |
| 41 | NHD510124910 | PHILLIPS AUTO SALES INC | INACTIVE |
| 42 | NHD500019799 | ULTIMATE AUTO REPAIR | INACTIVE |
| 44 | NHD500022587 | FARLAND D D S P A | ACTIVE |
| 45 | NHD510125578 | GARYS RV | ACTIVE |
| 46 | NHD510160088 | ULTIMATE AUTO REPAIR | ACTIVE |
| 57 | NHD510123870 | OXY GON INDUSTRIES INC | INACTIVE |
| 58 | NHD986472785 | M & M FORD INC | ACTIVE |
| 61 | NHD982199648 | PIKE INDUSTRIES INC | INACTIVE |
| 65 | NHD986485860 | E MOTT & SON | ACTIVE |
| 77 | NHD982200172 | BOBCAT OF NEW HAMPSHIRE | ACTIVE |
| 82 | NHD510115413 | CHERRY CAR CARE | INACTIVE |
| 83 | NHD500021241 | WHITE MOUNTAIN CABLE CONST CO | ACTIVE |
| 85 | NHD510106953 | ALSTART | ACTIVE |

GROUNDWATER HAZARDS:
Derived from NH DES Groundwater Hazards Inventory. Includes existing and potential threats to source water quality including, but not limited to: CERCLA superfund sites, complaints, leaking bulk fuel storage facilities, groundwater release detection permits, isolated gw sample w/contaminant detection, non-petroleum hazardous waste, non-hazardous/non-sanitary holding tanks, initial spill response, lined landfills, proposed landfills, unlined landfills, leaking above-ground storage tanks, leaking underground storage tanks, lined wastewater lagoons, leaking motor oil storage tanks, old open dump sites, leaking heating oil tanks, rapid infiltration basins, septage lagoons, subsurface wastewater disposal >20,000gal/day, unsolicited site assessments, sludge lagoons, sludge applications, oil spill/releases, spray irrigation, municipal/commercial stump/demo dumps, solid waste transfer stations, underground injection control, and unlined wastewater lagoons. Last updated March, 2003

**GROUND WATER HAZARDS**

| Map # | Site ID | Name | Description |
|---|---|---|---|
| 2 | 199302029 | PLEASANT VIEW GARDENS | Leaking underground fuel storage |
| 4 | 199302029 | PLEASANT VIEW GARDENS | Leaking heating oil tank |
| 6 | 200109004 | RON'S GARAGE | Underground injection control |
| 11 | 199604009 | OLD CLARKS GRAIN STORE | Leaking underground fuel storage |
| 14 | 199212035 | LANDRY & REEVES TRUCKING | Underground injection control |
| 16 | 199210020 | MARSTON FARMS | Leaking underground fuel storage |
| 17 | 199210020 | MARSTON FARMS | Non-petroleum contamination |
| 18 | 199905012 | CHICHESTER DPW SHED | Underground injection control |
| 27 | 199808018 | R S AUDLEY INC | Stump or demolition dump |
| 31 | 199607026 | NH DOT PS 503 | |
| 38 | 199102044 | CHICHESTER MOBIL | Leaking underground fuel storage |
| 43 | 200209043 | GARYS RV | Holding tank registration |
| 47 | 199203040 | WHITEHEAD RESIDENCE | |
| 50 | 199011031 | MR MIKES SUNOCO | Leaking underground fuel storage |
| 53 | 199809068 | HESS STATION 29201 | Leaking underground fuel storage |
| 55 | 199809068 | HESS STATION 29201 | Initial response spill |
| 59 | 200012041 | M & M FORD INC | Leaking motor oil storage tank |
| 62 | 199809068 | HESS STATION 29201 | Holding tank registration |
| 67 | 199808010 | BURLSHIRE KENNEL | Holding tank registration |
| 72 | 199010031 | PHELPS AERIAL LIFT | Underground injection control |
| 73 | 199103008 | MTS ENVIRONMENTAL | Groundwater release detect. permit |

FLOOD PLAINS:
Provided by the Central New Hampshire Regional Planning Commission.

AQUIFERS:
Produced by USGS and provided by NH DES. Current as of March 2003

POTENTIALLY FAVORABLE GRAVEL WELL AREAS:
This layer shows a computerized overlay analysis to determine areas of stratified drift aquifer potentially having water yield and quality sufficient to serve as large public water supplies. Areas were derived by removing areas with potential for groundwater contamination (NH DES derived "U400" layer; areas with potential groundwater contaminants) from high transmissivity aquifers (Aquifers, T-Max * 2000 sq ft / day). Local land use information and further hydrogeologic analysis are essential to determine the suitability of any location as an actual well site. Buffers used to create this map do not guarantee protection from well contamination. The status of sites and associated buffers are subject to change when contamination has been cleaned up. Similarly, the existing source water protection areas may be revised as more site-specific hydrogeologic information becomes available.

AUTOMOBILE SALVAGE YARDS:
Provided by NH DES. Includes Automobile Salvage Yards. Developed by NH DES. Last Updated March, 2003

1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

# *Water Resources*

Prepared by the Society for the Protection of NH Forests - June 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS
*GIS Services*
*54 Portsmouth Street, Concord, NH 03301*
*(603) 224 - 9945 www.spnhf.org*

High value scenic areas fall in several major areas in Chichester. The Suncook River Valley has relatively high values; its low lying topography and farm fields can be seen by drivers passing through the valley. The area around Horse Corner Road and Towle Road is another scenic area. This is essentially the foothills of the southern highland region and is visible from several of the scenic roads in town.

Surveys of town residents for the 1993 and 1997 Master Plans showed a clear desire to keep the rural feeling of Chichester; a point emphasized in the 1997 plan and by the CCC. *Protection of scenic resources is key to maintaining rural character. This can be accomplished by not only conserving high value scenic areas, but by preserving the viewpoints themselves. Further scenic road designations would aid here as well.*

The highest value areas on this map actually fall outside of Chichester to the east in Epsom. This fact may emphasize the need to work with Epsom officials on joint conservation projects.

## Tax Map and Zoning District Transparent Overlays

Two transparent overlays were created for this study at the same scale (1:24,000) as the large format natural resource maps. These include the *2002 Tax Map* as well as the *Zoning District* map. Both maps were derived from 2002 source cad data created by S.E.A. Consultants, Inc. The tax map overlay includes 2003 revisions for all subdivisions through 7/10/03.

Chichester's five zoning districts are soils-based and include commercial / industrial, residential, rural / agricultural, open space (wetland), and open space (steep) districts (see *Table 8: Zoning Districts*).

## Co-occurrence Model

The final integrative stage of this study consisted of a GIS-based natural resource co-occurrence analysis. The product of this analysis is displayed on the *Natural Resource Co-occurrence* map.

The co-occurrence model that was applied in this analysis consisted of nineteen (19) natural resource factors (see *Table 7: Co-occurrence Model Factors*). Each of these factors received one (1) point, with the exception of three of the scenic resource factors which received two (2) points each. The numerical values are summed by overlaying all of the factors in the GIS. Where more factors exist, the result is a higher score; where few exist, lower scores are found. Co-occurrence values are then shown on the map with a light to dark color scale. Higher values (or more resource rich areas) are displayed in a darker shade, making them more visible.

# Town of Chichester

## *New Hampshire*

### KEY

***Scenic Features***

- State-designated scenic byway
- Designated by town vote
- Other scenic local roads
- Scenic Road Buffers - 500'
  - *valued 2 points in co-occurrence analysis*
- Scenic viewpoints with azimuth
  - *Viewpoint vicinity areas shown in yellow were valued 2 points in co-occurrence analysis*

***Viewshed Analysis Scores***

- 1 - 2 points
- 3 - 4
- 5 - 7
- 8 - 10
- 11 - 13
- 14 - 16
- 17 - 18

***Political Boundaries***

- Neigboring Town Lines
- Chichester Town Line

***Conservation & Public Lands ****

- Conservation lands: town-owned
- Conservation easements - private
- Conservation lands - other towns
- Town buildings / facilities
- Town open space
- Town forest

***Roads***

- I 393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails
- Utility Lines

***Hydrography***

- Perennial
- Seasonal
- Lakes / Ponds / Rivers
- Wetlands (NWI / USGS)

***Topography***

- Contours (20' interval)

***Other Features***

- Village, settlement
- Summit
- Fairgrounds
- Campground
- Cemetery
- Gravel pit - active / inactive
- Natural feature
- School

** Conservation & Public Lands: Only the conservation lands displayed in shades of green x-hatch have permanent protection from development.*

### DATA SOURCES

***NH GRANIT Data***

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***Other Data***

- Roads derived from NH DOT roads layer (5/2002) with assorted corrections and updates digitized from '98 GRANIT digital orthophoto quads and as identified by Town of Chichester.
- Town-Owned Land: Parcels were identified by Town of Chichester and digitized by SPNHF using 2002 digital tax map file provided by S.E.A. Consultants, Inc.
- Scenic Viewpoints: Identified by Chichester Conservation Commission members using Garmin GPS 12 receivers and digitized by SPNHF.
- USGS Digital Elevation Data: refer to explanation on right edge of map.
- Gravel Pits: digitized by SPNHF from GRANIT digital USGS maps and/or '98 digital orthophotos.
- Cemeteries: digitized by SPNHF using Garmin GPS 12 data collected by conservation commission.

***Map Disclaimer***

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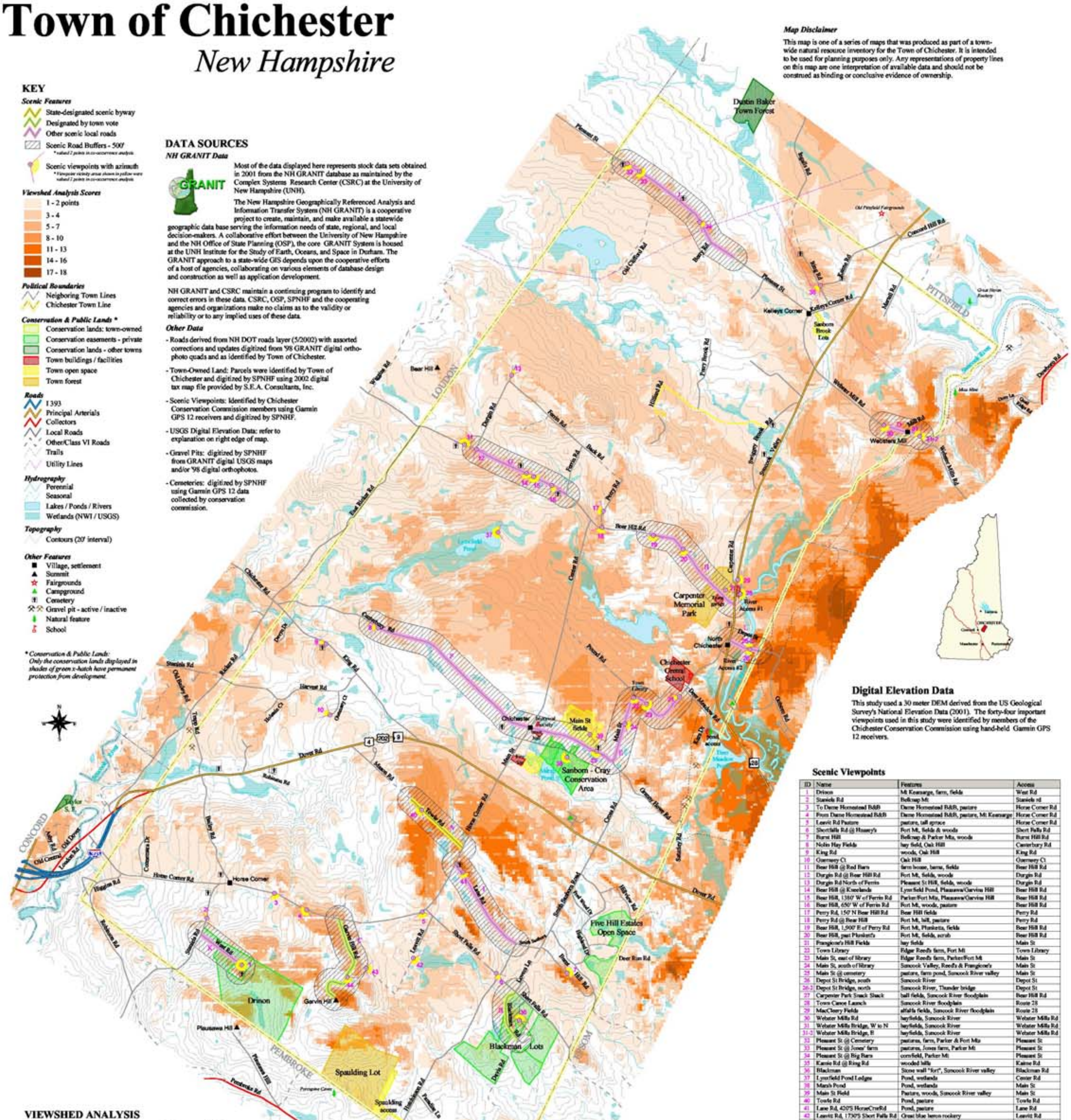



### Digital Elevation Data

This study used a 30 meter DEM derived from the US Geological Survey's National Elevation Data (2001). The forty-four important viewpoints used in this study were identified by members of the Chichester Conservation Commission using hand-held Garmin GPS 12 receivers.

### Scenic Viewpoints

| ID | Name | Features | Access |
|---|---|---|---|
| 1 | Drinon | Mt Kearsarge, farm, fields | West Rd |
| 2 | Staniels Rd | Belknap Mt | Staniels rd |
| 3 | To Dame Homestead B&B | Dame Homestead B&B, pasture | Horse Corner Rd |
| 4 | From Dame Homestead B&B | Dame Homestead B&B, pasture, Mt Kearsarge | Horse Corner Rd |
| 5 | Leavitt Rd Pasture | pasture, tall spruce | Horse Corner Rd |
| 6 | Shortfalls Rd @ Hussey's | Fort Mt, fields & woods | Short Falls Rd |
| 7 | Burnt Hill | Belknap & Parker Mts, woods | Burnt Hill Rd |
| 8 | Nolin Hay Fields | hay field, Oak Hill | Canterbury Rd |
| 9 | King Rd | woods, Oak Hill | King Rd |
| 10 | Guernsey Ct | Oak Hill | Guernsey Ct |
| 11 | Bear Hill @ Red Barn | farm house, barns, fields | Bear Hill Rd |
| 12 | Durgin Rd @ Bear Hill Rd | Fort Mt, fields, woods | Durgin Rd |
| 13 | Durgin Rd North of Ferrin | Pleasant St Hill, fields, woods | Durgin Rd |
| 14 | Bear Hill @ Kneelands | Lynnfield Pond, Plausawa/Garvins Hill | Bear Hill Rd |
| 15 | Bear Hill, 1380' W of Ferrin Rd | Parker/Fort Mts, Plausawa/Garvins Hill | Bear Hill Rd |
| 16 | Bear Hill, 650' W of Ferrin Rd | Fort Mt, woods, pasture | Bear Hill Rd |
| 17 | Perry Rd, 150' N Bear Hill Rd | Bear Hill fields | Perry Rd |
| 18 | Perry Rd @ Bear Hill | Fort Mt, hill, pasture | Perry Rd |
| 19 | Bear Hill, 1,900' E of Perry Rd | Fort Mt, Plunketts, fields | Bear Hill Rd |
| 20 | Bear Hill, past Plunkett's | Fort Mt, fields, scrub | Bear Hill Rd |
| 21 | Frangione's Hill Fields | hay fields | Main St |
| 22 | Town Library | Edgar Reed's farm, Fort Mt | Town Library |
| 23 | Main St, east of library | Edgar Reed's farm, Parker/Fort Mt | Main St |
| 24 | Main St, south of library | Suncook Valley, Reed's & Frangione's | Main St |
| 25 | Main St @ cemetery | pasture, farm pond, Suncook River valley | Main St |
| 26 | Depot St Bridge, south | Suncook River | Depot St |
| 26-2 | Depot St Bridge, north | Suncook River, Thunder bridge | Depot St |
| 27 | Carpenter Park Snack Shack | ball fields, Suncook River floodplain | Bear Hill Rd |
| 28 | Town Canoe Launch | Suncook River floodplain | Route 28 |
| 29 | MacCleery Fields | alfalfa fields, Suncook River floodplain | Route 28 |
| 30 | Webster Mills Rd | hayfields, Suncook River | Webster Mills Rd |
| 31 | Webster Mills Bridge, W to N | hayfields, Suncook River | Webster Mills Rd |
| 31-2 | Webster Mills Bridge, E | hayfields, Suncook River | Webster Mills Rd |
| 32 | Pleasant St @ Cemetery | pastures, farm, Parker & Fort Mts | Pleasant St |
| 33 | Pleasant St @ Jones' farm | pastures, Jones farm, Parker Mt | Pleasant St |
| 34 | Pleasant St @ Big Barn | cornfield, Parker Mt | Pleasant St |
| 35 | Kaime Rd @ Ring Rd | wooded hills | Kaime Rd |
| 36 | Blackman | Stone wall "fort", Suncook River valley | Blackman Rd |
| 37 | Lynnfield Pond Ledges | Pond, wetlands | Center Rd |
| 38 | Marsh Pond | Pond, wetlands | Main St |
| 39 | Main St Field | Pasture, woods, Suncook River valley | Main St |
| 40 | Towle Rd | Pond, pasture | Towle Rd |
| 41 | Lane Rd, 420'S HorseCrnRd | Pond, pasture | Lane Rd |
| 42 | Leavitt Rd, 1730'S Short Falls Rd | Great blue heron rookery | Leavitt Rd |
| 43 | Leavitt Rd, 650'E Garvin Hill Rd | Fort Mt, other hills | Garvin Hill Rd |
| 44 | Garvin Hill Rd | Pond, hill, pasture, historic hotel | Garvin Hill Rd |

### Scenic Roads

| ID | Name | Type | Extent | Description |
|---|---|---|---|---|
| A | Towle Rd | state-designated scenic byway | Horse Corner Rd to end | stone walls, woods, fields |
| B | Blackman Rd | designated by town vote | Shortfalls to Davis Rd | stone walls, stone bridge, pasture, Parker Mt view |
| C | Garvin Hill Rd | designated by town vote | Horse Corner Rd to end | stone walls, woods, fields, spectacular view from Garvin Hill |
| D | Webster Mills Rd | other scenic local roads | Viewpoint 30 to Suncook bridge | spectacular views of Suncook River & surrounding fields & woods |
| E | Main Street | other scenic local roads | Center Rd to viewpoint 21 | fields, Marsh Pond, spectacular view of Frangione/Reed Farm, Suncook valley |
| F | Canterbury Rd | other scenic local roads | Main St to 200' west of viewpoint 8 | pastures, farm houses & barns |
| G | Bear Hill Rd - West | other scenic local roads | Durgin Rd to Ferrin Rd | spectacular views of Fort Mt, Garvin's & Plausawa Hills, fields, Lynnfield Pond |
| H | Bear Hill Rd - East | other scenic local roads | 1,900' east of Perry Rd jct to Rt 28 | spectacular views of Fort Mt & fields |
| I | Lane Rd | other scenic local roads | Horse Corner to Hutchinson | farm houses, barns, horse pastures |
| J | Pleasant St | other scenic local roads | Cemetery to edge of map 10 lot 9 | farm houses, barns, cow pastures |
| K | West Rd | other scenic local roads | Staniels Rd to end | hay fields, farm house, views to west |
| L | Depot St | other scenic local roads | Route 28 to Epsom | Thunder Bridge, historical building, Suncook River |

### VIEWSHED ANALYSIS

A viewshed analysis identifies the areas on a surface that are visible from one or more observation points. It answers questions such as, "What can I see from these locations?" or in the case of this Chichester study, "What areas are visible from one or more of the designated viewpoints?"

