Chapter 8:
Geospatial Resources of Dutchess County, NY

Robert Wills and Neil Curri[1]
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INTRODUCTION

The Natural Resource Inventory of Dutchess County, NY gives our communities and the public a detailed look at our rich and varied natural environment, while describing the natural and man-made forces affecting it and its health. It is a living document that will be updated periodically, so the public, in their private and civic actions, can consider the consequences of their actions on nature, and temper or alter them as appropriate to minimize any negative effect.

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The inventory of natural resources for the county was first published in 1985. Although similar in format to the original, the 2010 version makes great

[1] This chapter was written during 2010 by Robert Wills (Dutchess County Department of Planning and Development) and Neil Curri (Cornell Cooperative Extension Dutchess County Environment & Energy Program). The document was reviewed by Dr. Phil Thibault (Dutchess County Office of Computer Information Systems).

use of digital technology in the form of **Geographic Information Systems** (www.gis.com) to create, store, and analyze the accurate digital representations of environmental features, and through the internet to communicate concepts and policies through maps. This chapter will provide an explanation of how this data was developed, and how it can be used in support of environmentally responsible land use decisions.

Making a map has been the traditional method of documenting a natural resource. For example, in one of the first maps of a section of the original Nine Partners Patent, a subjective delineation of features found on the ground was recorded on paper (Figure 8.1).

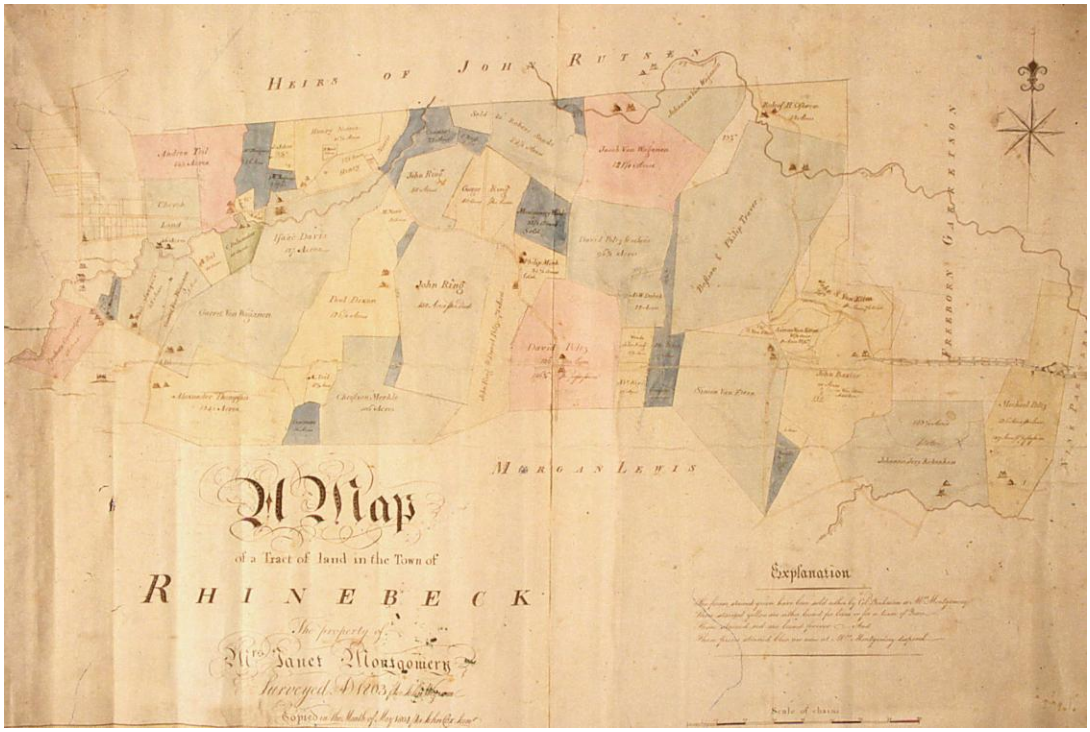

Figure 8.1: Janet Livingston Map of Rhinebeck, circa 1803

In the first Dutchess County Soils maps published in 1939, field survey and paper maps were the tool and communication device to record and disseminate this information. With the invention and wide-spread use of the Global Positioning System (GPS) and Geographic Information Systems (GIS), natural resource data can now be collected and mapped on a more regular basis and with much greater accuracy than in the past.

All of the natural resource information in the county is now in electronic form and available to municipalities and the public, either for their use within a GIS or as customized maps.

Throughout the Natural Resource Inventory, data are used to illustrate the relationships we have with the elements of our environment and the consequences our actions have on nature. Much of this data describes a place – whether a bird's nest or stream bank, back yard or municipality, it is geographic in nature, and has a location as part of its definition. Location is the unifying element of the data: given a place (like an address), inferences can be made about the conditions present at that location.

Figure 8.2: Creed Ankony Farm in the Town of Rhinebeck

We rely on **geographic analysis** to help us understand the complicated relationships between the things we see in our landscapes. "What caused a wetland to form at that spot?" "Why is that plant community present at the base of that hill?" For example, one layer of polygons might represent areas of fertile soils; another, areas of gentle slope. A third layer might focus on only those hillsides facing directly south into strong sunshine. One can imagine each type of data drawn on separate layers of tracing paper. When all the layers are stacked up, one soon sees where characteristics overlay and where they don't. If we assign a value from most suitable to least suitable, based on the quantity of superimposed characteristics, we can begin to make a decision based on a place. Adding up all the

occurrences of overlap gives us a high score. What we may have found in this example is a good location for a vegetable garden. This is what GIS does for us electronically, with any of our locally produced data layers, or with those which can be found on the internet (Figure 8.3).

Figure 8.3: Example of GIS data layers

The Natural Resource Inventory is a similar, but comprehensive, collection of layers of geographic information representing ecosystems and natural features. By design, each of the layers overlays one another, registered to coordinates common to all -- the boundaries of the county. Further, this collection overlays all other county geographic data, including temporal data (such as tax parcel boundaries) and physical features (such as structures and roads). Because of this connection, powerful analysis can occur, giving us a rich and dynamic look at the characteristics of a place.