Viewsheds are delineated by determining the visibility between locations and this is accomplished by using what's called a digital elevation model (DEM). DEMs contain elevation values of the land's surface in a grid-based data format where each cell in the grid has a specific elevation value. A GIS-based viewshed analysis utilizes the DEM to examine lines of sight from designated viewpoints and determines which grid cells or areas are visible from that viewpoint based on the topography or lay of the land (as defined by the DEM).

When multiple viewpoints are included in the viewshed analysis, the "viewable" lands are identified and assigned visibility values which can be considered a measure of that area's scenic resource value. Those areas assigned a value of zero are not visible from any observation point and may therefore be considered to have low scenic value. Those assigned values greater than zero can be seen by that many points and therefore have a higher scenic resource value. This map displays these visibility values in increasing shades of color with the darker shades representing the higher scenic resource areas that are visible from more viewpoints.

Scale - 1:24,000

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

# *Scenic Resources*

Prepared by the Society for the Protection of NH Forests - July 2003


SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

*GIS Services*
*54 Portsmouth Street, Concord, NH 03301*
*(603) 224 - 9945 www.spnhf.org*

# Town of Chichester

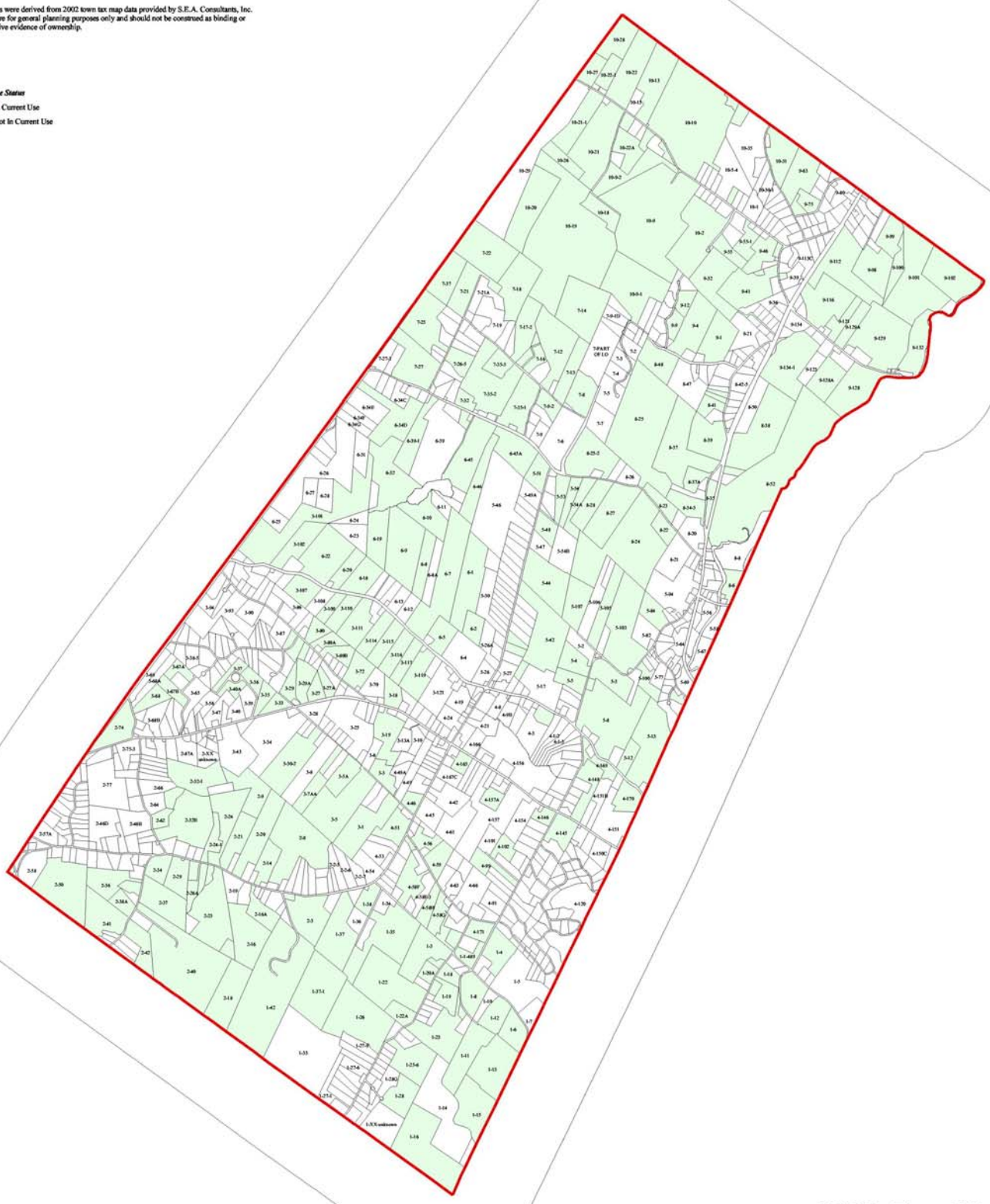
*New Hampshire*

Lot lines were derived from 2002 town tax map data provided by S.E.A. Consultants, Inc. These are for general planning purposes only and should not be construed as binding or conclusive evidence of ownership.

**KEY**

***Current Use Status***

- In Current Use
- Not In Current Use



## *2002 Tax Map*

Prepared by the Society for the Protection of NH Forests - July 2003

2000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

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# Town of Chichester
*New Hampshire*

**KEY**

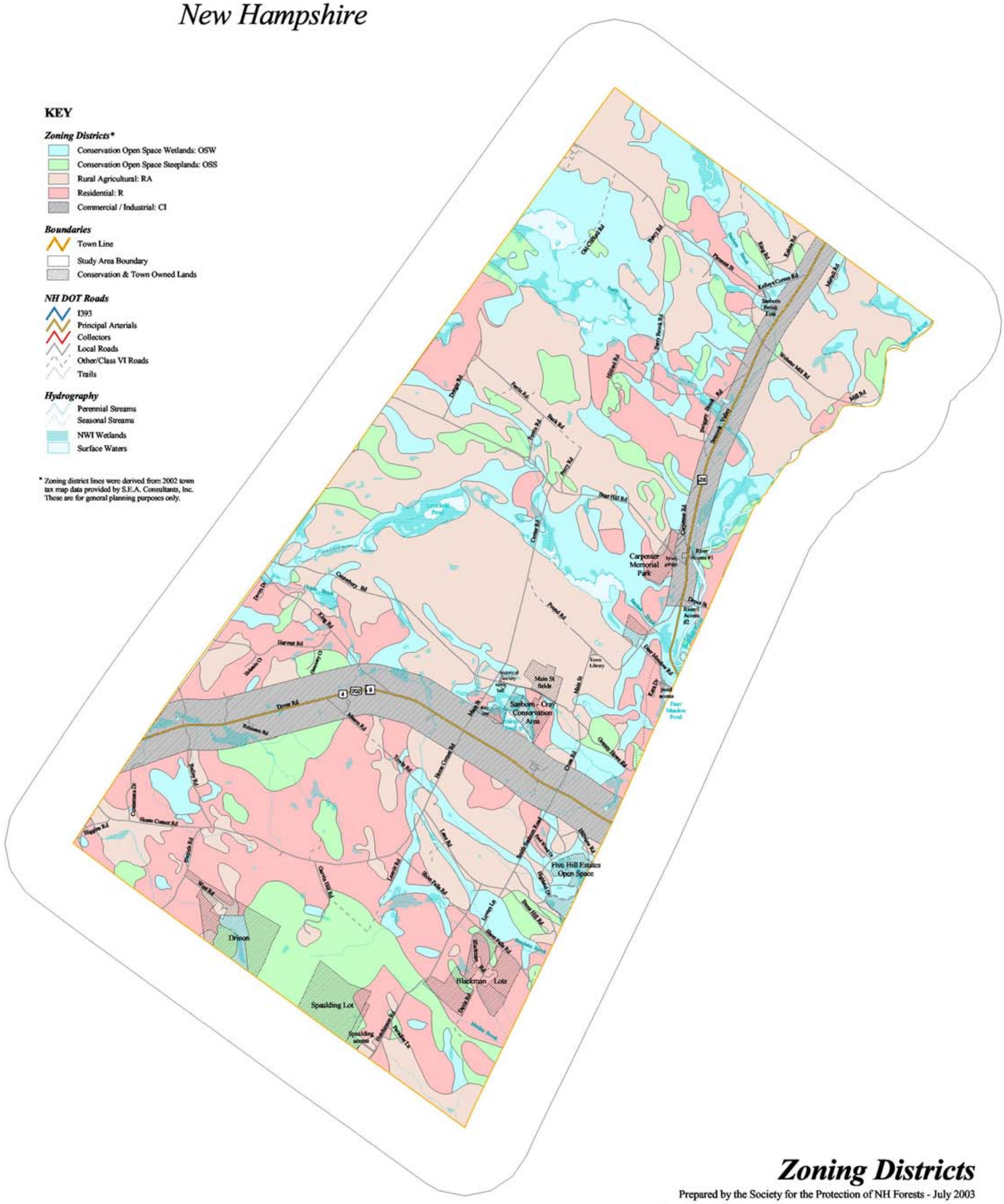
***Zoning Districts****
- Conservation Open Space Wetlands: OSW
- Conservation Open Space Steeplands: OSS
- Rural Agricultural: RA
- Residential: R
- Commercial / Industrial: CI

***Boundaries***
- Town Line
- Study Area Boundary
- Conservation & Town Owned Lands

***NH DOT Roads***
- I393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails

***Hydrography***
- Perennial Streams
- Seasonal Streams
- NWI Wetlands
- Surface Waters

* Zoning district lines were derived from 2002 town tax map data provided by S.E.A. Consultants, Inc. These are for general planning purposes only.




## *Zoning Districts*

Prepared by the Society for the Protection of NH Forests - July 2003

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**Table 7: Co-occurrence Model Factors**

| | |
|---|---|
| **Habitat Factors:** | |
| Unfragmented Lands (> 1000 acres) | 1 point |
| NWI wetlands | 1 |
| Undeveloped Riparian Zones | 1 |
| Topographic Passpoints | 1 |
| Ridgeline Corridors | 1 |
| Wetland Buffers (100 feet) | 1 |
| Early Successional Habitat | 1 |
| Agricultural Lands | 1 |
| Deer Yards | 1 |
| South Slopes (> 10%) | 1 |
| Steep Slopes (> 35%) | 1 |
| | |
| **Water Resource Factors:** | |
| Sanitary Radii (active wells only) | 1 point |
| Potentially Favorable Gravel Well Areas | 1 |
| Drinking Water Protection Areas | 1 |
| Stratified Drift Aquifer (max. transmissivity ≥ 1000 $ft^2$/day) | 1 |
| 100-year Flood Zones | 1 |
| | |
| **Scenic Resource Factors:** | |
| Viewsheds; Visible from 5-10 Viewpoints | 1 point |
| Viewsheds; Visible from 11-18 Viewpoints | 2 |
| Viewpoint Vicinity Areas | 2 |
| Scenic Roads (500' Buffers) | 2 |

The theoretical maximum score for any particular location is twenty- two (22) (i.e. all factors occur at that location). In the case of Chichester, the maximum score was actually ten (10), so no location contained all of the factors. To some extent this is due to the fact that certain classes are mutually exclusive. For instance, there is no overlap between ridge-line corridors and pass-points. Also, some layers are limited in geographic extent (e.g. sanitary radii) and are thus less likely to overlay with other factor.

*Figure 1: Co-occurrence Values by Acreage* shows the relative area of each co-occurrence value. According to this model about one quarter of the town has no resource values (value = 0), while the very highest values have relatively small acreage. For this study, values 4 through 10 are considered the top values – about 8% of the town's total acreage (or about 1,017.9 acres). The top 20% high value areas by acreage are where values ≥ 3.

**Figure 1: Co-occurrence Values by Acreage**

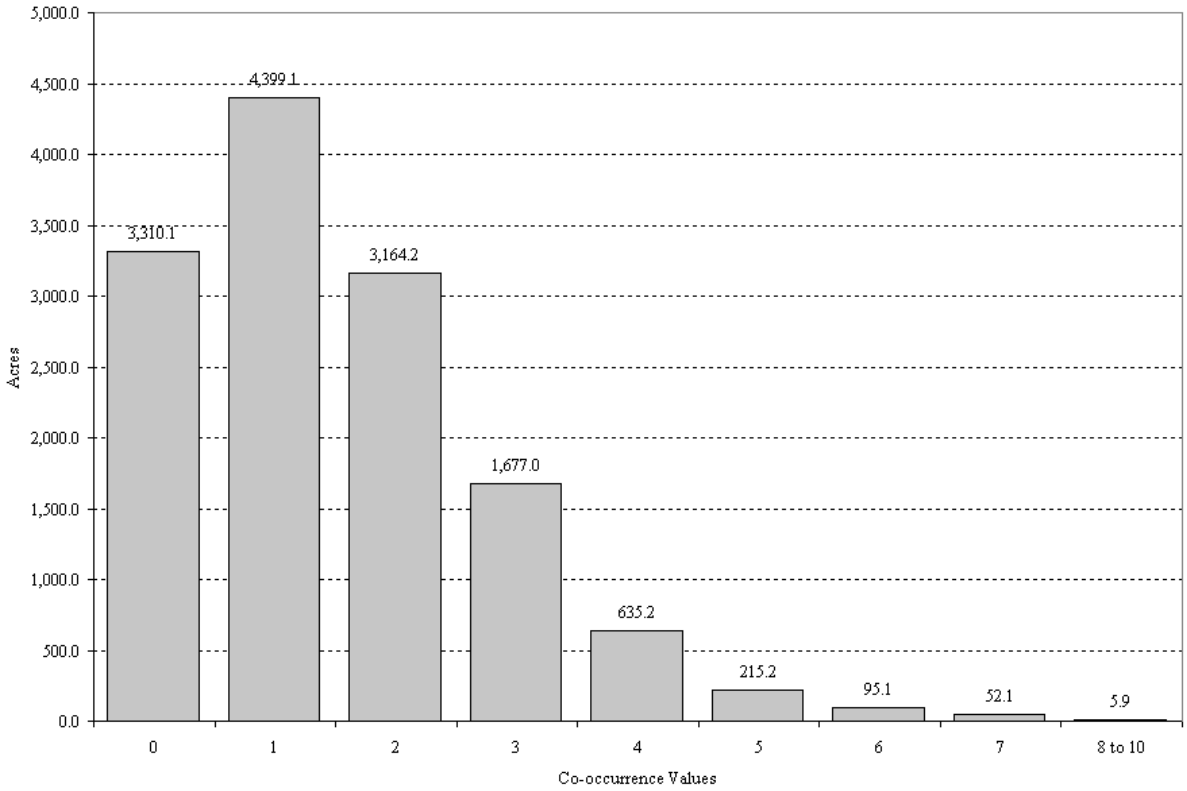
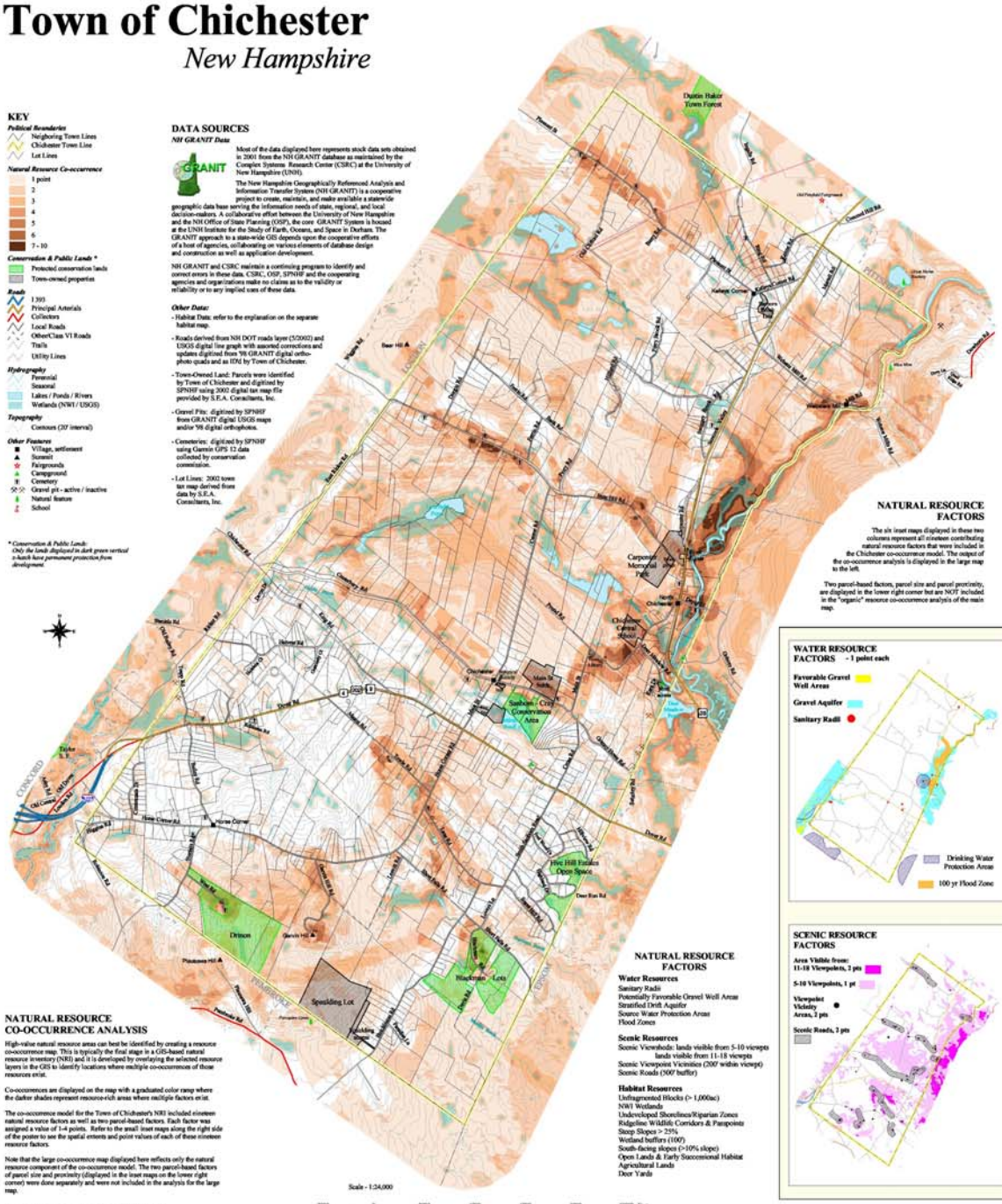