The concept of overlaying layers of environmental information as a foundation for understanding people's relationship to nature was pioneered by the planner and philosopher, Ian McHarg. In his landmark book published in 1969, "Design with Nature", McHarg lays out a framework for using environmental information in land planning exactly like the previous example about our vegetable garden. In an ecological approach, humans come to understand the specialness and limitations of nature, designing their habitats *with* nature in mind, not in opposition or ignorance to it. GIS and the overlay of data about natural systems help us see this relationship clearly.

Figure 8.4: Overlay Mapping, a precursor to modern GIS analysis

"It's not a stretch to say that the development of GIS technology and the entire industry around it was profoundly influenced by the work of McHarg. He popularized the overlay concept and laid the groundwork for what was to become GIS, thus taking a number of budding young landscape architects and geographers and changing their lives forever."

- Jack Dangermond, Environmental Systems Research Institute President, in ArcNews Online Summer 2009

Dutchess County has invested considerable amounts in not only the creation of the data behind the Natural Resource Inventory, but in its dissemination to the public through our website: www.co.dutchess.ny.us/CountyGov/Mapping.htm Please visit often.

GIS HISTORY IN DUTCHESS COUNTY

Understanding the history of GIS development in the county is integral to understanding how the data supporting the Natural Resource Inventory can be correctly used. GIS data in the county was created by many organizations, using many different methods, over a twenty-five year period. Inherent in each method is a level of accuracy that likely will vary substantially from another method. As the position of features will be affected, any analysis

that uses methods which superimpose one layer on another must be designed to account for these imprecisions.

Geographic Information Systems were developed in the late-1960s by the Government of Canada. The first commercially available GIS was developed in the 1970s by the Environmental Systems Research Institute (ESRI). In the mid-1980s, the first use of GIS in Dutchess County was a joint effort between The Rockefeller University Field Station and the Environmental Management Council (EMC). Through this partnership, many base environmental layers were developed and used in the first edition of the Natural Resource Inventory in 1985. In 1986, Dutchess County Government organized the GIS Executive Committee to coordinate the GIS efforts of any interested county entity. Besides county departments, the EMC, Central Hudson, Dutchess Community College, and several municipalities participated. Interestingly, it was 1988 when IBM submitted the first proposal for a unified, county-wide GIS, to the tune of over $2 million dollars ($3,750,000 in today's dollars), a proposal that was not funded by the Dutchess County Legislature.

During the subsequent decade, while the EMC's GIS Lab flourished, a number of independent initiatives began in Dutchess County. GIS courses were developed and taught at Dutchess Community College, Marist, Vassar, and SUNY New Paltz. The Office of Emergency Response funded the development of Enhanced 911, which included the delineation and addressing of road centerlines. The New York City Department of Environmental Protection awarded the County Real Property Tax Service Agency a $50,000 grant to develop digital real property tax parcel lines for all properties within the NYC watershed boundary. The county purchased the first set of digital aerial photography, based on scans of the US Department of Agriculture's National Air Photo Program for 1995. It was with these layers that departmental initiatives and analysis began in earnest.

In 1999, a study was completed which looked at the current state of GIS operations in the county and presented a vision for the future. The ongoing arrangement, where individual departmental staff exercised their specialized knowledge to create subject-specific geographic information, was respected. However, the need to establish a common base map to which all other data can be referenced, in concert with standards for data creation, was deemed

critical to growth and future operations, because it would allow sharing data. It was only within this organizing framework of data and standards that sharing data and analysis among all county departments and municipalities could take place. In this way GIS could grow in an organized fashion. This vision was implemented by the GIS Executive Committee, funded by County Government, and established over subsequent years (Koehler, 1999).

Currently, many county departments and agencies create geographic information, specific to their missions, just as at the turn of the century. Each layer, however, is registered to the common base map or core data layers as we now call them. Data standards allow any municipality, department, or interested party the ability to create new data and share it with other users. Everyone then has the comfort of knowing that layers will overlay and accuracy standards are respected. This framework has also allowed a number of local communities and Conservation Advisory Committees to create their own GIS data, and analyze it along with NRI data and other base data layers like tax parcels. The City of Poughkeepsie, Clinton, Dover, East Fishkill, LaGrange, and Pleasant Valley have been among the leaders in this effort.

Dutchess County has a robust system to put this GIS data investment into the hands of our residents, through on-line applications available to the public and to municipalities. Beginning in 2004, ParcelAccess made possible viewing of Real Property Tax information on all county parcels, and GeoAccess provides a portal to much municipal data. In addition, Dutchess County Office of Computer Information Systems (OCIS) has designed three tools specifically for viewing and analyzing data layers, to answer questions about planning and environmental protection. The ACCESS and Local Data Explorer (LDE) tools, now obsolete, and the current tool, ArcStudio, allow viewing of most county GIS data and queries of the associated data, buffering of features, markups, measuring, and creation of mailing lists. ArcStudio is accessible to municipalities, county employees, and the general public through a Dutchess County GIS workstation. All applications and others continue to evolve with the latest advances in internet and GIS technology. Cooperatively, the Cornell Cooperative Extension (CCEDC) Environment & Energy Program GIS Lab also continues a long history of providing GIS outreach and data access to residents and municipal Conservation Advisory Committees.

Individual GIS data distribution and mapping assistance is available to municipalities, consultants, and individuals both through individual Dutchess County Departments and CCEDC. At this time, there are over 100 published datasets available by request. For a comprehensive list, inquire with departmental GIS contacts listed at the following web page, http://www.co.dutchess.ny.us/CountyGov/14461.htm#Contacts, or log onto a public GIS workstation available at many town government offices, where you can also access the ArcStudio application.

DUTCHESS COUNTY DATA DEVELOPMENT

Over time, Dutchess County has taken steps to standardize data creation methods and quality control procedures. These, along with the use of reference data layers like digital orthophotography to derive new data, has vastly improved the accuracy of newly created data. However, some of this early data is still available and being used right along with data produced more recently. Before embarking on a GIS analysis, one must be aware of these differences.

The accuracy and accessibility of environmental data that we have today was unimaginable when the first NRI was compiled in 1985. Methods of data capture have changed, as have the methods for creating the documentation of the capture, our interpretive maps. Throughout the past twenty-five years, environmental data and maps compiled for the NRI have been either created or acquired by many county departments, and reflect the non-centralized organization of GIS in the county. Improvements in computer technology and remote sensing (acquiring information about an object without being in contact with it) have meant great improvements in data accuracy, and more intuitive and accessible means of analysis and display. Clearly, older geographic data is likely to be less accurate than newly captured data. Caution is warranted when overlaying geographic data of different production dates.

RASTER DATA

Raster data represents features through a continuous matrix of cells, otherwise known as a GRID, as opposed to drawn borders demarcating object A from object B. Although raster data can represent discrete features, it is most suited to continuous data themes such as terrain elevation, temperature, or population (shown in Figure 8.5). Digital photographs are raster data representing variations in color, whereas a digital elevation model (DEM) represents variation in the elevation of terrain.

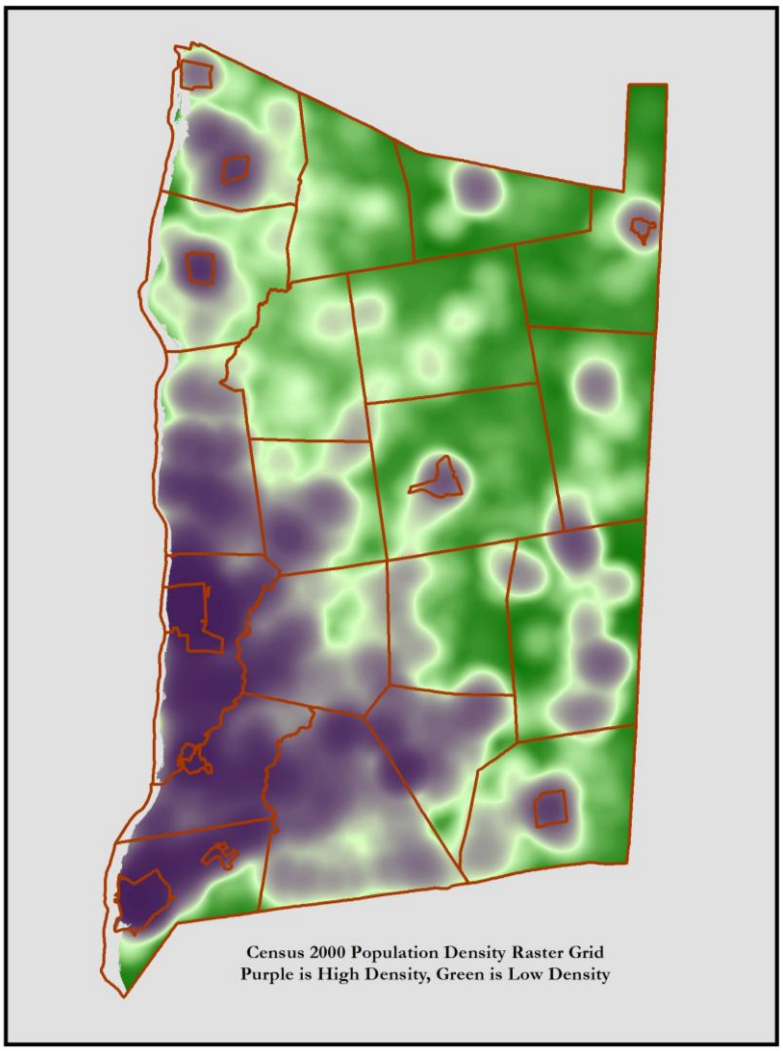

Figure 8.5: Density raster grid of Dutchess County population, from 2000 Census

Raster data can be created either by converting photographs or maps to digital form with an optical scanner, or collected from objects in the environment using remote sensing devices

such as aerial cameras, space vehicles, or temperature sensors. Similar to vector data, conversion procedures had to take into account error inherent in the source material, dependant on the quality of the original pictures or in the media upon which it was reproduced. Remote sensing methods also must account for and correct error. In the case of aerial photography, deviations in elevation of the terrain and the position of the camera mounted in the aircraft, as well as the stability of the aircraft, had to be measured and corrected to achieve a high accuracy result. Even the shape of the camera lens affected which portion of the resulting image was within accuracy standards. For example, the 1990 edition of county aerial photography could only be referred to as simple "pictures," as it was not corrected for many of these artifacts. Radial distortion caused by the shape of the camera lens caused an elongation of objects the further they were from the center of the exposure. Nor were the photographs orthorectified, or tied through sophisticated measurement to true ground location. Our current 2009 edition of digital orthophotography has a horizontal accuracy of plus/minus five feet, meaning that the coordinates of 98 percent of objects visible in the photos can be at most five feet from their true ground location.

Current technology has eliminated the need to use film in aerial cameras. Direct-digital imaging is used as the source for orthophotography. All manipulation of the original image to correct for errors introduced by camera lens, etc. is now done directly through computer programs. This eliminates all of the errors introduced in conversion from film to digital media, and can correct some of the aforementioned problems. In addition, the flight vehicle carries Global Positioning System (GPS) equipment that records, with sub-centimeter accuracy, the exact position of the camera at the time each of the photos was taken, which additionally eliminates another source of inaccuracy.

Resolution, or the size of the smallest cell of information capable of being captured, was a factor in what could be seen in the digital file. Obviously, very small features would be lost if the resolution was larger than these features. The storage capacity and speed of computers also dictated how detailed (and therefore how large) a file could be before it was rendered unusable. Because the resolution of space-based remote sensing devices have been so coarse (the latest LANDSAT-7 sensors collect 15-, 30-, and 60-meter resolution) Dutchess County

has utilized aircraft-based cameras instead. The 2009 digital orthophotography has a resolution of six inches, making objects as small as one foot across clearly visible. Because of its accuracy and resolution, the 2009 digital orthophotography is the reference layer for all other layers. In fact, **orthophotography** (aerial photography registered to the earth's surface) has long been used as the basis for developing other GIS data comprised of points, lines and polygons (vector data). The American Society for Photogrammetry and Remote Sensing first developed standards for extracting useful information from aerial photography in 1937. Dutchess County Tax Parcel Maps were first created in 1972 using the 1970 edition of orthophotography as a reference.

Figure 8.6: A farmer leading cows from one corral to another, Town of Washington, from the 2009 edition of Dutchess County digital orthophotography

A different type of airplane-mounted sensor is used to collect elevations from our landforms, to develop contour lines and terrain maps. In this technique, called **LiDAR (Light Detection and Ranging)**, a laser transmitter and receiver, similar to that used in highway speed enforcement, shoots laser pulses at the ground at the rate of 10,000 bursts of light per second. The reflected light is captured, with the time interval between projection and reception recorded. From this, distance between the aircraft and ground is calculated. As the height of the aircraft is known, the elevation of the terrain can be derived. This is illustrated as a continuous surface, or GRID (shown in Figure 8.7).