*Figure 2: High-Value Co-occurrence Areas* highlights those high value areas spatially. The largest concentration of high value areas is along the Suncook River floodplain. All subtotals (scenic, wildlife, and water resource) have high values here, making this a high priority area. Other areas of concentration can be seen around the Perry Brook Pond, Lynxfield Pond, and in a few isolated patches in the southern part of town. The Perry Brook and Lynxfield Pond regions are driven largely by wildlife habitat values. Wetlands, open/early successional lands, and deer yards abound here. The high value areas to the south are driven partially by wildlife habitat values, particularly upland features like ridge-line corridors and unfragmented blocks, and also by significant scenic values.

In addition to this "organic" version, a parcel based co-occurrence analysis was carried out. This analysis is described in the Conservation Planning section, page 38.

# Town of Chichester

*New Hampshire*




## KEY

***Political Boundaries***
- Neighboring Town Lines
- Chichester Town Line
- Lot Lines

***Natural Resource Co-occurrence***
- 1 point
- 2
- 3
- 4
- 5
- 6
- 7 - 10

***Conservation & Public Lands ****
- Protected conservation lands
- Town-owned properties

***Roads***
- 1 393
- Principal Arterials
- Collectors
- Local Roads
- Other/Class VI Roads
- Trails
- Utility Lines

***Hydrography***
- Perennial
- Seasonal
- Lakes / Ponds / Rivers
- Wetlands (NWI / USGS)

***Topography***
- Contours (20' interval)

***Other Features***
- Village, settlement
- Summit
- Fairgrounds
- Campground
- Cemetery
- Gravel pit - active / inactive
- Natural feature
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***Other Data:***
- Habitat Data: refer to the explanation on the separate habitat map.
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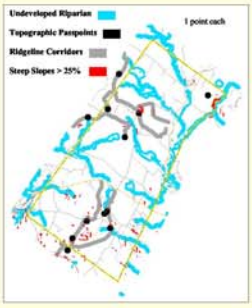
- Cemeteries: digitized by SPNHF using Garmin GPS 12 data collected by conservation commission.
- Lot Lines: 2002 town tax map derived from data by S.E.A. Consultants, Inc.

## NATURAL RESOURCE FACTORS

The six inset maps displayed in these two columns represent all nineteen contributing natural resource factors that were included in the Chichester co-occurrence model. The output of the co-occurrence analysis is displayed in the large map to the left.

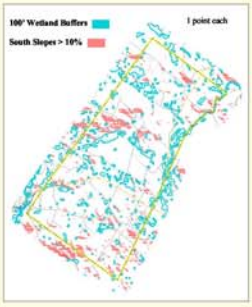
Two parcel-based factors, parcel size and parcel proximity, are displayed in the lower right corner but are NOT included in the "organic" resource co-occurrence analysis of the main map.

### WILDLIFE HABITAT FACTORS - 1 point each



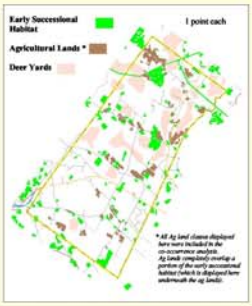

### WATER RESOURCE FACTORS - 1 point each




### SCENIC RESOURCE FACTORS




** All Ag land classes displayed here were included in the co-occurrence analysis. Ag lands completely overlap a portion of the early successional habitat (which is displayed here underneath the ag lands).*

## NATURAL RESOURCE FACTORS

**Water Resources**
- Sanitary Radii
- Potentially Favorable Gravel Well Areas
- Stratified Drift Aquifer
- Source Water Protection Areas
- Flood Zones

**Scenic Resources**
- Scenic Viewsheds: lands visible from 5-10 viewsets
- lands visible from 11-18 viewsets
- Scenic Viewpoint Vicinities (300' within viewpt)
- Scenic Roads (300' buffer)

**Habitat Resources**
- Unfragmented Blocks (> 1,000ac)
- NWI Wetlands
- Undeveloped Shorelines/Riparian Zones
- Ridgeline Wildlife Corridors & Passpoints
- Steep Slopes > 25%
- Wetland buffers (100')
- South-facing slopes (>10% slope)
- Open Lands & Early Successional Habitat
- Agricultural Lands
- Deer Yards

Scale - 1:24,000

3000 0 2000 4000 6000 8000 10000 Feet

1 0 1 2 Miles

## NATURAL RESOURCE CO-OCCURRENCE ANALYSIS

High-value natural resource areas can best be identified by creating a resource co-occurrence map. This is typically the final stage in a GIS-based natural resource inventory (NRI) and it is developed by overlaying the selected resource layers in the GIS to identify locations where multiple co-occurrences of those resources exist.

Co-occurrences are displayed on the map with a graduated color ramp where the darker shades represent resource-rich areas where multiple factors exist.

The co-occurrence model for the Town of Chichester's NRI included nineteen natural resource factors as well as two parcel-based factors. Each factor was assigned a value of 1-4 points. Refer to the small inset maps along the right side of the poster to see the spatial extents and point values of each of these nineteen resource factors.

Note that the large co-occurrence map displayed here reflects only the natural resource component of the co-occurrence model. The two parcel-based factors of parcel size and proximity (displayed in the inset maps on the lower right corner) were done separately and were not included in the analysis for the large map.

## CO-OCCURRENCE SUBTOTALS

The co-occurrence analysis generated a total natural resource co-occurrence score by adding the values of all nineteen natural resource factors. Subtotals were also calculated based on the contributions of the scenic resource, water resource, or habitat resource components of this total. The first two of the smaller inset maps displayed to the right represent subtotals for the habitat component and the water resource component.

HABITAT SUBTOTAL = Unfragmented Blocks + NWI Wetlands + Undeveloped Riparian Zones + Ridgeline Wildlife Corridors + Ridgeline Wildlife Passpoints + Steep Slopes > 25% + South Facing Slopes > 10% + 100' Wetlands Buffers + Agricultural Lands + Open Lands & Early Successional Habitat + Deer Yards

The darker green areas may be particularly important from the standpoint of protecting wildlife habitat.

WATER RESOURCE SUBTOTAL = Drinking Water Protection Areas + Gravel Aquifer + Potentially Favorable Gravel Well Areas + Sanitary Radii + Flood Zones

The darker blue areas are particularly important from the standpoint of protecting drinking water supplies

## PARCEL-BASED FACTORS

The two parcel-based factors included parcel size and parcel proximity to existing conservation lands or other town open space. These are displayed in the third and fourth inset maps on the far right corner.

PARCEL SIZE FACTOR

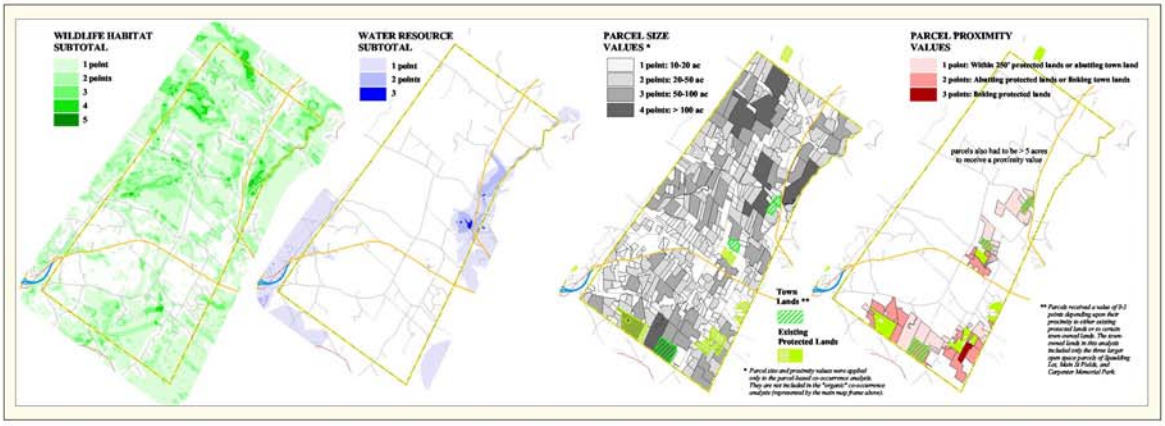
The third inset map to the right displays the larger parcels in darker shades of gray based on the following point values:

| | |
|---|---|
| 0-10 acres: | 0 points |
| 10-20 acres: | 1 point |
| 20-50 acres: | 2 points |
| 50-100 acres: | 3 points |
| > 100 acres: | 4 points |

PARCEL PROXIMITY FACTOR

Parcels were also assigned a value of 0-3 points depending upon their proximity either to existing protected lands or to certain town-owned lands. The town-owned lands included in this analysis were the three larger open space parcels of Spaulding Lot, Main Street Fields, and Carpenter Memorial Park.

The darker red parcels shown in the inset map on the far right corner are particularly important from the standpoint of building onto and linking existing protected parcels with the goal of establishing larger contiguous blocks of protected land.




CHICHESTER CONSERVATION COMMISSION

***Map Disclaimer***

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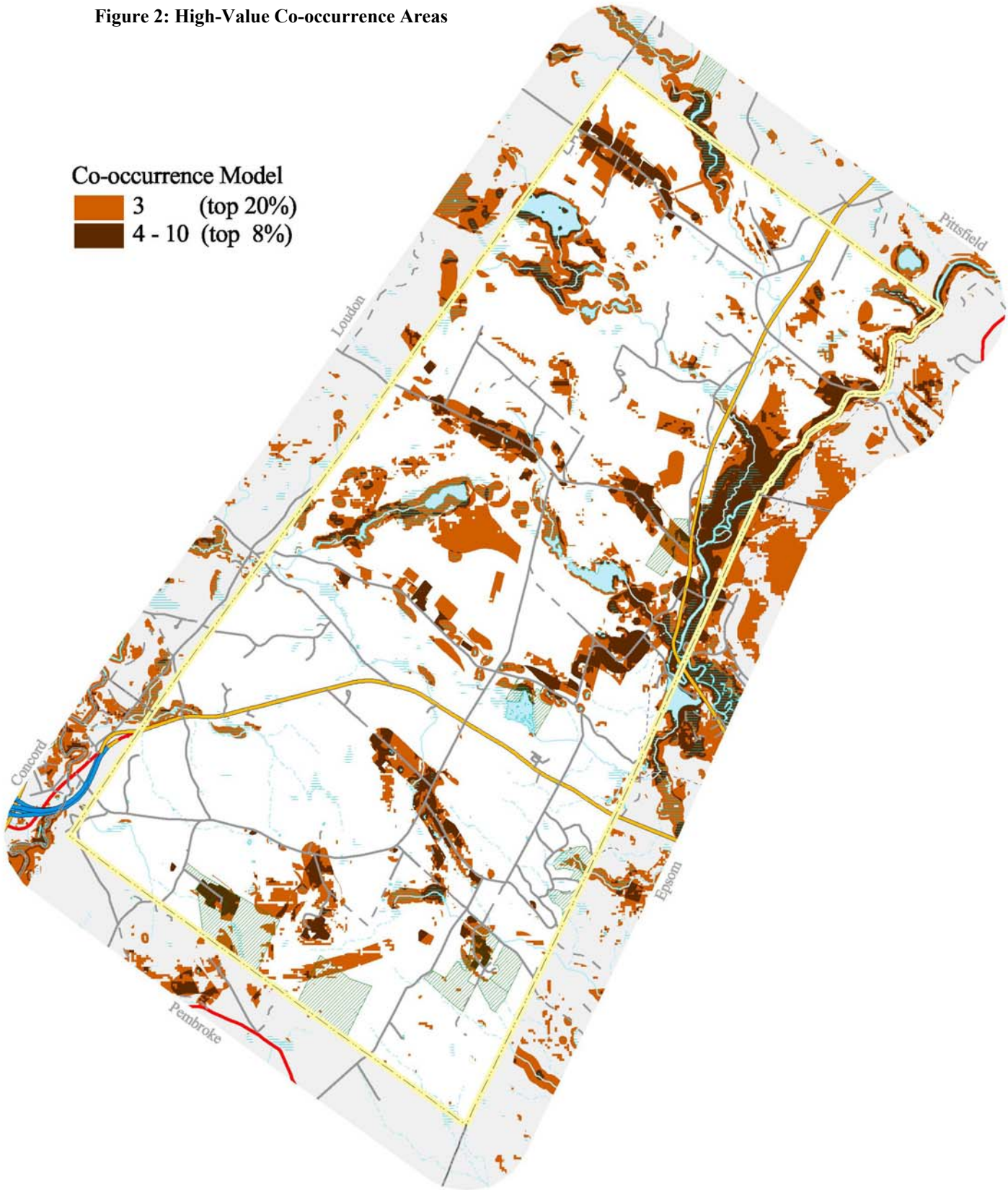
# *Natural Resource Co-occurrence*

Prepared by the Society for the Protection of NH Forests - July 2003

*GIS Services, 54 Portsmouth Street, Concord, NH 03301*
*(603) 224 - 9945 www.spnhf.org*

SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS

**Figure 2: High-Value Co-occurrence Areas**



## *FINDINGS*

This section reports on several specific areas of the study's findings:

1. In the interest of wildlife protection and preservation, lands in Chichester which have high potential for habitat-based conservation will be discussed. The discussion will focus on linkages between these newly identified lands and existing conservation lands both in Chichester and in surrounding towns.
2. In thinking ahead towards the next master planning process the relationship between the natural resources of Chichester is examined with respect to current master plan goals and zoning regulations.
3. A strategy for the use of this natural resource inventory for conservation and community planning purposes is proposed.

### Wildlife Habitat Management

*Figure 3: Habitat Co-occurrence Subtotal* shows high value wildlife habitat areas. The eleven factors in the habitat co-occurrence analysis include:

- Unfragmented Lands (> 1000 acres)
- NWI wetlands
- Undeveloped Riparian Zones
- Topographic Passpoints
- Ridgeline Corridors
- Wetland Buffers (100 feet)
- Early Successional Habitat
- Agricultural Lands
- Deer Yards
- South Slopes (> 10%)
- Steep Slopes (> 25%)

These eleven factors are combined in the subtotal to estimate areas of exemplary wildlife habitat in Chichester.