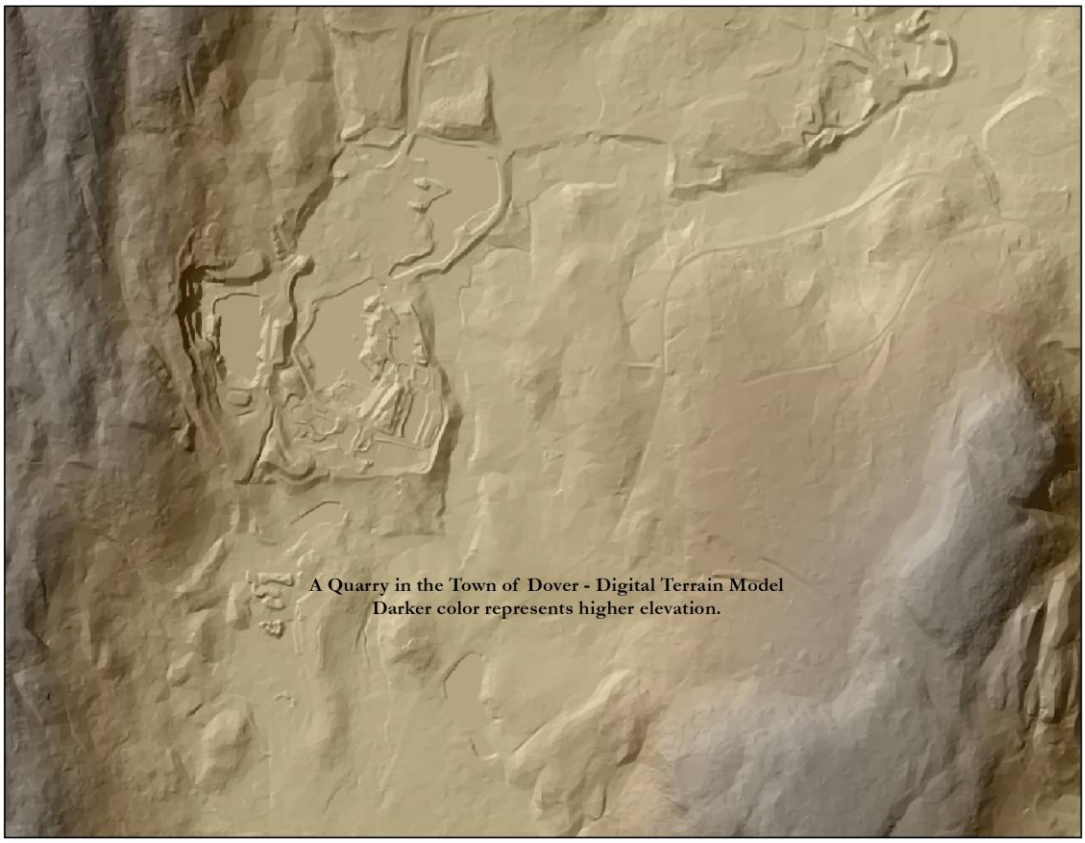

Figure 8.7: Digital terrain model showing a quarry in the Town of Dover

VECTOR DATA

It is only recently that new GIS data has been developed from existing highly accurate digital representations of geographic features. Most GIS data did not start out in digital form, but as a map of the features of the earth, usually on paper, which required conversion to use on the computer. Features which appeared on a map were traced, using a device called a digitizer, which generated an electronic version of the points, lines and polygons that existed on paper or other media. This data is called **vector data**, and is comprised of discrete features, each of which can be associated with different characteristics. The accuracy of the resultant computer version relied not only on the operator's skill at tracing accurately, but on the accuracy of the source map. Inherently, the source map had errors based on many factors, including the scale and accuracy of the source from which *it* was created, delineator's error, the number of times and methods used in its reproduction, its scale, and even the

media upon which it was created (paper changes size based on the relative humidity). Further, accuracy is degraded when misinformation is placed in the layer's database.

Vector data is captured and drawn with many new techniques and technology. For example, **Global Positioning Systems** utilizes satellites in earth orbit to derive the location of devices capable of receiving signals from the satellites that include their locations and the time of the transmission. These hand-held devices, or GPS receivers, which can be carried over the ground by a person, are used to locate objects in the environment, or trace the path of a trail or area like a farm field. While tracing the path or area, data about the feature can be logged into the device. This field-collected data can then be brought directly into a geographic information system and analyzed or displayed as a map.

GUIDELINES FOR USING DATA

A GIS analysis does not simply start by throwing data layers together and seeing what overlaps. Whether using Dutchess County data or that acquired elsewhere, one must understand how the data was made. And the first source for an explanation is the **metadata** (Figure 8.8). Metadata is the "data about the data", the "who, what, where, when, why" of its creation, and the "how much and how good" it is in objective terms. What this leads you to is an idea of how the data can be used. Dutchess County has a format for metadata that is based on the Federal Geographic Data Committee standard for metadata. It includes all necessary information about how the data was created and its accuracy. From it, one can determine why it was made, what its age and accuracy are, what it can be appropriately used for, and what source documents were used in its creation. (Source documents refer to those maps or images which, through electronic means, were converted into digital form.)

Metadata Record

GIS Connection

Home | Search Menu

Dutchess County GIS Metadata Record: 1159
Title: Dutchess County Forests
Category Theme: Thematic
This record was last modified on: 20081202 (year, month, day) and it is being maintained by: Planning located in: Poughkeepsie, NY.

No Data is Available for Download -Please see further details in the Data Distribution section of this metadata record.

STORED IN GEODATABASE -Open ArcGIS, navigate to **gis_vector**,and open the dataset

Identification Information

Abstract: Forest landcover for the entire County, delineated using County year 2000 digital orthophotography, divided into four areal classifications: complete county-wide forest and derived raster file (GRID format); individual forest fragments; forests split by municipal boundaries; forests split by 2000 orthophoto tile grid (10K foot-square grid). Area/perimeter metrics were derived for each classification as a basis for future analysis.

Purpose/ Supplemental Information: This data was prepared in cooperation with the Institute of Ecosystem Studies for use in research on the relationship of habitat fragmentation, densities of white-footed mouse populations, and Lyme disease dynamics. Rules were developed by IES staff for this delineation. No differentiation is made between tree species, nor between deciduous and coniferous forests. Area/Perimeter ratios can be used as an indication of forest fragmentation, where suburban sprawl encroaches on dense forest areas. Suggested uses for this data are welcomed.

Attribute Overview:
Values of area and perimeter were calculated in english and metric units for the forest units in each geographic division (county-wide, municipality, 10K tile, or forest fragment). From these, forest to total land area ratio, perimeter of forest unit, perimeter area ratio, and isoperimetric quotient were calculated. Because some amount of temporal perimeter was subtracted from forest units (at municipal boundaries, for instance), isoperimetric quotient values can exceed 1.

Attribute Detail:
n/a

Dates: This data was published 20071015. This data is valid for the time beginning (Beginning Date): 20000503 to (Ending Date): 20000503

Originator: Dutchess County Department of Health

http://gis.dcny.gov/datacatalogue/fullmetarecord.asp (1 of 4)9/11/2009 3:21:05 PM

Figure 8.8: Dutchess County GIS Metadata for Dutchess County Forests

Some of the data characteristics listed in a metadata record will be related to **scale**. Is this data set really good enough to tell me something about: my back yard? …my neighborhood? …my town? There is a reason why the disclaimer "not for site specific use" appears on maps…it is because the minimum mapping unit, or **resolution**, of the data, is larger than the proposed analysis unit. For instance, the Dutchess County Soil Survey is an approximation of soil types in a location. It cannot be the sole source for locating a septic distribution field on a property. A field investigation utilizing excavation is the supplement for acquiring "site

specific" data at the "back yard" level. The same is true for GIS datasets, and knowledge of their resolution is necessary for an appropriate analysis.

Scale of the original source map adds another kind of error. The contour layer first used in the County's GIS was created by the US Geological Survey. The contour lines were digitized from 1:24,000 quad maps for which 90 percent of the features were positioned to within fifty feet of their ground location (see National Map Accuracy Standards). Compare this to our current five-foot contours, which are based on our digital terrain model (Figure 8.9). Using this much more accurate source, 98 percent of the features are within five feet of their true ground location, an improvement of over ten times!

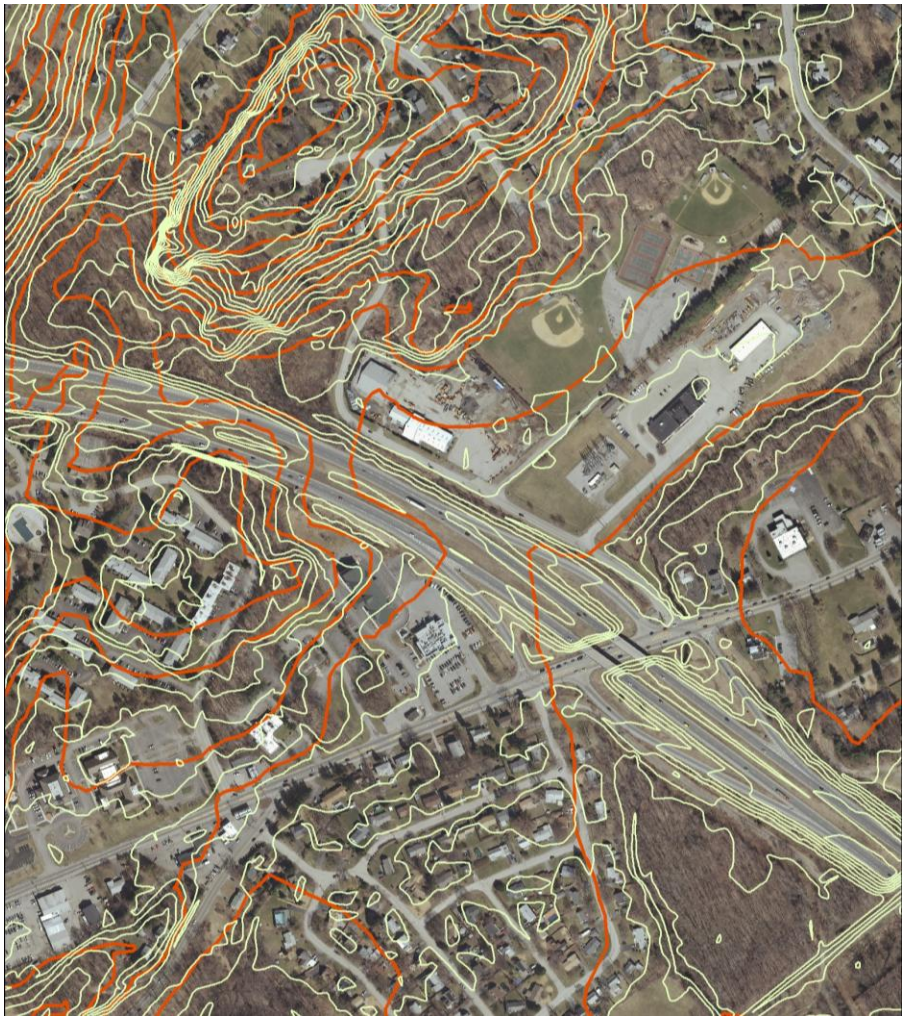

Figure 8.9: Map of US Interstate 84 in Fishkill. Yellow lines represent current five-foot contours; orange lines represent USGS ten-foot contours.

Location is one dimension of geographic data; time is another. In many instances, time is a characteristic not to be ignored, as important as location in understanding a complex natural phenomenon. "When did that happen?" "How quickly did that change?" These are two questions that knowledge of when an observation was made can help to answer. For example, the amount and extent of changes to land use becomes readily apparent when comparing two (or more) editions of aerial photography (Figure 8.10)