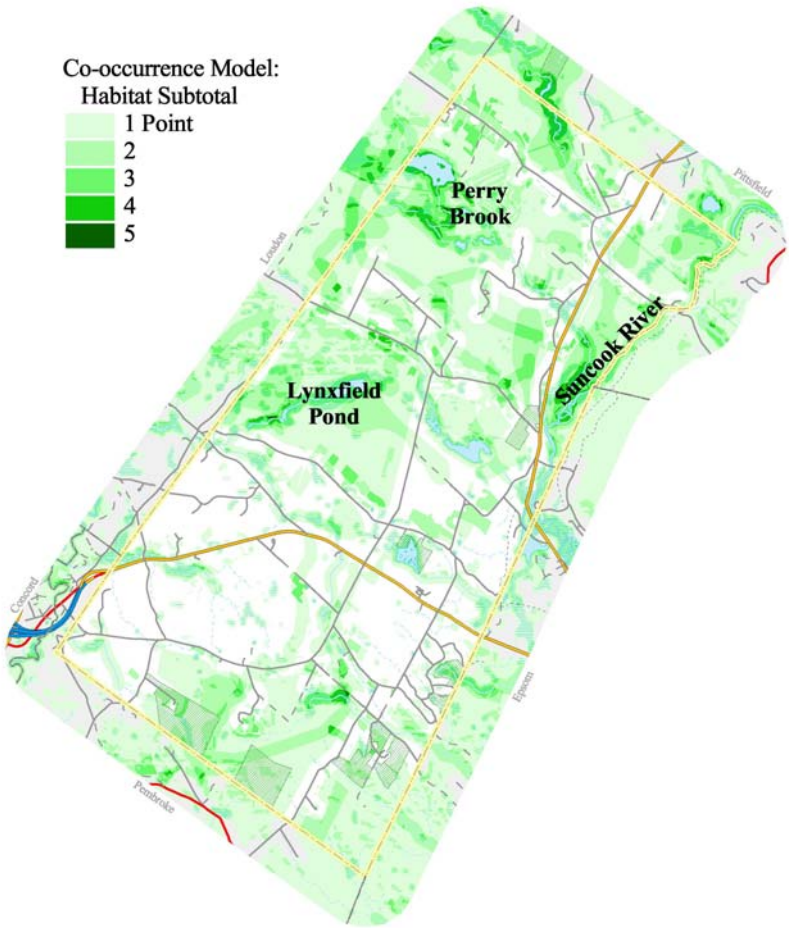
Three potential wildlife management strategies are outlined here. First, the potential to connect protected lands in Chichester is assessed. Next, focus areas are proposed for wildlife habitat conservation. Finally, connecting exemplary wildlife habitat in Chichester with protected lands in surrounding towns is assessed.

In the south-eastern corner of Chichester there are several conserved and town-owned parcels: the Drinon, Spaulding, and Blackman lots. While the Spaulding lot is not a protected lot, it is town owned and in natural land cover, and as such should be a priority for conservation status. As it is calculated in this co-occurrence model, these lots have moderate wildlife habitat quality. However, these existing lots are separated by only a few lots, and there are many undeveloped and large lots surrounding them. While this might not have otherwise been a priority habitat area, the established conservation network here is an obvious place to begin work. Despite the moderate habitat quality here, protection of these upland lots does have the potential to protect forest resources and travel corridors, and to connect upland habitat with wetland areas.

*Figure 3: Habitat Co-occurrence Subtotal* shows three proposed focus areas for wildlife habitat conservation. The first, "Lynxfield Pond" centers on the large

unfragmented block (1,157 acres) surrounding the Lynxfield Pond wetlands complex. This area includes virtually all of the habitat factors in concentration, including wetlands and their associated qualities, as well as upland factors such as steep slopes and ridgeline corridors. This focus area is also connected to other areas with potential exemplary wildlife habitat through undeveloped riparian zones and ridgelines.

**Figure 3: Habitat Co-occurrence Subtotal**




The second focus area, "Suncook River", falls in the Suncook River floodplain near the Pittsfield / Epsom border. This focus area features primarily wetland / floodplain habitat features and is part of a large unfragmented block (2,194 acres) extending into Epsom. A significant portion of this area is agricultural / open land, an increasingly rare habitat type in New Hampshire. Again, many travel corridors lead to and from this area in riparian zones and large areas of undeveloped land. *Linkages and protection possibilities should be pursued with the town of Epsom.*

The third and potentially most significant focus area is "Perry Brook". It falls on the largest of the unfragmented land blocks in Chichester (4,108 acres) and features large wetland complexes, open and early successional lands, and multiple travel corridors.

Linking wildlife habitat in Chichester with surrounding towns, and particularly with protected lands may be challenging, largely because there is little conserved land within or around Chichester (see *Figure 4: Conservation and Public Lands Near Chichester, NH*). One opportunity exists with the Five Hill Estates Open Space, a conservation property largely isolated from others in Chichester but is adjacent to good wildlife habitat in Epsom. This is a potentially noteworthy fact for conservation groups working in Epsom.

The most notable potential for linking habitat lies in the Sanborn Brook unfragmented block, which falls within the towns of Chichester, Loudon, and Pittsfield. According to the co-occurrence analysis, this block has significant wildlife habitat extending into all three towns along Sanborn Brook. The potential exists for Chichester to work with the surrounding towns to connect Pleasant Street with the Osborn Wildlife Management Area complex (which includes state and municipally owned lands). Resource values are high here and justify efforts at cooperation.

Wildlife habitat preservation ideally should be carried out on a landscape scale. This involves regional planning and thinking beyond town boundaries. As such, the ideal partner for this kind of work is the Central New Hampshire Regional Planning Commission (CNHRPC). Drawing on CNHRPC expertise and experience with other municipal officials will allow Chichester Conservation Commission members to build relationships with their cohorts in surrounding towns.

**Figure 4: Conservation and Public Lands Near Chichester, NH**

## Land-use and Natural Resources

This portion of the report focuses on Chichester's current planning goals. The issue addressed here is Chichester's land use practices (town development objectives and zoning) versus natural resource occurrence.

Currently, Chichester can be considered a relatively rural town. However, housing demand is increasing and resource-based use of the land is decreasing. Most of the town is forested or in natural land cover, with significant potential for development. Guiding development and conservation in concert will be of critical importance to Chichester in the coming decades.

The 1997 Master Plan presents some general goals which are relevant to this natural resource inventory. In addition to facilities improvements, business is to be encouraged along the route 4 / 9 / 202 and 28 corridors, while housing is to be encouraged outside of this zone. Perhaps more apropos, based on various 1990s surveys of Chichester residents, a clear desire emerged to maintain the rural character of the town. This is to be achieved through maintaining the resource-based zoning ordinance and through careful scrutiny of proposed subdivisions.

This desire to maintain rural character is widespread in New Hampshire, but often does not benefit from financial or political support. Chichester on the other hand has a relatively progressive zoning ordinance which has the potential to maintain rural character while balancing industrial and residential development with the traditional forestry and agricultural practices and natural areas. Since 1978, zoning has been based largely on development potential as determined by soils and topography.

The Master Plan makes some specific recommendations with regard to natural resource conservation. According to the plan, areas considered for conservation should aim to protect:

- productive forest soils
- prime wetlands
- shorelands
- aquifers
- scenic vistas
- active farmlands or areas with excellent agricultural potential
- drinking water supply

These goals parallel the structure of the natural resource co-occurrence model developed for this study, with the exception that the Master Plan does not address wildlife habitat protection (see **Co-occurrence Model**, page 20). In order to assess how well Chichester's major planning tool (i.e. zoning) matches with the town's natural resources, an analysis was carried out which compared resource co-occurrence values and zoning districts.

First, brief definitions of zoning districts will be given based on the town Master Plan and Zoning Ordinance publications. Five zones are defined in Chichester (see *Table 8: Zoning Districts* and *Figure 5: Zoning Districts*). **Open Space – Wetlands** (OSW; 2,991 acres) is designed to restrict development in order to protect wetland resources and is inclusive of major hydric soil groups. No residential development is allowed here, but agriculture, forestry, recreation, and wildlife management is allowed and encouraged.

**Open Space – Steeplands** (OSS; 1,592 acres) limits development on steep shallow soils with grades over 15%. Residential Development is allowed on less-steep slopes with 5 acre minimum lot size.

The **Rural-Agricultural** (RA; 4,475 acres) zone is another zone limiting development where shallow or hardpan soils are found; this zone is explicitly designed to "preserve the rural character of the community". Residential development is allowed in appropriate areas with a 5 acre minimum lot size.

The **Residential** (R; 3,222 acres) district is found on deep soils with less-steep slopes where residential development is easily facilitated. For single family homes, minimum lot size is 2 acres.

**Commercial – Industrial** (CI; 1,274 acres) district is found along the route 4 / 9 / 202 and 28 corridors. This district is designed to encourage business development to increase the tax base of the town while concentrating growth along travel corridors and thus minimize congestion.

**Table 8: Zoning Districts**

| Zoning District | Abbreviation | Acreage | % of Chichester |
|---|---|---|---|
| Commercial / Industrial | CI | 1,274 | 9.4 |
| Residential | R | 3,222 | 23.8 |
| Rural / Agricultural | RA | 4,475 | 33.0 |
| Open Space - Steep | OSS | 1,592 | 11.7 |
| Open Space - Wetland | OSW | 2,991 | 22.1 |

**Figure 5: Zoning Districts**

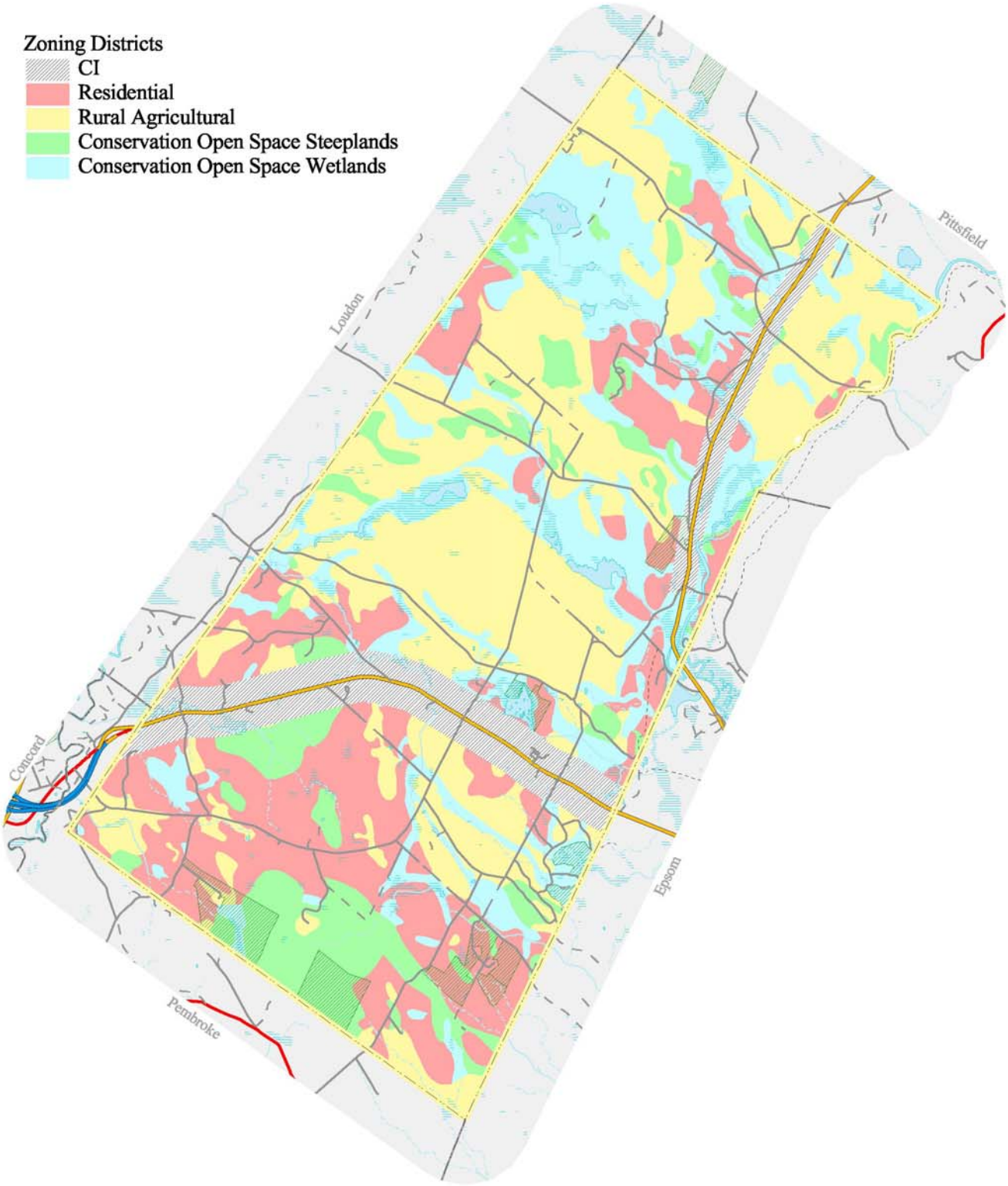


*Table 9, Co-occurrence Value Acreage by Zoning District* and *Table 10: Zoning District Acreage by Co-occurrence Value* summarize and compare the natural resource composition of each zoning district by examining the acreage of each co-occurrence value. The two tables display the data in different ways: *Table 9* expresses the composition of each zoning district by co-occurrence values; *Table 10* displays each co-occurrence value and how it occurs over zoning districts.

The information in *Table 9* points to the wisdom of a natural resource based zoning scheme; looking at the relative co-occurrence values (i.e. percent of district acreage; the gray columns) one sees that the zones where more intensive development is allowed (i.e. CI, R) have the largest percentages of 0 resource values and the smallest percentages of high resource values (i.e. 2 through 10). This might be better displayed in *Figure 6: Zoning District; Relative Natural Resource Values* where it can be seen that the relative co-occurrence concentrations are consistently lower in these two districts over high value areas. Perhaps more significantly, the data shows that the most conservation oriented district (OSW) consistently has the highest concentration of high co-occurrence value (i.e. 3 through 10). The other development-restrictive districts have relative natural resource concentrations more than twice that of CI and R.

**Table 9: Co-occurrence Value Acreage by Zoning District**

| Co-occurrence Value | Commercial / Industrial | | Residential | | Rural - Agricultural | | Open Space - Steep | | Open Space - Wetland | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 606.39 | 47.59% | 1,204.30 | 37.38% | 709.34 | 15.85% | 315.56 | 19.82% | 474.54 | 15.87% |
| 1 | 379.97 | 29.82% | 1,069.12 | 33.18% | 1,516.11 | 33.88% | 571.61 | 35.90% | 862.30 | 28.83% |
| 2 | 167.23 | 13.12% | 565.23 | 17.54% | 1,262.89 | 28.22% | 393.61 | 24.72% | 775.25 | 25.92% |
| 3 | 74.79 | 5.87% | 230.61 | 7.16% | 635.59 | 14.20% | 221.08 | 13.88% | 514.92 | 17.22% |
| 4 | 25.50 | 2.00% | 100.34 | 3.11% | 231.01 | 5.16% | 48.13 | 3.02% | 230.25 | 7.70% |
| 5 | 12.61 | 0.99% | 35.22 | 1.09% | 83.57 | 1.87% | 20.38 | 1.28% | 63.44 | 2.12% |
| 6 | 4.30 | 0.34% | 11.99 | 0.37% | 27.78 | 0.62% | 13.36 | 0.84% | 37.70 | 1.26% |
| 7 | 2.55 | 0.20% | 4.22 | 0.13% | 7.39 | 0.17% | 7.02 | 0.44% | 30.97 | 1.04% |
| 8 | 0.68 | 0.05% | 0.42 | 0.01% | 1.19 | 0.03% | 0.77 | 0.05% | 1.10 | 0.04% |
| 9 | 0.16 | 0.01% | 0.32 | 0.01% | 0.00 | 0.00% | 0.83 | 0.05% | 0.45 | 0.01% |
| 10 | 0.00 | 0.00% | 0.03 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% |
| Total | 1,274.16 | 100.00% | 3,221.78 | 100.00% | 4,474.85 | 100.00% | 1,592.34 | 100.00% | 2,990.89 | 100.00% |
| | | | | | | | | | | |
| 3-10 (top 20%) | 120.58 | 9.46% | 383.13 | 11.89% | 986.51 | 22.05% | 311.57 | 19.57% | 878.81 | 29.38% |
| 4-10 (top 8%) | 45.79 | 3.59% | 152.52 | 4.73% | 350.93 | 7.84% | 90.49 | 5.68% | 363.90 | 12.17% |

**Figure 6: Zoning District; Relative Natural Resource Values**

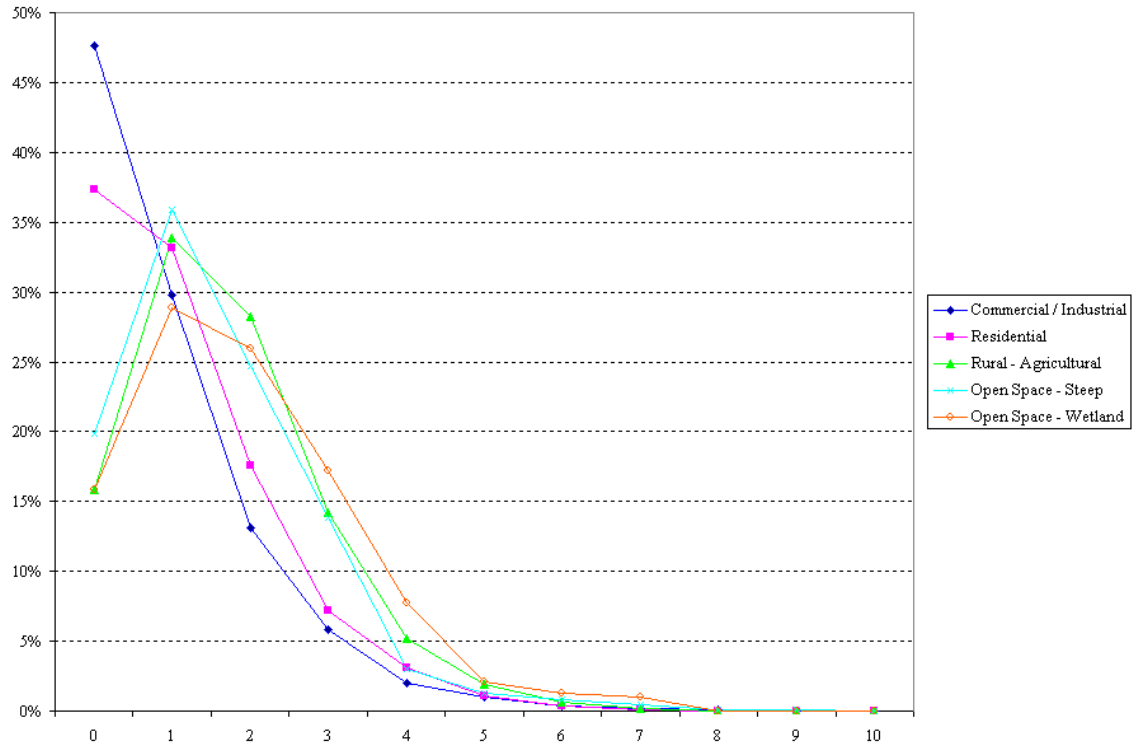



*Table 10: Zoning District Acreage by Co-occurrence Value* shows that low value areas fall largely over developable districts, and high value areas are concentrated in OSW and RA. Looking at the 0 resource areas (value = 0), one can see that more than half (55%) fall into CI and R, *whereas the more "conservation oriented" districts have lower relative percentages of this value*. Likewise, looking at the high value areas (values between 3 – 10 or the top 20%) it can be seen that RA and OSW encompass the majority of these areas. This can be seen graphically in *Figure 7: Relative Co-occurrence Values by Zoning District*.

What this suggests is that Chichester's zoning districts are generally compatible with natural resource use and preservation as they are estimated in this study. While significant higher value areas do exist within the more development-intensive zones (CI and R), relative concentrations are higher in the other zones.

*Figure 8: Zoning Districts and High Value Natural Resource Areas* shows where the high value co-occurrence values (≥3, shown in black) occur relative to zoning districts. One can see that certain large high-value areas coincide with the more development-oriented districts (CI, R, and to some extent RA); these areas are circled in Red on the map. Because natural areas in the CI and R districts are likely at greater risk of development than in other districts, they may warrant a higher priority for protection.

**Table 10: Zoning District Acreage by Co-occurrence Value**

| Zoning District | 0 | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commercial / Industrial | 606.39 | 18.32% | 379.97 | 8.64% | 167.23 | 5.29% | 74.79 | 4.46% | 25.50 | 4.01% | 12.61 | 5.86% |
| Residential | 1,204.30 | 36.38% | 1,069.12 | 24.30% | 565.23 | 17.86% | 230.61 | 13.75% | 100.34 | 15.80% | 35.22 | 16.36% |
| Rural / Agricultural | 709.34 | 21.43% | 1,516.11 | 34.46% | 1,262.89 | 39.91% | 635.59 | 37.90% | 231.01 | 36.37% | 83.57 | 38.83% |
| Open Space - Steep | 315.56 | 9.53% | 571.61 | 12.99% | 393.61 | 12.44% | 221.08 | 13.18% | 48.13 | 7.58% | 20.38 | 9.47% |
| Open Space - Wetland | 474.54 | 14.34% | 862.30 | 19.60% | 775.25 | 24.50% | 514.92 | 30.70% | 230.25 | 36.25% | 63.44 | 29.48% |
| Total | 3,310.11 | 100.00% | 4,399.10 | 100.00% | 3,164.21 | 100.00% | 1,676.98 | 100.00% | 635.22 | 100.00% | 215.20 | 100.00% |
| | | | | | | | | | | | | |
| **Zoning District** | **6** | | **7** | | **8-10** | | | | **3-10 (top 20%)** | | **4-10 (top 8%)** | |
| Commercial / Industrial | 4.30 | 4.52% | 2.55 | 4.89% | 0.84 | 14.14% | | | 120.58 | 4.50% | 45.79 | 4.56% |
| Residential | 11.99 | 12.60% | 4.22 | 8.08% | 0.77 | 12.96% | | | 383.13 | 14.29% | 152.52 | 15.20% |
| Rural / Agricultural | 27.78 | 29.20% | 7.39 | 14.17% | 1.19 | 20.03% | | | 986.51 | 36.80% | 350.93 | 34.97% |
| Open Space - Steep | 13.36 | 14.04% | 7.02 | 13.46% | 1.60 | 26.94% | | | 311.57 | 11.62% | 90.49 | 9.02% |
| Open Space - Wetland | 37.70 | 39.63% | 30.97 | 59.40% | 1.54 | 25.93% | | | 878.81 | 32.78% | 363.90 | 36.26% |
| Total | 95.12 | 100.00% | 52.15 | 100.00% | 5.94 | 100.00% | | | 2,680.61 | 100.00% | 1,003.63 | 100.00% |

**Figure 7: Relative Co-occurrence Values by Zoning District**

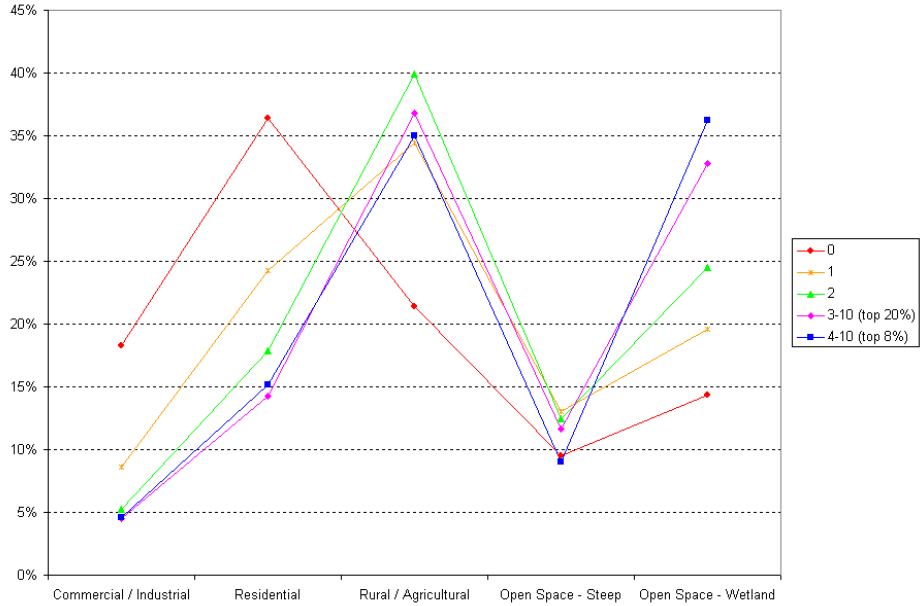
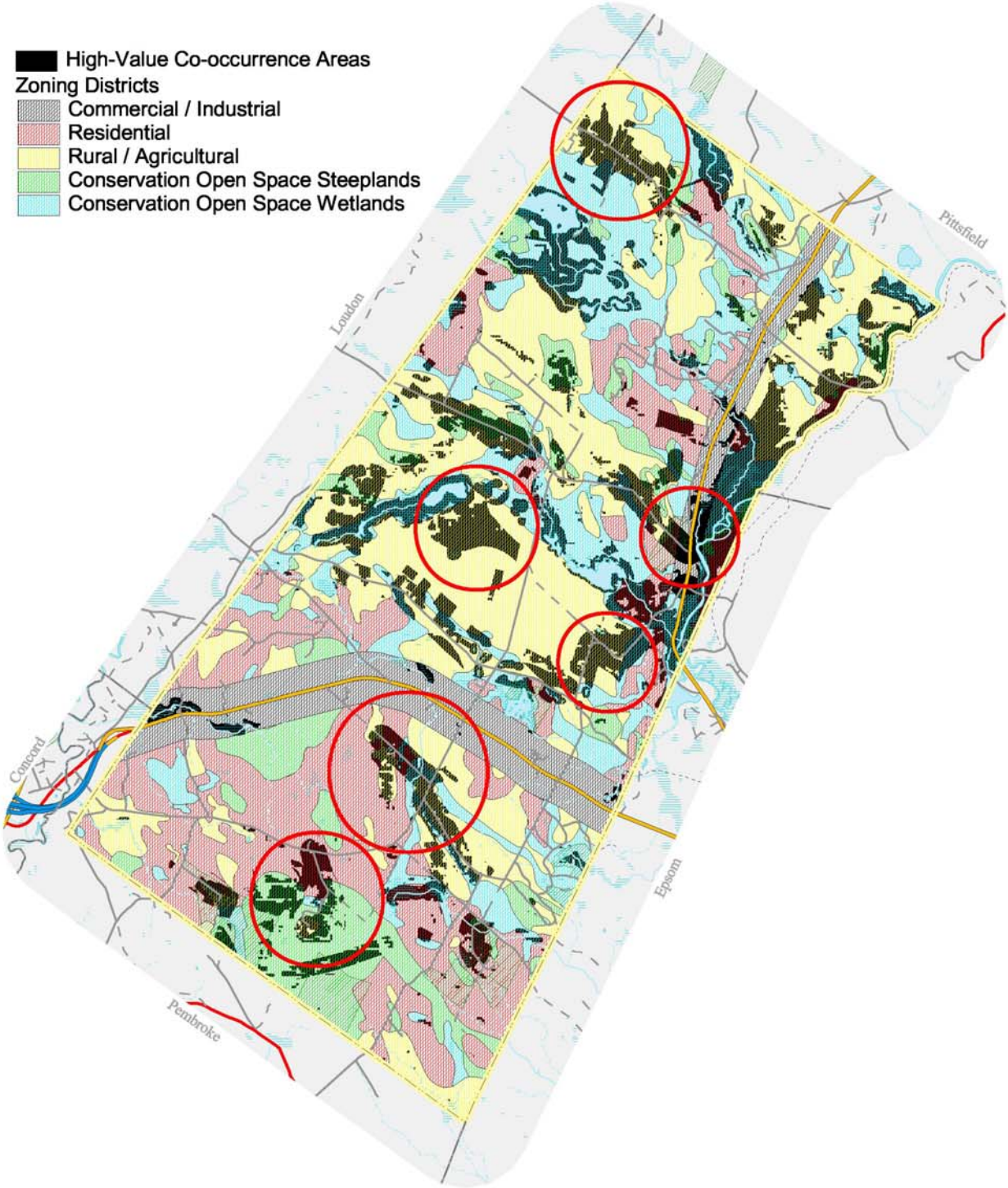


**Figure 8: Zoning Districts and High Value Natural Resource Areas**



## Conservation Planning

A major focus of this study has been to prioritize conservation efforts in the town. This section will lay out a conservation strategy based on the findings of the co-occurrence analysis. Two methods for prioritizing action are proposed:

1. First, based on organic co-occurrence values (i.e. values not tied to parcels), several regions have been set out as "*focus areas*". These will serve as a general guide for prioritizing conservation work and provide conservation "themes" for each part of town; that is, a specific purpose for each area such as water quality, wetlands protection, etc.
2. Also, a *parcel-based co-occurrence analysis* was carried out in parallel with the organic analysis. This method prioritizes individual tax parcels for conservation efforts based on its particular natural resource values, size, and proximity to conservation lands.

### *Focus Areas*

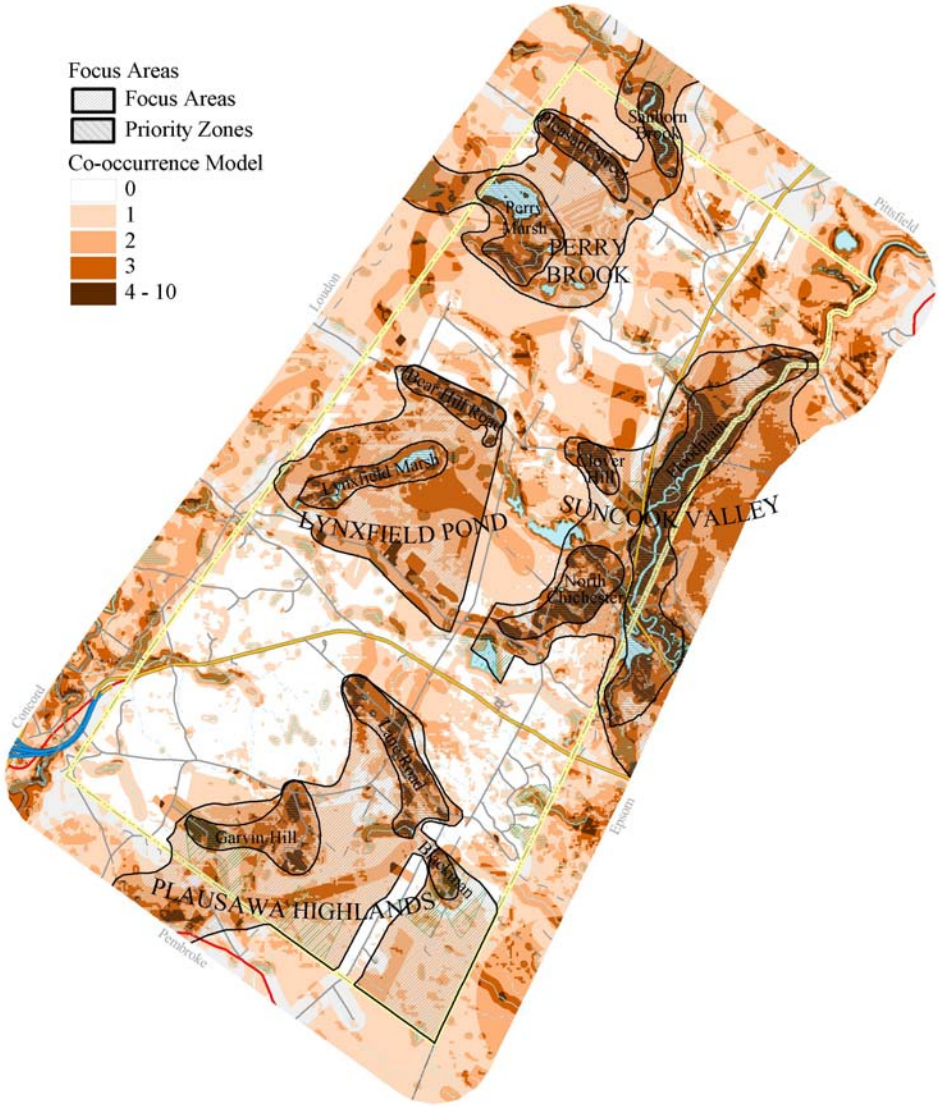
The natural resource co-occurrence values served as the basis for identifying "focus areas" and "priority areas". These areas are displayed in *Figure 9: Conservation Focus Areas*. Those areas with high resource values were manually selected and delineated through visual interpretation; in this case, no strict rules were used, but the location of the highest value areas (i.e. ≥ 4 points, or the top ~8% by acreage) formed the basis for the location of these four focus areas. The boundaries were then drawn based on the surrounding values of ≥ 3 points (the top ~20% by acreage). Other factors were considered in drawing the boundaries as well: some logical, such as roadways (used as boundaries) and obvious densely populated areas (omitted), some strategic, such as in the Plausawa Highlands focus area where resource values are low to moderate, but much conservation land exists with current projects underway.

In addition to the larger focus areas, more narrowly drawn "priority areas" are also delineated. These areas have the highest concentrations of values (generally clusters with scores of 4 or greater). These may be areas where greatest attention is given for conservation efforts. Also, they may serve as a way to focus field studies; this study uses generalized digital data to determine where high value natural resource areas are likely to be found. In some cases the conservation commission may want to do detailed investigation to find what specific qualities these areas hold (e.g. bird species survey, qualitative wetland studies, investigations for recreation potential).

Focus areas are loosely prioritized based on resource values. The Suncook Valley area has the highest concentration of high scoring areas, and as such rates as the highest priority focus area. The Perry Brook area also rates highly, with Lynxfield pond scoring similarly. The Plausawa Highlands area is ranked third. In the following sub-sections, the four areas will be described in more detail to give a qualitative sense for what is driving the co-occurrence values.

*The focus areas described here are one interpretation of the co-occurrence model used in this natural resource inventory. The boundaries and priorities should be considered as guiding not binding. In other words, the CCC should evaluate how well each area fits in with its mission and changing focus.*

**Figure 9: Conservation Focus Areas**




**Suncook Valley**

The Suncook River Valley has the highest concentration of high co-occurrence values. Factors from all categories combine to cause this. The "Floodplain" priority zone is unique in that it is the one floodplain / aquifer in Chichester. As such, the high-values are driven by floodplain, aquifer, potentially favorable gravel well area, and wetland factors. In addition, it is sitting on a large unfragmented land block where there are several agricultural fields which add to the agricultural and open lands scores.

The "North Chichester" priority zone, in addition to habitat values such as deer yards and early successional lands, has notable scenic qualities. Main Street (a designated scenic road) runs through this zone and several scenic viewpoints are found

here as well. This zone also contains a significant sensitive water resource area in the Chichester Central School wellhead protection area

The "Clover Hill" priority zone is driven by scenic factors to some extent as well as Bear Hill Road runs directly through it. Agricultural fields and open lands add to the habitat value of this area.

The Suncook Valley Region, according to this analysis, is exemplary in terms of wildlife habitat, water resources, and scenic values. This confluence of resource values will allow for a strong case for land conservation to be made here and will potentially allow numerous funding sources to be tapped.

The most valuable long term resource here may be the high-productivity aquifer. Chichester has no municipal water supply and no immediate plans or funding for town wells. As the population of this region grows, water resources will become increasingly stressed and potentially scarce. Protecting them now could be critical to the human and environmental health of the town. NH DES Water Supply grants may be a future option for funding[9].

The Suncook River aquifer is certainly a shared resource as it straddles the Epsom town line. Water supply protection and mutual wildlife habitat is a potential area for collaboration between the two towns here. In addition to collaboration between municipalities, several land trusts work in the region including the Bear-Paw Regional Greenways (Epsom and east), the Friends of the Suncook River, and the Five Rivers Conservation Trust.

**Perry Brook**

The Perry Brook focus area is centered around the large wetland complex in the north-west portion of the town and sits on the largest unfragmented block in the town. Wetland resources, undeveloped riparian zones, and open / early successional lands combine to form an area of high habitat value. In addition, scenic values make portions of this area aesthetically valuable.