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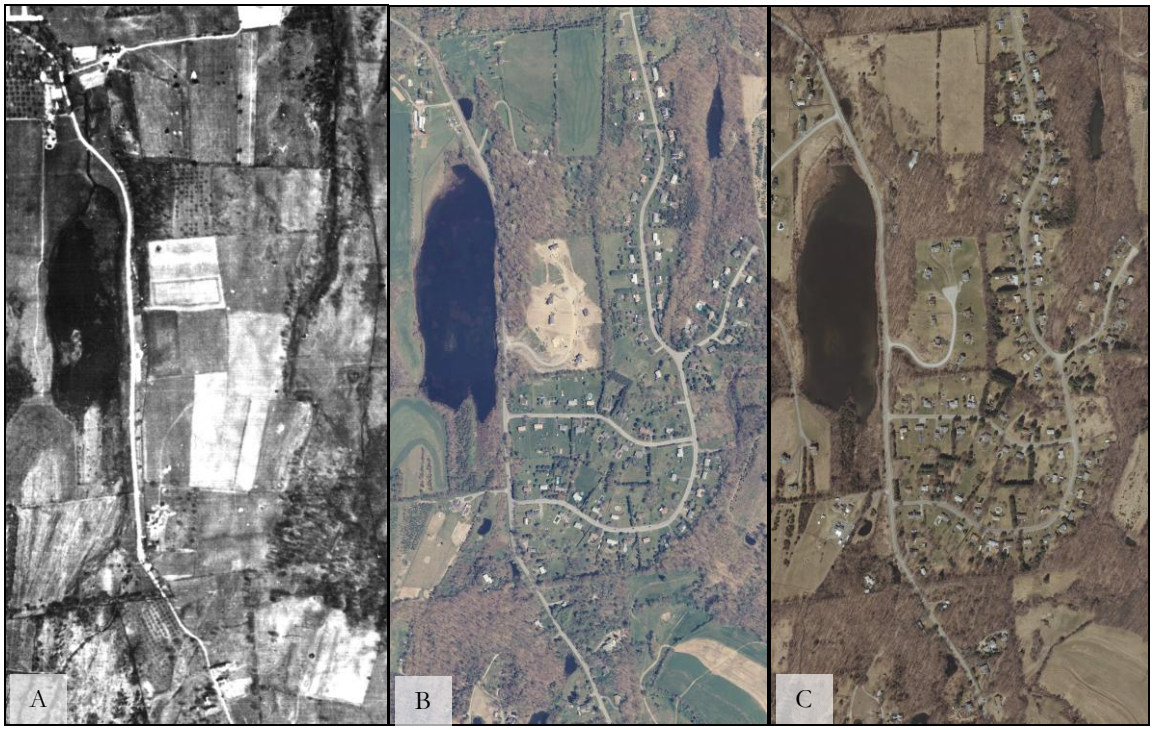

Figure 8.10: Aerial imagery of the Town of LaGrange from A) 1936 Aerial Photography, B) 2000 Digital Orthoimagery, C) 2009 Digital Orthoimagery

Equally important is knowledge of the age of the data. "How current is it?" With fast-paced changes in technology come improvements in the accuracy, completeness, and comprehensiveness of data. One needs to know these characteristics, described in the metadata, before valid analysis can take place. For example, many residential structures had been built between the time of the 2004 and 2009 digital orthophoto acquisitions. Conducting an analysis on 2004 data could therefore lead one astray.

DATA

Following is a list of geographic information data resources for the county, organized by NRI Chapter: Climate; Geology and Topography; Soils; Hydrological Resources; Biological Resources and Biodiversity; and Designated Significant and Protected Areas. From a public GIS workstation available at municipal offices or Cornell Cooperative Extension, one can access a complete list of all GIS data for Dutchess County at http://gis.dcny.gov/datacatalogue/topicsearchresults.asp. This is not a World Wide Web address, but a link to Dutchess County's intranet, and is only available from a computer linked to the county network. Note that each dataset has a person to contact for more information about the resource and instructions on how to obtain it.

For each dataset there is a Technical Contact and Interpretive Contact. The Interpretive Contact verifies that the GIS data is correct, maintains the metadata record, and coordinates the distribution of the data layer to those requesting it. The Technical Contact is the person within the department who can be contacted for technical issues like database construction, and who physically updates the GIS data.

The data layers, categorized by NRI chapter:

Climate

- Meteorological data (current and historic) from the Cary Institute of Ecosystem Studies
- GIS and meteorological data from the National Weather Service

Geology and Topography

- Bedrock and Surficial Deposits
- Contours: five-, ten-, and twenty-foot
- Terrain, Hillshade, and Elevation Models: two-, ten-, and thirty-meter resolution

Soils

- Hydrologic Soil Groups
- Soil Survey (SSURGO)
- Steep Slopes: 15%, 20%, and 25%.
- Prime and Secondary Agricultural Soils

Hydrology

- Aquifers
- NYC DEP East of Hudson Drainage
- FIRM Maps FEMA Q3 Flood data
- Minor Streams
- National Hydrological Dataset
- Linear and Areal Hydrology (planimetric)
- SPDES Storm Discharge Points
- Detailed Watersheds
- Well Completion Reports
- Wellhead Protection Areas
- Wells/Public Water Supplies

Biological Resources

- Municipal Biodiversity Assessments (Hudsonia)
- New York State:
    - NYS DEC Biodiversity Outreach Program
    - NY Natural Heritage Rare Animal Status List
    - NYS Biodiversity http://www.dec.ny.gov/lands/5094.html
- Cary Institute of Ecosystem Studies
- Cornell Cooperative Extension Dutchess County Environment & Energy Program
- http://www.dutchesswatersheds.org
- Dutchess County Planning & Development:
    - Biodiversity Blocks
    - Centers and Greenspaces Plan
- Local municipalities: Conservation Advisory Committees; watershed groups

Protected and Significant Areas

- Critical Environmental Areas
- Municipal Open Space Plans, Habitat Maps
- Land protected by Conservation Easement or Government-owned
- Forested lands

Core Data Layers

- Tax Parcel Maps and Real Property Tax database
- Digital Orthophotography (true-color and false-color infrared)
- Planimetric data layers (pavement, structure footprints, large parking lots)
- Road centerline file

CORE DATA LAYERS

Critical in most GIS analyses are the core data layers that describe ownership and our built environment. The county's 2009 digital orthophotography represents the reference standard for all visible features on the ground, with an accuracy of about five feet horizontal and six-inch pixels. It will be used as the reference for updating all planimetric features. The county digital elevation model also has an accuracy of about five feet horizontal, and is the reference for all elevation information including contours, terrain, and watersheds. The Real Property Tax Parcel Maps present a representation of the limits of ownership with a core database input by local assessors of key property and structure descriptors reflecting what improvements have been made to any property. Planimetric features, or those drawn directly from the orthophotography, represent areas of impervious surfaces found in roads, structures and parking lots. Along with ownership information and appropriate environmental layers, the core data layers are essential to include in any environmental GIS analysis.