The high-scoring "Perry Marsh" priority zone is driven largely by wetland factors such as NWI wetlands, wetland buffers, and undeveloped riparian zones. Habitat values are high here and on the "Sanborn Brook" priority area, where several large deer yards exist.

These two priority zones are additional areas where potential exists for collaboration with adjacent municipalities. The watersheds of each brook extend well into the neighboring towns, as does the Perry Brook unfragmented block. Migratory paths such as ridge line and stream corridors cross town lines, forming potential linkages between future conserved areas. The Osborn Wildlife Management Area (WMA) complex in Loudon and Pittsfield is a potential area for expansion for those towns and linking to the wildlife / agricultural complex of northwest Chichester is a potential future goal. The New Hampshire Department of Fish and Game is a potential partner here; open water and marsh-land is often a focus for WMA expansion and addition and rare wildlife habitat is a focus for the non-game division. Collaboration and investigation is a potential here[10].

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[9] Contact NH DES Land Acquisition Grants and Assistance program staff, Sarah Pillsbury (603) 271-1168. More information at http://www.des.state.nh.us/dwspp/ .

[10] http://www.wildlife.state.nh.us/ ; contact Beth McGuinn at (603) 271-2461.

The Pleasant Street priority zone is largely a scenic and agricultural zone. These two factors are consistent with the oft stated town goal of maintaining Chichester's rural character. Agricultural land protection is a potential strategy here. USDA Natural Resource Conservation Service administers the Farm and Ranchland Protection Program, whereby a property's status can be maintained as a working farm while being put under conservation. These grants are quite competitive but worth looking into[11]. Another potential agricultural conservation resource is the American Farmland Trust[12].

**Lynxfield Pond**

This focus area is similar in character to the Perry Brook area, though slightly more limited in extent. Habitat values lie at the heart of this locale, especially in the large wetland complex surrounding Lynxfield Pond.

The high resource value "Lynxfield Marsh" priority zone is largely driven by wetland factors; NWI wetlands, undeveloped riparian zones, etc. Deer yards and areas of south-facing and steep slopes criss-cross here as well. All of these factors' location on the 1000+ acre Lynxfield Pond unfragmented block make this another potential wildlife conservation project.

The focus area is also bounded by two designated scenic roads; Canterbury Road to the south and Bear Hill Road to the north. The buffers around these roads contain some of the highest resource values in the focus area. These highly visible "symbols" of Chichester's character may be used to generate support for conservation projects in the region.

**Plausawa Highlands**

This hilly region in the south part of town harbors the majority of the town's existing conservation acreage and significant potential exists for conservation linkage between town-owned parcels. The Spaulding lot, an un-protected, town-owned lot, is an obvious choice for protection. This would create a stable corner-stone for a conservation complex in the focus area.

Though natural resource values (as determined in this study) are moderate to low overall in this focus area, there are several high-value pockets which warrant consideration for conservation action. The Garvin Hill priority zone has some worthy wildlife habitat potential (again, field studies may confirm this notion and add detail to habitat information here) as well as some obvious scenic value. This is a well-known historic site which could easily garner public support. Also, there are several scenic vistas as well as scenic areas along Towle and Lane roads. These may be places to consider starting conservation projects.

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[11] http://www.nrcs.usda.gov/programs/fpp/
[12] http://www.farmland.org/

### *Parcel-Based Co-occurrence Analysis*

The final task critical to natural resource-based conservation planning is identifying target parcels. The co-occurrence modeling process can be taken a step beyond the "organic" combination of natural resource factors to a parcel-based approach. This method uses the organic natural resource values and extents and calculates acreage-weighted average values for each parcel. Two critical additional factors considered here are parcel size and proximity.

Six separate parcel-based co-occurrence maps were generated as part of this study. Each one describes a unique aspect of the total analysis. The first three are the same subtotals used in the organic co-occurrence model: wildlife habitat, water resources, and scenic resources. Each of these displays parcels which score highly for the particular subtotal. Generally speaking, the parcel-based approach matches the patterns of the organic co-occurrence model in each subtotal (this makes sense and is generally the case in studies of this type).

The map "Parcels Classified by Organic Resource Co-occurrence" describes the "raw" natural resource values of the parcel, without regard to the parcel-based factors of parcel size or proximity. This model also approximates the general pattern of the larger organic co-occurrence model.

Given that the time and effort put into each conservation project is often similar irrespective of size, a mode of prioritizing parcels must be used to maximize conservation efforts. The map "Parcels Classified by Parcel Size and Parcel Proximity" adds a new subtotal into this mix which scores parcels based on their acreage and proximity to protected conservation lands. Points were added to each parcel as follows:

- 10 – 20 acres 1 point
- 20 – 50 2
- 50 –100 3
- > 100 4

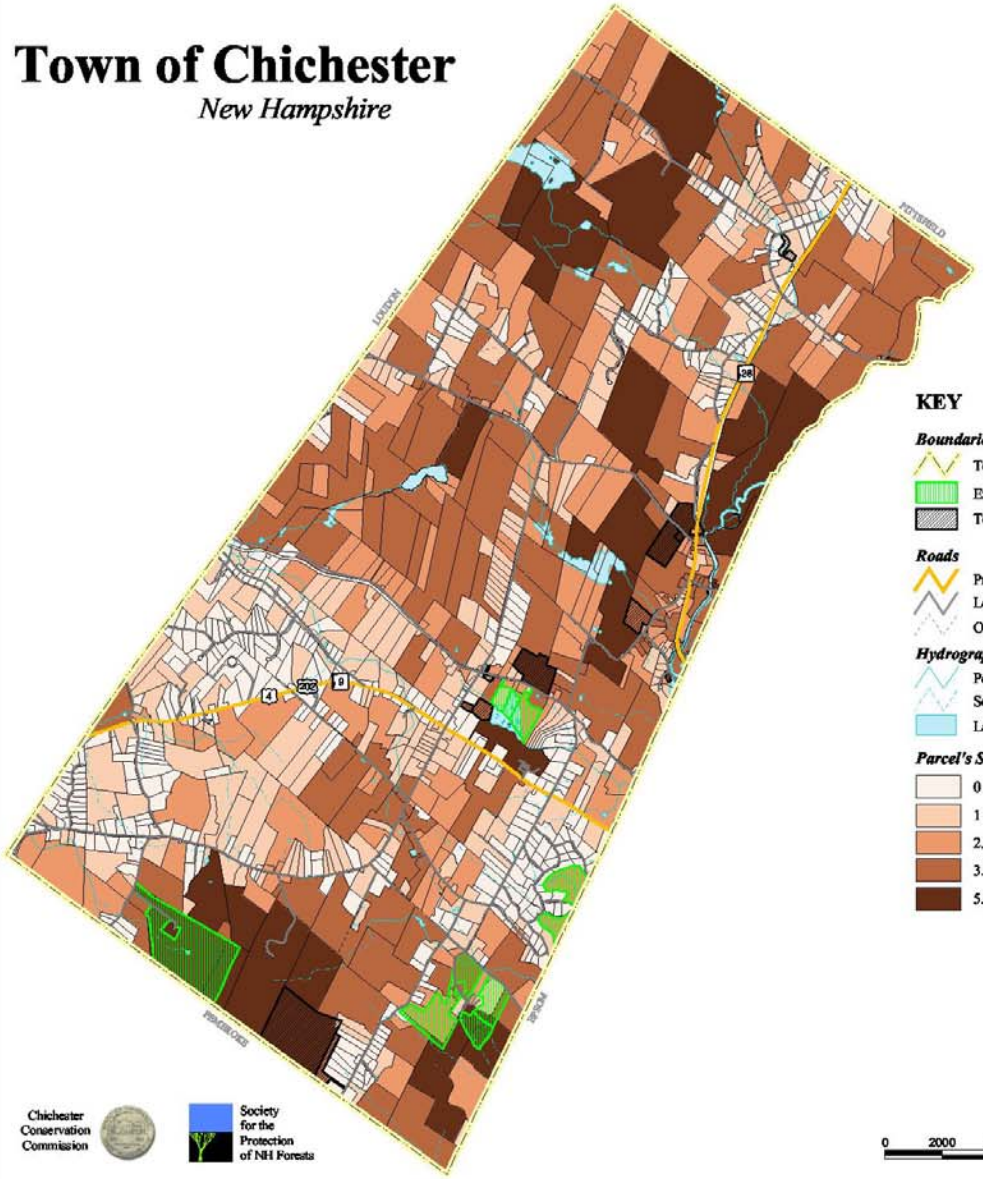
and:

- Within 250' of protected lands or abutting town lands 1 point
- Abutting protected lands or linking town lands 2
- Linking protected lands 3

When these parcel size/proximity scores are then added to the organic scores, the "total" score is generated. This final map "Parcels Scored by Total Resource Co-occurrence" shows those parcels which might be considered priorities with regard to conservation. The patterns on this map are interesting and do not necessarily match those of the organic subtotal. The high ranking parcels here are a statistical combination of high-resource values along with high-acreage and close proximity to protected lands. These parcel rankings are listed in Appendix 4.

# Town of Chichester

*New Hampshire*




**KEY**

***Boundaries***

- Townline
- Existing Protected Lands
- Town-Owned Lands *(not protected)*

***Roads***

- Principal Arterials
- Local Roads
- Other/Class VI Roads

***Hydrography***

- Perennial Streams
- Seasonal Streams
- Lakes / Ponds / Rivers

***Parcel's Scenic Resource Co-occurrence Score***

- 0 - 1
- 1 - 2.4
- 2.4 - 3.6
- 3.6 - 5.5
- 5.5 - 8.8

N

0 2000 4000 6000 8000 10000 Feet

Chichester Conservation Commission

Society for the Protection of NH Forests

Mapping and GIS analysis completed for the Chichester Conservation Commission by The Society for the Protection of New Hampshire Forests, GIS Services - July 2003

# Parcels Classified by Total Resource Co-occurrence

**Parcel-Based Natural Resource Co-occurrence Analysis**

Because many conservation planning decisions are parcel-based, a more advanced level of co-occurrence analysis may include a statistical analysis of natural resource value on a parcel-by-parcel basis. This approach uses the values and extents associated with the large format "organic" co-occurrence map and calculates acreage-weighted average values for each parcel.

This map displays the influence of all twenty-one factors that make up Chichester's co-occurrence model. Parcels with a higher cumulative total co-occurrence value are displayed here in increasingly dark shades of brown. All factors were assigned a value of one point each unless noted otherwise.

**Wildlife Habitat Factors**

Unfragmented Blocks (> 1,000ac)
NWI Wetlands
Wetland buffers (100')
Undeveloped Shorelines/Riparian Zones
Ridgeline Wildlife Corridors
Passpoints
South-facing slopes (>10% slope)
Steep Slopes > 25%
Open Lands & Early Successional Habitat
Agricultural Lands
Deer Yards

**Parcel-Based Factors**

Parcel Size: 1-4 points
Parcel Proximity to Protected Lands: 1-3 pts

**Water Resource Factors**

Sanitary Radii (150'-400')
Potentially Favorable Gravel Well Areas
Stratified Drift Aquifer (Tmax > 1000 ft2/day)
Drinking Water Protection Areas
100 Year Flood Zones

**Scenic Resource Factors**

Viewsheds:
- Visible from 5-10 Viewpoints: 1 pt
- Visible from 11-18 Viewpoints: 2 pts

Viewpoint Vicinity Areas: 2 pts
Scenic Roads - 500' Buffers: 2 pts

*Refer to the large format "organic" co-occurrence maps for a more detailed display of the resource factors and their spatial extents.*

**Data Sources**

Most of the data displayed here represents stock data sets obtained in 2001 and 2002 from the NH GRANIT database as maintained by the Complex Systems Research Center (CSRC) at the University of New Hampshire (UNH).

NH GRANIT and CSRC maintain a continuing program to identify and correct errors in these data. CSRC, OSP, SPNHF and the cooperating agencies and organizations make no claims as to the validity or reliability or to any implied uses of these data.

**Other Data**

- Lot Lines: 2002 town tax map derived from data by S.E.A. Consultants, Inc.
- Town-Owned Land: Parcels were identified by Town of Chichester and digitized by SPNHF using 2002 digital tax map file provided by S.E.A. Consultants, Inc.
- Roads derived from NH DOT roads layer (5/2002) and USGS digital line graph with assorted corrections and updates digitized from '98 GRANIT digital ortho-photo quads and as ID'd by Town of Chichester.

**Map Disclaimer**

This map is one of a series of maps that were produced as part of a town-wide natural resource inventory for the Chichester Conservation Commission and is intended to be used for planning purposes only. Representations of property lines on this map are one interpretation of available data and should not be construed as binding or conclusive evidence of ownership.

## *RECOMMENDATIONS FOR FURTHER WORK*

This study is a comprehensive look at the natural resources of Chichester. Virtually all available data appropriate to the study were utilized, however, there is additional data which could be developed, and addendums to the study which could be completed.

*A prime wetlands study* would be an excellent next step in terms of wetlands protection, particularly given the 2003 wetlands bylaw passed by the town. Such an endeavor would identify those largest, most significant, or most sensitive wetlands in the town, and afford them an additional level of protection with NH DES[13]. As with any natural resource, wetlands extend beyond municipal boundaries. As such, it may be worth reviewing prime wetlands designations of surrounding towns prior to beginning or making recommendations to surrounding towns upon completion of the study.

*The creation of an updated soils map* would be particularly helpful to planning in Chichester. Since the zoning ordinance is largely based on 1965 soils mapping, it may be worth acquiring updated soils information. Digital soils data would be particularly useful for reassessing zoning districts and wetlands delineation, as well as evaluating agricultural and forestry potential and unusual ecosystems. The Natural Resource Conservation Service has completed updated field mapping for Merrimack County soils, however, digitization is not expected for another two to three years. Many towns are contracting digitization of their soils data from groups like Complex Systems Research Center at UNH.

No forest resource study was carried out as a part of this study. Soils data would facilitate such a study, as would appropriate land cover data. Such a study would indicate forest productivity and the potential for forestry-based conservation.

Finally, the stated objective of this natural resource inventory is for the CCC to continue its conservation efforts. While recommendations on specific land conservation methods do not fall directly under the scope of this project, there are several publications which will serve as excellent companions to this report. The Center for Land Conservation Assistance[14] has two publications oriented towards initiating and carrying out land protection projects:

- *Open Space for New Hampshire; A Toolbox For The New Millennium*
- *Saving Special Places: Community Funding for Land Conservation*

A third CLCA publication, *Conserving Your Land; Options for New Hampshire Landowners*, is scheduled to be available in the fall of 2003; it focuses on direct conservation strategies through case studies and an explanation of relevant tax laws. The Trust for Public Land, New Hampshire has recently (2003) published the *Local Greenprinting for Growth*. This four volume series for municipal planners is a guide for achieving quality of life through balanced conservation, recreation, and economic growth.[15] Also, the New Hampshire Land and Community Heritage Investment Program (LCHIP), in addition to offering grants for land conservation, has several publications

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[13] For NH Wetlands regulations, see http://www.des.state.nh.us/wetlands/pdf/482a.pdf and http://www.des.state.nh.us/wetlands/pdf/wt100-700.pdf

[14] Contact Dijit Taylor at (603) 224-9945 x361 or http://www.spnhf.org/explor/library.html

[15] Contact Kathy Blaha at (202) 543-7552

available[16]. These references are invaluable tools for planning for conservation projects, landowner outreach, and municipal planning.

## *CONCLUSIONS*

This report identifies the key findings of the Chichester 2003 Natural Resource Inventory. Analyses centered around wildlife habitat, water resources, and scenic resources. These individual studies were integrated in the culminating co-occurrence model which identifies regions of high natural resource values.

There is potential for wildlife habitat protection and management in Chichester. The town has large areas of undeveloped land in natural cover (forests, wetlands, etc.). Significant areas are found in the north portion of the town around Lynxfield Pond, the Suncook River, and in the Perry Brook watershed. All of these areas are unprotected for the most part, but hold potential for conservation as well as linkage through undeveloped migratory corridors.

Zoning districts and master plan goals appear to be largely synchronized with the results of this study. The master plan goals of protecting aquifers and drinking water, wetlands, shorelands, and the rural character of the town are addressed in the conservation plan given here; adding wildlife habitat management and protection is recommended for future master plans. Zoning districts seem to match well with natural resources as they occur in Chichester; that is, those more conservation oriented districts (Open Space-Wetlands, Open Space-Steeplands, and Rural-Agricultural) have a prevalence of higher value resource areas when compared to districts with higher development potential (Residential and Commercial-Industrial). Additionally, those most high value resource areas fall primarily on conservation-oriented districts. Additional soils studies and updated data may help to confirm this.

The analyses which were carried out and the maps created from those analyses point to several next steps with respect to conservation. Several focus areas are proposed which serve to guide conservation efforts. The parcel-based co-occurrence analysis ranks individual parcels in terms of their resource values. Both the organic and parcel based analyses point to the Suncook River valley as the highest priority area for conservation; wildlife habitat, and water and scenic resources are all exemplary here. Additional land protection potential exists around the Perry Brook and Lynxfield Pond areas, as well as in the Plausawa Highlands in the south.

Further recommended work includes a prime wetlands study in conjunction with NH DES and potentially surrounding municipalities, as well as updating and digitizing soils data. A forest resource study may also benefit the town and add an additional forestry-based conservation option.

[16] http://www.lchip.org/

## *Appendix 1. Data Sources*

For stock data-sets, references to the provider and relevant metadata are given. For data developed specifically for this project, more extensive information is provided. This section is a technical report, and is thus oriented towards the GIS user.

State agencies providing data include GRANIT (Geographically Referenced Analysis and Information Transfer System), New Hampshire Department of Environmental Services (NH DES), New Hampshire Department of Transportation (NH DOT), and Central New Hampshire Regional Planning Commission (CNHRPC).