COMMUNITY-BASED LANDSCAPE ANALYSIS

One of the most frequent ways communities implement land use policy is through the review of development proposals brought before their Planning Boards. Instead of being ecology-centered, this process often pits the landowner against the community in an expensive adversarial relationship in which ecosystems can be the losers. Traditionally, a land owner interested in developing will retain the advice of an engineer, who develops a plan that maximizes the profit potential of the property before understanding the visions and aspirations of the community, and the ecological systems within which their client's property sits. This elaborate plan, which undoubtedly reflects a substantial investment, is presented at the beginning of a lengthy, confrontational process. Following is an example of how the Natural Resource Inventory data is being used in land use decisions.

Dutchess County Planning & Development has proposed an alternative that is being implemented in a number of our communities. In a process that begins with an initial meeting focused on a site map and Resource Analysis, the landowner and Planning Board

discuss the assets and constraints of the site (Figure 8.11A, B, and C). This is the start of a conversation where everyone knows what is important to the community, what features are important to save, and what the reviewing body would like to see on the site. With minimal expense, the applicant learns up front where the "buildable" areas are on the site. The applicant will also know what to expect in the State Environmental Quality Review (SEQR) process, as possible environmental impacts will already have been discussed. This can be done with an 11x17 map of ecological systems, physical constraints such as soils and slope water bodies and streams, a checklist, a site walk, and a discussion. The potential for months of "back and forth" between the applicant and the Board has now been avoided. The engineering consultants can use their talents to satisfy both the needs of the applicant and the municipality (Carille and Akeley, 2007).

FORM A: RESOURCE ANALYSIS ASSESSMENT Date filled in:_____

(To be initially reviewed and completed by applicant in preparation for review and completion by Planning Board)

Name of subdivision: _____

Address:_____

Specific Site Considerations

	Yes	No	Not Sure
1. Are there streams, wetlands, water bodies or watercourses that might require protective buffer areas? Refer to Hudsonia guidelines.	___	___	___
2. Is this parcel adjacent to the Harlem Valley Rail Trail or a public recreational area?	___	___	___
3. Is there active or inactive farmland on the parcel(s)?	___	___	___
4. Will the farmland be preserved?	___	___	___
5. Is there active farmland on adjacent parcel(s)?	___	___	___
6. Is this an Agricultural Exempt parcel(s)?	___	___	___
7. Can land contiguous to the adjacent farmland be preserved?	___	___	___
8. Is this parcel within an aquifer resource area?	___	___	___
9. Are there ridgelines and mountaintops that the Town desires to be kept clear of development?	___	___	___
10. Are there stone walls or rock outcrops on the site? If yes, indicate walls on land use sketch.	___	___	___
11. Could development significantly alter the viewshed from public lands?	___	___	___
12. Could development alter the quality of public viewsheds?	___	___	___
13. Is the parcel adjacent or within an officially designated historic site or district?	___	___	___
14. Are there special cultural and historic features that should be preserved?	___	___	___
15. Are there high-quality trees and significant groups of trees that should be preserved?	___	___	___
16. Are there, or is there the potential for significant wildlife habitats or wildlife migration areas? Refer to the Hudsonia study.	___	___	___
17. Do any of these significant natural areas (forests, wildlife habitats, etc) extend into abutting properties?	___	___	___
18. Can the development be connected to a public water supply?	___	___	___
19. Are there prime soils or soils of statewide importance located on the property?	___	___	___