Shapefiles are listed here in parenthesis (with path and filename as they exist on the project CD). Also see electronic metadata included with the project (../Metadata).

### *Base Layers*

Black and White Aerial Photography: Provided by GRANIT, "Digital Orthophoto Quads (DOQs) - 1998", acquired spring 1998. (../GISData/Aerials/aerialphotos_tiffs.dbf) http://www.granit.sr.unh.edu/data/datacat/pages/doq98.pdf

Conservation & Public Lands: Provided by GRANIT, "Conservation/Public Lands", last updated June 12, 2003. (../GISData/-cons.shp) http://www.granit.sr.unh.edu/data/datacat/pages/cons.pdf. Updates provided by the Chichester Conservation Commission and SPNHF.

Contour Lines: Derived by SPNHF from USGS NED data. (../GISData/dem-derived_contours-20.shp)

NWI wetlands: Provided by GRANIT, "Wetlands/National Wetlands Inventory", last updated Summer 2001. (../GISData/-nwi.shp) http://www.granit.sr.unh.edu/data/datacat/pages/nwi.pdf

Roads: Composite derived by SPNHF from NH DOT, "Roads", last updated May 2002 and USGS "Roads".(../GISData/-roads.shp) http://www.state.nh.us/dot/

Surface Water Features: Provided by GRANIT, "Hydrographic", last updated October 1995. (../GISData/-hydropol.shp *and* surface_water.shp) http://www.granit.sr.unh.edu/data/datacat/pages/hydro.pdf

Town Boundaries: Provided by GRANIT, "Political Boundaries", last updated June 1996. (../GISData/-town.shp and townlines.shp) http://www.granit.sr.unh.edu/data/datacat/pages/pb.pdf

Town-Owned Land: Developed by the Chichester Conservation Commission and SPNHF, last updated July 2003. Consists of tax parcels identified by commission members as town-owned (see "Tax Parcels" below). (../GISData/townland.shp)

Utilities: Provided by GRANIT, "Pipelines", last updated January 1993.
(../GISData/utilitylines.shp)
http://www.granit.sr.unh.edu/data/datacat/pages/pipe.pdf

### *Water Resources*

Aboveground Storage Tanks: Provided by NH DES, "AST_Site", last updated October 2002. From NH DES metadata: "This coverage was developed by the Oil Remediation and Compliance Bureau which has an ongoing effort to create a GIS counterpart to its AST registration data base. The project is now in its ninth year. The coverage contains 1,107 features. The majority of these features ( 80%) were field located on USGS paper quadrangles using traditional field methods (i.e., map/compass), transferred to mylar, and digitized; the remaining features ( 20%) were located using differentially-corrected GPS data."
(../GISData/-astsite.shp)

Aquifers: Provided by GRANIT, "Aquifers/Transmissivity", last updated February 2000.
(../GISData/-nh_tm.shp) http://www.granit.sr.unh.edu/data/datacat/pages/tra.pdf

Automobile Salvage Yards: Provided by NH DES, "Junkyd", last updated November 1991. From NH DES metadata, "Automobile Salvage Yards which are registered with NH DES. Developed by the Water Quality and Permits Compliance Bureau."
(../GISData/junkyd.shp)

Facilities Generating Hazardous Waste: Provided by NH DES, "Rsite", last updated January 2003. From NH DES metadata: "Facilities which are registered under the Federal Resource Conservation and Recovery Act. Developed by the Hazardous Waste Compliance Bureau."
(../GISData/-rsite.shp)

Favorable Gravel Well Sites: Generated by SPNHF according to NH DES guidelines "FGWA", a detailed explanation of which follows. (../GISData/fgwa.shp)

The FGWA GIS analysis process involves the buffering of various features that represent potential or known sources of ground water contamination. These include surface water features, urban features such as roads, and NH DES known and potential contamination sites. These buffered features are then erased from the extent of the stratified drift aquifer, leaving the "potentially favorable" areas.

U400des.shp was developed by unioning the (usually 1,000') buffered coverages of nine to eleven known and potential contamination site layers. This is then used as one of two erase coverages on the stratified drift aquifer coverage (nh_tm.shp) to be used for a 150 gallon/min analysis with maximum transmissivity $\geq$ 2,000 $ft^2$

A second aquifer erase coverage consists of buffered roads and surface water features and is called hyt4nnn.shp.

The specific GIS analysis is: Aquifers (Tmax ≥ 2,000 $ft^2$) → ERASE U400des.shp → ERASE hyt4nnn.shp → FGWA

For further information, please refer to the NH DES technical manual: 'A Guide to Identifying Potentially Favorable Areas to Protect Future Municipal Wells in Stratified-Drift Aquifers', NH Department of Environmental Services, Publication NH DES-WD-99-2.

Floodplains: Provided by CNHRPC, digitized from paper National Flood Insurance Plan maps, no existing metadata. (../GISData/flood_plain.shp)

Groundwater Hazards: Provided by NH DES, "C_site", last updated March 2003. From NH DES metadata: "Existing and potential threats to source water quality including, but not limited to: Above-ground storage tanks, CERCLA superfund sites, complaints, leaking bulk fuel storage facilities, groundwater release detection permits, isolated gw sample w/contaminant detection, non-petroleum hazardous waste, non-hazardous/non-sanitary holding tanks, initial spill response, lined landfills, proposed landfills, unlined landfills, leaking above-ground storage tanks, leaking underground storage tanks, lined wastewater lagoons, leaking motor oil storage tanks, old open dump sites, leaking heating oil tanks, rapid infiltration basins, septage lagoons, subsurface wastewater disposal >20,000gal/day, unsolicited site assessments, sludge lagoons, sludge applications, oil spill/releases, spray irrigation, municipal/commercial stump/demo dumps, solid waste transfer stations, underground injection control, unlined wastewater lagoons. Developed by the Oil Remediation and Compliance Bureau; and Water Supply Engineering Bureau."
(../GISData/-csite.shp)

Point/Non-Point Potential Pollution Sources: Provided by NH DES, "Np_pt", last updated March 1995. From NH DES metadata: "Selected types of potential and existing point and non-point pollution sources, including: CSOs (combined sewer outfalls); quarries; sand and gravel operations; sand/salt storage piles; septage/sludge applications; septage/sludge lagoon/composting sites; snow dumps; and storm drains. Developed by NH Regional Planning Commissions and NH DES."
(../GISData/-np_pt.shp)

Public Water Supplies: Provided by NH DES, "PWS", last updated March 2003. From NH DES metadata: "Public water supply sources registered with NH DES. Includes community, transient/non-community, and non-transient/non-community public water supply systems. Developed by the Water Supply Engineering Bureau."
(../GISData/-pws.shp)

Sanitary Radii: Generated by SPNHF from the NH DES Public Water Supply layer. The data-layer was developed by buffering the Public Water Supply Layer on the sanitary radius field. The size of the sanitary radius is determined by the permitted daily production of the well (gallons / day):

| | |
|---|---|
| <14,401 | 150' |
| 14,401 - 28,800 | 175' |
| 28,801 - 57,600 | 200' |
| 57,601 - 86,400 | 250' |
| 86,401 - 115,200 | 300' |
| 115,201 - 144,000 | 350' |
| > 144,000 | 400' |

(../GISData/sanrad.shp)

Underground Storage Tanks: Provided by NH DES, "Ust_site", last updated March 2003. From NH DES metadata: "Underground storage tank sites. Developed by the Oil Remediation and Compliance Bureau." (../GISData/-ustsite.shp)

Watershed Boundaries: Provided by GRANIT, "Watershed Boundaries", last updated September 2002. (../GISData/-nhhuc12.shp)
http://www.granit.sr.unh.edu/data/datacat/pages/wshed.pdf

Wellhead Protection Areas: Provided by NH DES, "WHPA", last updated March 2003. From NH DES metadata: "Public Water Supply Drinking Water Protection Areas (DWPA) which are being delineated as part of the State's wellhead protection program under RSA 485-C. The coverage is limited to the sources of community and non-community, non-transient water systems. Under the State's program, wellhead protection areas are defined as the area from beneath which groundwater is likely to flow toward and reach a water supply well. Developed by the Water Supply Engineering Bureau." (../GISData/-whpa.shp)

### *Unfragmented Natural Lands*

Unfragmented Natural Lands: Developed by SPNHF according to guidelines in the UNH Cooperative Extension Publication, *Natural Resource Inventories: A Guide for New Hampshire Communities and Conservation Groups*. The specific GIS analysis was carried out as follows:

MERGE USGS roads (class ≠ V and VI) AND NH DOT Roads (class ≠ 66) → BUFFER merged roads to 500 feet → ERASE 500 foot buffer from landmass → resultant data-layer is a draft Unfragmented Natural Lands layer.

This draft layer was then reviewed by the CCC. Roads were reviewed and correctly classified as fragmenting or not. Finally, aerial photos were reviewed to remove any developed land from unfragmented lands. The final analysis was then run:

BUFFER corrected roads to 500 feet → ERASE 500 foot buffer from landmass → Final Unfragmented Natural Lands. (../GISData/unfraglands2.shp)

### *Wildlife Habitat*

Undeveloped Shorelines And Riparian Zones: Developed by SPNHF. Specific GIS analysis is:

1. BUFFER 300' perennial streams, surface waters >3 acres, and NWI wetlands > 3 acres.
2. DELINEATE developed lands based on interpretation of digital aerial photographs; on-screen digitize at scales between 1:5,000 and 1:10,000. A strict definition of "developed" was used in this case, and was considered to be any non-natural surface including buildings, paved surfaces, railroad right-of-ways, mowed grass (including lawns, road sides and medians, and hayed fields), agricultural fields, orchards, active gravel pits or quarries, power line right-of-ways. This definition allows the resultant data-layer to approximate exemplary riparian and shoreline habitat.
3. ERASE developed lands from 300' buffer.

(../GISData/riparian_undev-300'.shp)

Open Lands & Early Successional Habitat Features: Developed by SPNHF. Delineated on 1998 color-infrared aerial photographs provided by the Merrimack County Forester's Office; polygons were digitized on-screen using digital aerial photographs. For detailed information on methods see **Appendix 2: Open Lands and Early Successional Habitat Mapping** and **Appendix 3: Open Lands and Early Successional Habitat Definitions.**
(../GISData/oles.shp)

Quarries & Gravel Pits: Provided by NH DES, derivative of Regional Environmental Planning Program data-layer, "Repp_pt". Selection on "Class" field where class = "gravel pit – inactive".

Deer Yards: Provided by NH Fish and Game Department, digitized by SPNHF from hard-copy map of Chichester deer yards. Maps provided 1993, no revision date given. (../GISData/deer_yards.shp)

Steep Slopes: Derived from digital elevation model provided by USGS; includes all slopes ≥ 25%. (../GISData/slope25+.shp)

South-Facing Slopes: Derived from digital elevation model provided by USGS; includes all slopes ≥ 10%, with aspects between 157.5° and 247.5° (i.e. South and South-west facing slopes).
(../GISData/southsteep.shp)

Ridgeline Corridors: SPNHF derived, delineated from topographic contours and watershed boundaries. Manually digitized watershed boundaries and major ridge-lines. Buffered 300 feet to account for ridge breadth and meandering travel corridors.
(../GISData/ridge_lines.shp and ridge_lines-300'buffer.shp)

Passpoints (Topographic Saddles): SPNHF derived, delineated from topographic contours. Manually digitized major saddles and ridge low-points. Buffered 300 feet to account for saddle breadth and meandering travel corridors. (../GISData/passpoint.shp and passpoint-500'buffer.shp)

### *Historic Cultural Features*

Historic/Cultural Sites: Points were selected and marked on paper maps by CCC members, digitized by SPNHF. Cemeteries were acquired using GARMIN GPS 12 receivers. Note: Point features may have been moved for the purposes of display on this map – features should be considered accurate but "generalized". (../GISData/hist-cult.shp)

Active Farms & Agricultural Lands: Developed by SPNHF from CCC identified fields. CCC members delineated polygons on hard-copy 1:12,000 scale aerial photo base maps; polygons were then digitized on-screen using digital aerial photographs. (../GISData/agricultural.shp)

### *Tax Map Transparent Overlay*

Tax Parcels: Town of Chichester's 2002 tax map. Derived by SPNHF from unregistered source cad data created by and purchased from S.E.A. Consultants, Inc. for $500. Conversion to this final georeferenced shapefile format was carried out through a move, scale, and rotate process in E.S.R.I.'s ArcView GIS 8.2 in June 2003. 2003 subdivision revisions through 7/10/03 were then applied to this and completed by SPNHF on 7/14/2003. (../GISData/Taxmap/Taxmap2.shp)

### *Zoning Map Transparent Overlay*

Zoning Districts: Town of Chichester's zoning district file. Derived by SPNHF from unregistered source CAD data (Index.dxf) created by and purchased from S.E.A. Consultants, Inc. for $500 (which included all the source tax map files as well). Conversion to this georeferenced shapefile format was carried out through a move, scale, and rotate process in E.S.R.I.'s ArcView GIS 8.2 in June 2003.

Attributing of polygons with the appropriate zoning district code was carried out by SPNHF GIS services using black and white paper photocopy of the 1996 Chichester Master Plan Zoning District map. Inspection and verification of coding was completed by CCC member Jeff Andrews. (../GISData/Zoning_lines_ply.shp)

### *Natural Resource Co-occurrence*

Natural Resource Co-occurrence: Generated by SPNHF through the consecutive unions of each natural resource source file. (../GISData/Cocur/finalcocur.shp)

### *Scenic Resources*

Scenic Viewpoints: 46 viewpoints were identified by CCC members and acquired using GARMIN GPS 12 receivers. (../GISData/scenicviewpoints3.shp)

Scenic Viewpoint Bearings: The directional component of each viewpoint was generated by SPNHF from compass bearings collected in the field by Chichester Conservation Commission members. (../GISData/bearing_lines.shp)

Scenic Viewsheds: GIS generated by SPNHF through analysis of the 46 viewpoints in conjunction with a USGS NED digital elevation model. Two versions exist:
One represents the lands visible from the viewpoints with the [GRIDCODE] field representing the number of viewpoints that can be seen from that location. (../GISData/-viewshed_co-occurrence2.shp).
The other represents the individual viewsheds of all 46 viewpoints AND whose attribute table was built to allow one to identify/select the lands visible from EACH of the viewpoints, individually. (../GISData/Viewshed_bypoint.shp).

Scenic Roads: Twelve scenic roads were identified and marked on paper maps by the CCC and then digitized by SPNHF. (../GISData/scenicroads.shp)

Scenic Road Buffers: SPNHF derived by buffering scenic roads 500'. (../GISData/Cocur/scenicroads_buffer500'_dsv.shp)

Viewpoint Vicinity Areas: SPNHF derived to represent the immediate foreground area of each viewpoint and constrained by the viewpoint bearings and a distance of 200'. (../GISData/viewpoint_azimutharcs.shp)

### *Parcel-Based Co-Occurrence*

Parcel-Based Co-Occurrence: SPNHF derived through a statistical analysis of the resource co-occurrence file (..GISData/Cocur/finalcocur.shp) to calculate acreage-weighted average co-occurrence values for each parcel in the town's tax map. Displayed by joining parcelvalues3.dbf (on the field [ID]) to the attribute table of the digital tax map (..GISData/Taxmap/taxmap2.shp) and then classifying by the value fields.

### *Additional Data*

2001 New Hampshire Landcover Data: provided by GRANIT; the acreage figures generated for this report reflect GRANIT landcover data with the addition of rasterized NH DOT roads. Class 140, transportation was replaced by this layer. More information is available at: http://www.granit.sr.unh.edu/data/datacat/pages/nhlc01.pdf

## *Appendix 2: Open Lands and Early Successional Habitat Mapping*

(excerpt from *Wildlife Habitat GIS Modeling Study; Piscassic and Lower Lamprey River Watersheds of New Hampshire*)

Land cover types that can be characterized as "open lands and early successional habitats" are declining in both distribution and extent in New Hampshire, and are thought to represent only about 4% of the land cover of the state overall. These habitat types include a range of both natural land cover, such as abandoned hay lots and pastures (old field habitat) grading into early successional shrub and tree species, and managed land cover such as actively cropped agricultural fields, orchards, hay meadows, and disturbed areas associated with gravel pits and power line right-of-ways.

These habitat features are important to a number of wildlife species that depend on field and early successional habitats for breeding, foraging, and shelter, including the blue-winged and golden-winged warblers, New England cottontail rabbit, upland sandpiper, and several other species-of-concern which are included in this study. Unfortunately, very little detailed geographic information delineating these cover types is available from GRANIT or other sources.

Accordingly, an experimental, low-tech/rapid assessment procedure was developed using ArcView GIS software to identify and delineate early successional habitat features and other open land cover types features. A unique data layer comprised of 679 polygons was produced for the entire lower Lamprey River watershed using a combination of conventional aerial photo interpretation and delineation, followed by digitizing of delineated features directly in the GIS, as follows:

### *Image Data Sources*

Two digital imagery data sources were used in concert with one another in the development of this data layer:

- geo-referenced digital orthophoto quads (DOQ's) available from GRANIT, and
- color infrared (CIR) aerial photography currently available statewide on request from the UNH Cooperative Extension county offices.

Detail resolution and color rendition is far superior in the CIR images as compared to the panchromatic DOQ's, so they were used as the initial basis for delineation and coding of various open land and early successional features. However, the CIR photos are not available as digitally-mosaicked images nor are they geo-referenced for use in the GIS, so the GRANIT DOQ imagery was used as the "spatial backdrop" against which features identified in the CIR imagery could be accurately located and digitized on-screen. Since both image datasets were acquired in 1998/1999, features are consistent from one image to the other, with few exceptions.