Figure 8.11A: Resource Analysis Form

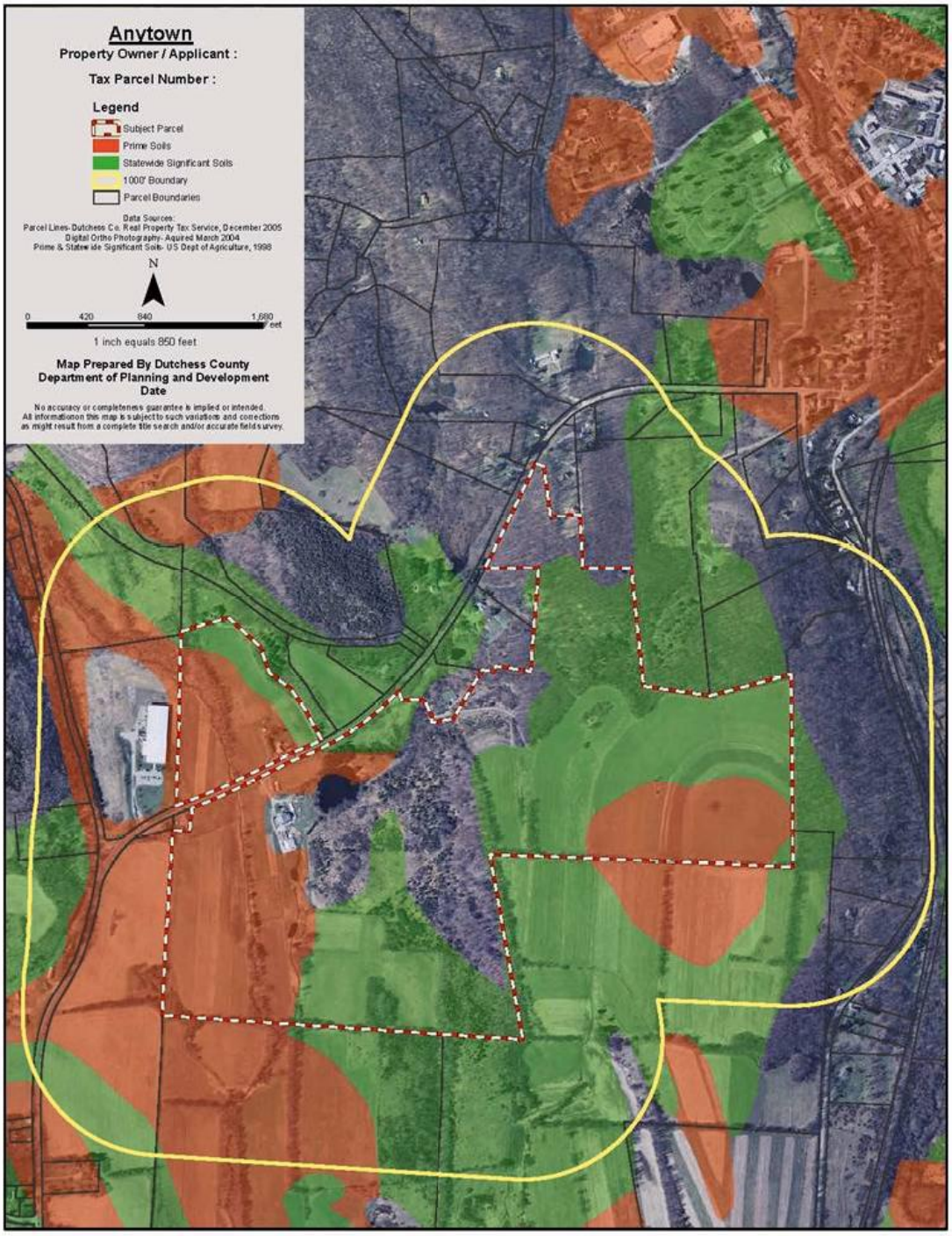

Figure 8.11B: Soils Map

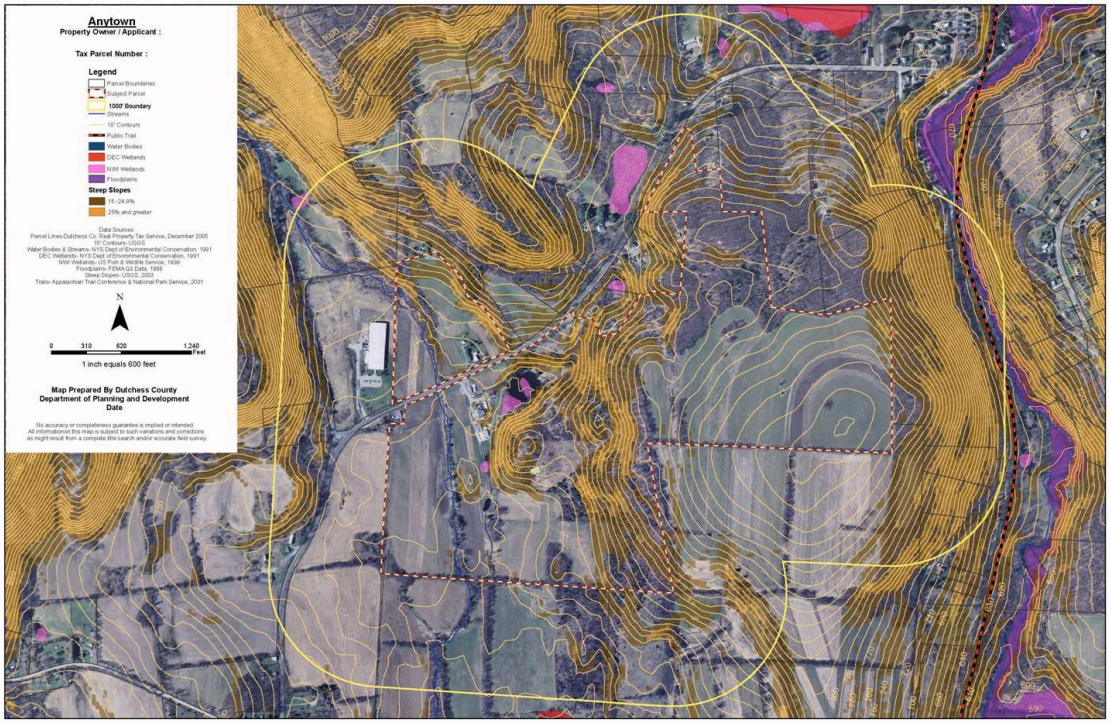

Figure 8.11C: Resource Analysis Map

SUMMARY

It is comparatively easy to recognize that traditional forms of human habitation like villages and hamlets can exist in harmony with natural ecosystems, while suburban sprawl, progressively using ever increasing amounts of land per household, fragments sensitive habitat and agricultural lands, and renders them unusable for their previous residents. Taking civic actions to lessen these negative impacts requires an accurate portrayal of the natural conditions and development context.

Sound land use policy necessarily relies on sound environmental data, scrutinized with sound analysis. This sturdy three-legged support, crafted with the vision and aspirations of a community, can then allow the ecological expectations to match the realities of the built environment. The Natural Resource Inventory provides policymakers and the public with the interpretation and accurate data necessary to conduct the legitimate analyses necessary to make sound policy. This chapter has described the data behind the NRI and hopefully

conveyed some insight into responsibly using the data, in an effort to make a compelling argument for protecting both nature and humanity.

RESOURCES FOR ADDITIONAL INFORMATION

- **GIS in Dutchess County:**
  - http://www.co.dutchess.ny.us/CountyGov/14456.htm
  - http://www.co.dutchess.ny.us/CountyGov/14461.htm
  - http://www.co.dutchess.ny.us/CountyGov/GISStandards.htm
  - http://ccedutchess.org/environmentenergy/geographic-information-systems-gis
- **The NRI:** www.co.dutchess.ny.us/CountyGov/Mapping.htm
- **NRI Data:** http://gis.dcny.gov/datacatalogue/topicsearchresults.asp
- **Raster Imagery:**
  - http://www.satimagingcorp.com/satellite-sensors/landsat.html
  - http://landsat.gsfc.nasa.gov/data/where.html
  - http://glcf.umiacs.umd.edu/data/landsat/
- **Metadata:**
  - http://www.fgdc.gov/metadata
  - http://www.co.dutchess.ny.us/CountyGov/GIS.htm
  - http://www.nysgis.state.ny.us/coordinationprogram/workgroups/wg_1/related/standards/index.html
- **Remote sensing data:**
  - http://www.satimagingcorp.com/satellite-sensors/landsat.html
  - http://landsat.gsfc.nasa.gov/data/where.html
  - http://glcf.umiacs.umd.edu/data/landsat/
- **National Map Accuracy Standards:** http://egsc.usgs.gov/isb/pubs/factsheets/fs17199.html#US%20National
- **Model Subdivision Regulations:** http://www.co.dutchess.ny.us/CountyGov/Departments/Planning/subdivisionofland.pdf

REFERENCES

Carille, Lindsay & Roger Akeley. "Model Subdivision Regulations." Poughkeepsie, NY: Dutchess County Department of Planning and Development, January 2007.

Koehler, David. *GIS Needs Assessment for Dutchess County*. PlanGraphics, Inc. July 29, 1999.