Note: if CIR photos are not available, DOQ's can be used alone for delineation, but features such as field edges and details such as the texture of ground surfaces (important

in clarifying cover types and early successional canopy closure) tend to be somewhat unclear, especially at larger scales, thus making interpretation difficult at times.

<u>For the purposes of this project, the steps in generating the open lands/early successional habitat data layer are as follows:</u>

1. Stock 9x9 CIR photos were first scanned at 300 dpi on a flatbed scanner and then converted to TIFF graphic files that can be inserted into an MSWord document or into ArcView layouts for reprinting. These files were output on a color laser printer at close to the original 9" x 9"format for use as stereo photo pairs, and also at larger scales measuring up to 18" x 18" on a large-format inkjet plotter for detail viewing and reference without magnification. The color laser prints yield the best resolution – at near photographic quality – and thus are used as the basis for delineation.

2. Agricultural fields, hay meadows, old fields in varying stages of natural succession, and other features such as gravel pits and cleared/disturbed areas are outlined and coded with felt-tip pen directly on each 9 x 9 CIR print, with allowances for the inherent overlap from image to image. Stereo viewing glasses and matching pairs of photos can be used to view three-dimensionally to confirm field patterns and/or verify early successional stands of trees embedded within a larger forest context.

3. An ArcView project view is then built with the DOQ's displayed as an image background on which other reference data layers (roads, streams, NWI wetlands, etc) are overlaid in color to help in orientation and "pattern-seeking" as the CIR photo delineations are transferred into the GIS environment. A view scale of 1:12,000 is typically a good starting point for identifying field patterns and delineating edges, but larger scales are helpful in situations where shapes are complex and overlapping polygons are to be avoided.

4. Working systematically from the CIR images, various features and spatial patterns on the CIR's are located visually in the context of the DOQ image, and at least one graphic polygon is first drawn according to field edges and other defining features. The Draw Polygon tool is used for this purpose.

5. Then, using the XTools convert-graphic-to-polygon function, a shapefile theme is created on which the remainder of open land/early successional habitat data layer is built. Using the Theme Edit function in ArcView and the Draw Polygon tool, all remaining polygons can be rapidly added to the initial shapefile, digitizing "on-the-fly" and on-screen.

6. During digitizing, delineations on the CIR imagery are checked against reference data layers, such as the NWI wetlands, and interpretive errors are corrected. In some cases, as with identification of old gravel pits, toggling between the DOQ and the corresponding USGS topographic quad digital raster graph (DRG) helps

to verify the type and location of features. Similar toggling with the GRANIT land cover type grid can also be used to check feature and cover types.

7. Since the attribute table is also actively being built while the theme is being edited, habitat type codes and any other data associated with each polygon may be entered into the attribute table, as each polygon is digitized, or in small batches as all the polygons from one CIR are digitized and before moving on to the next image.

8. Area and perimeter data for each polygon must be updated periodically using the XTools extension. This may also be done on-the-fly and while in the Theme Edit mode.

9. A redundant back-up system is recommended while the data layer is being developed. Periodically converting the shapefile to another filename, e.g., version 1, version 2, etc., is an easy method of saving data frequently as work progresses. The ArcView .apr file should also be backed up frequently to guard against corruption of the project file, which is a possibility when working with large image datasets and several extensions.

Identifying and classifying open land and early successional habitats from aerial photography requires a certain amount of skill and experience in interpreting spatial details and patterns visible in the imagery. However, in the predominately forested landscape of New Hampshire, field patterns and other types of openings in the tree cover are clearly evident in most aerial photography. The tendency to "read" emergent wetlands as early successional habitat is probably the most likely error in interpretation, but features in the photography can easily be checked against NWI wetlands mapping in the GIS and discounted. Similarly, cemeteries were easily recognized and culled from delineation by comparing to USGS DRG mapping on-screen.

**Figure 3** below depicts a typical CIR image on the left and a corresponding DOQQ image for comparison.

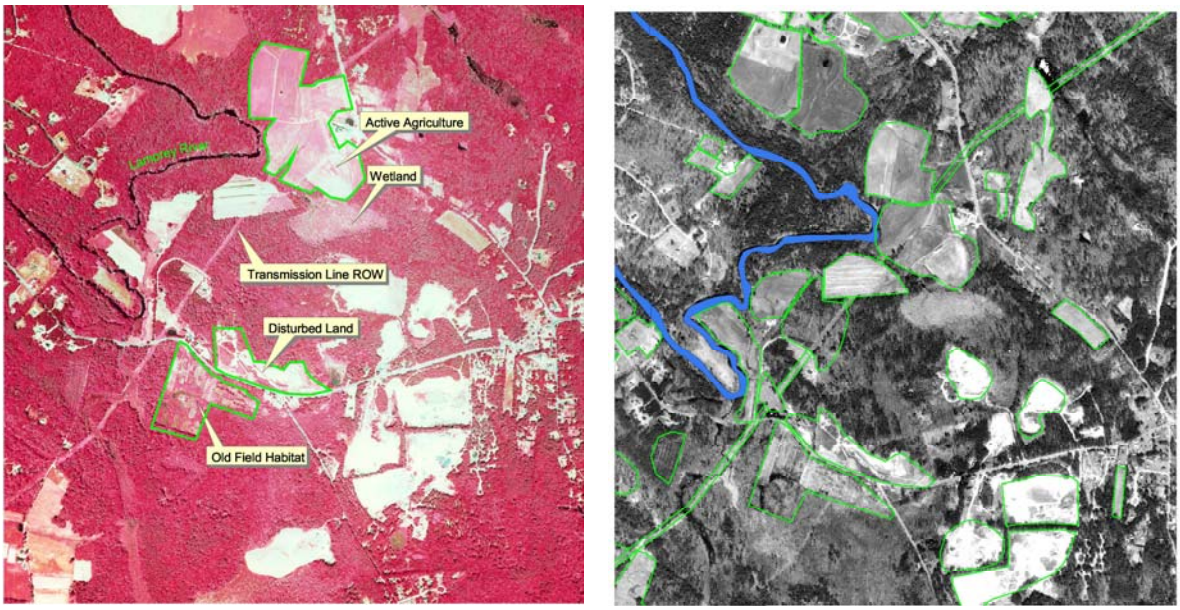


***Figure 3**: Color infrared source photography with selected habitat features noted on the left, and typical GRANIT DOQQ geo-referenced imagery on the right with all features digitized.*

Classification Scheme

The initial tendency in experimenting with a method to generate this data layer was to classify features in the simplest terms and according to broad groupings of habitat features, as follows:

- "open lands" in the form of fields and meadows,
- "early successional habitats" in the form of overgrown hay meadows and pastures, and fields becoming dominated by tree and shrub canopy,
- disturbed or cleared lands of various types, and
- gravel pits.

However, it quickly became evident in viewing the aerial photos that a continuum of open land and early successional cover types exists, ranging from actively-worked agricultural fields and croplands to advanced early successional stands of tree canopy moving into later seral stages of forest cover. The same was true of gravel pits, which also include sand and clay pits and associated disturbed or cleared land, and which can be actively worked, newly reclaimed, or abandoned and reverting to vegetation. Thus, the need to make distinctions along such a continuum generated seventeen (17) discrete classes of habitat features in the initial digitizing of the data layer, which added qualitatively to usefulness the final dataset.

A total of 679 polygons were digitized and attributed in approximately 30 hours work, covering the entire 85 square mile watershed and extending beyond the study area boundary in cases where significant habitat features and patterns exist within the half-

mile context buffer. Generally, a two-acre minimum size was used to avoid including residential yards and other small openings with little habitat value. Exceptions occur where clusters of small openings were evident in a predominately natural land cover context, e.g., a series of small meadows surrounded by woodland, with probable habitat value in the aggregate, or where smaller units were associated with larger units in a cluster.

An overview of the seventeen habitat features, a working definition, polygon count and total acreage in the study area is found in the table below.

| Habitat Feature | Definition | Count | Acres |
|---|---|---|---|
| Old field | Abandoned fields with <50% tree/shrub canopy cover | 86 | 656.1 |
| Old field/Early successional | Old fields with >50% but <100% canopy cover | 8 | 70.6 |
| Early successional | Old fields or openings with 100% sapling tree cover | 81 | 887.4 |
| Advanced early successional | Homogenous patterns of distinctly younger tree canopy | 5 | 150.2 |
| Powerline ROW | ROW clearings through forested/other natural land cover | 4 | 348.6 |
| Fields | Active agricultural uses, including row crops and hay fields | 398 | 3,797.8 |
| Fruit | Small fruit farming, e.g., blueberries | 2 | 6.8 |
| Orchard | Apple orchard | 3 | 70.6 |
| Gravel pit | Active gravel extraction and workings | 15 | 145.1 |
| Sand pit | Active sand extraction and workings | 9 | 67.3 |
| Clay pit | Active clay extraction, including ponded areas | 1 | 45.6 |
| Old gravel pit | Abandoned/revegetating or reclaimed gravel pits | 5 | 71.0 |
| Old sand pit | Abandoned/revegetating or reclaimed sand pits | 10 | 45.6 |
| Disturbed land | Land cleared of all or most vegetation; timber harvests | 27 | 259.2 |
| Disturbed/Gravel pit | Land cleared in associated with active gravel extraction | 9 | 112.9 |
| Wet Field | Fields with tile lines or ditching evident, adjacent wetlands | 15 | 60.9 |
| Man-made Wetland | Obvious constructed wetlands with regularized forms | 1 | 37.7 |
| | **Totals** | **679** | **6,732.3** |

### *Discussion*

Overall, this data layer represents about 12% of the study area land base, but narrowing to features more closely allied with the concept of "early successional habitat" – old fields and young shrub/tree canopy cover – shows only about 3.2% of the study area is supporting the most critical habitat features for a range of wildlife species.

Also, as can be seen in the polygon counts and acreage distribution, "Fields" are the dominant feature mapped, accounting for more than 50% of both the polygon count and the total acreage. However, even within this habitat feature class, a wide range of cover types exist. It is clear in the aerial photos that many of these fields are being worked

intensively for row crops or hay, and thus have limited habitat value for certain species such as ground-nesting birds. Still, some fields are likely utilized much less intensively, primarily for occasional hay crops or pasture. Older meadow openings that are likely mowed only once in a few years are also evident in the photos, but have been classed as "Fields" in this study. Thus, this cover class tends to be quite inclusive of a number of open field types, with differing habitat qualities, but the class as a whole cannot be more finely delineated without extensive fieldwork to rate the fields for type and intensity of use.

The "Old Field" cover type class is relatively easy to pick out in the aerial photos due to the spotty patterns of pasture juniper and invading shrub and tree canopy. These features are also mapped most often associated with other field patterns and farming activities; some of the polygons as old fields are clearly overgrown pastures still being used as part of a working farm.

"Early Successional" habitat features were delineated from three sources:

- true old field environments progressing to later seral stages,
- openings created by timber harvest, and
- powerline right-of-ways.

The break point for old field-versus-early successional habitat features was determined to be 50% combined tree and/or shrub canopy cover across the area seen as a field unit. Determining percentage of canopy closure on old field sites was done visually; no image processing and quantification was used, nor is it warranted because field patterns and edges are generally well-defined and the eye can easily judge distinctions of less-than and more-than 50% cover.

Timber harvests are readily decipherable as patterns of openings and skid road trails in the context of the prevailing forest canopy patterns. Lighter harvests, as with selective cuts, were not mapped as early successional habitat due to relatively minor openings created. However, several heavy cuts where more than 50% of the entire harvest zone is composed of openings, and a few clear-cut harvests, were evident in the photography. These were mapped as early successional habitats for the purposes of this study, but were not coded as timber harvest sites. In hindsight, it would be valuable to document timber harvest sites since the quality of the early successional habitat varies significantly from old field sites and because the early-successional composition and structure of the feature can be assumed to be ephemeral (i.e., area is being managed for timber and will likely be allowed to return to a forested condition).

Three major electric transmission right-of-ways traverse the study area from west to east, with cleared areas ranging from 85 feet to more than 200 feet in width. Although the ground cover under the powerlines is heavily managed to keep vegetation low, these right-of-ways were mapped as early successional habitat due to their similarity to old field environments. Powerline right-of-ways were mapped according to the prevailing cover type where the line crosses agricultural fields or other cover classes that have no woody growth.

Identifying active "gravel/sand/clay pit" sites is not difficult in the photography since the working face of the pit is often visible and haul roads are evident; they are also easily checked against USGS DRG images which label such extraction sites. Reclaimed pits are seen as smoothed, open areas, most often adjacent to active mine workings, as are a number of cleared/disturbed areas also associated with mining. Old or abandoned extraction sites are not readily seen, however, and these unique habitat sites were located by toggling from the DOQ's to the USGS DRG images that date from 1987. As a related cover class, "Disturbed" areas are sites that are clearly un-vegetated or sparsely vegetated. In some cases, these areas might be temporary site clearings in advance of new construction, but others are more permanently "cleared", as with the seasonal parking lot at the Epping speedway.

"Wet field" identification was made possible by scanning the field patterns for regularly-spaced, darker strips of vegetation, signally the wetter soils in ditches or over drain tile lines. These fields are almost always immediately adjacent wetlands, as well. Although all wet fields appeared to be under active agricultural management, the cover class was distinguished because wetland plants such as sedges could be present on wetter sites, and wildlife utilization could be enhanced.

The "Made Wetland" class was created to account for a single instance of a clearly manmade wetland constructed as a mitigation project near Route 101.

### *Summary*

While field checking of habitat delineation remains to be done in upcoming field seasons, this data has proved extremely useful in targeting geographic priorities for wildlife habitat conservation purposes. Land cover type mapping available from GRANIT is useful in determining broad-scale patterns of habitat type and structure, and to a limited degree in validating features digitized from aerial photography, but the relatively coarse resolution and definition in the land cover grid does not reveal the true extent and distribution of field and early successional habitat patterns on-the-ground.

Diversifying the classification system is also important since it allows the data layer to be queried for specific habitat types, and thus helps to pinpoint the modeling to only the most suitable habitat feature co-occurrences. However, groundtruthing the initial delineation, and "training" the data and method is very critical to the accuracy of the modeling effort.

New, alternative imagery is now available that would likely enhance the delineation accuracy and perhaps the precision. For example, geo-referenced digital images from Emerge with a sub-meter resolution show plant and land cover types in much more detail than either the CIR or DOQ imagery used in this study, and would obviate the need for back and forth referencing while digitizing on-screen.

Taken to a higher level, the use of high resolution spectral imagery and more sophisticated GIS processing than is possible with ArcView would allow the development of an open lands and early successional habitat data layer at regional scale, or even statewide, with periodic updates of this baseline data to detect change in location and maturity of the habitat features.

## *Appendix 3: Open Lands and Early Successional Habitat Definitions*

| Class Code | Class (definition) | Habitat Code | Habitat Feature (subclass) | Definition |
|---|---|---|---|---|
| 10 | Open Lands | 11 | Old Field | Abandoned fields with <50% tree/shrub canopy cover (generally pioneer species, including gray birch, aspen, white pine, and pasture juniper) |
| | (old fields and agricultural lands with 0 to 50% canopy cover) | 12 | Meadow | minimally managed meadows (mowed / hayed 1-2 times per year) and low to medium intensity pastures |
| | | | | |
| 20 | Early Successional Habitat | 21 | Old Field/Early Successional | Old fields with >50% but <100% canopy cover |
| | (young forests with 50 to 100% canopy cover) | 22 | Early Successional | Old fields or openings with 100% sapling tree cover (generally 7 to 8 years old) |
| | | 23 | Advanced Early Successional | Homogenous patterns of distinctly younger tree canopy (30 - 40' height, including pioneer species) |
| | | | | |
| 30 | Actively Managed Lands | 31 | Fields | Active agricultural uses, including row crops and hay fields |
| | (active agricultural and other intensively managed lands) | 32 | Orchard | Orchards (e.g. apple) |
| | | 33 | Fruit | Small fruit farming (e.g. blueberries) |
| | | 34 | Powerline Right-of-Way | ROW clearings through natural land cover |
| | | | | |
| 40 | Disturbed Lands | 41 | Clear Cuts | Land cleared of all or most vegetation, e.g. timber harvests |
| | (cleared lands with little to no vegetation) | 42 | Disturbed/Gravel Pits | Land cleared in association with active gravel extraction (small-scale, erratic operations) |
| | | | | |
| 50 | Gravel Pits | 51 | Active Gravel Pits | Active gravel extraction and workings |
| | (Open extraction sites either active or abandoned, as designated on USGS topo) | 52 | Active Sand Pits | Active sand extraction and workings |
| | | 53 | Active Clay Pits | Active clay extraction and workings (including pondings) |
| | | 54 | Old Gravel Pits | Abandoned/revegetating or reclaimed gravel pits |
| | | 55 | Old Sand Pits | Abandoned/revegetating or reclaimed sand pits |
| | | 56 | Old Clay Pits | Abandoned/revegetating or reclaimed clay pits |
| | | | | |
| 60 | Open wetlands | 61 | Wet field | fields with tile lines or ditching evident, adjacent to wetlands |
| | (wet fields/open wetlands with enhanced wildlife utilization | 62 | Man-made wetland | obviously constructed wetlands with regularized forms |

## *Appendix 4: Parcel-Based Co-occurrence Ranks.*

Five tables were generated for this analysis, one for each subtotal of the co-occurrence model (scenic, wildlife habitat, and water resources), one for the organic co-occurrence total, and one for the total co-occurrence score (incorporating parcel acreage and proximity values to the organic co-occurrence total). Each ranks the top fifty (50) parcels for the given subtotal/total.

The fields (columns) are the same for all of the tables. The field displaying the score for the given subtotal/total is shown in blue for emphasis; the field displaying the actual rank is shown in red.

These tables may also be viewed electronically on the project CD in the Microsoft Excel Worksheet "Parcel-BasedCo-occurrenceStats.xls".