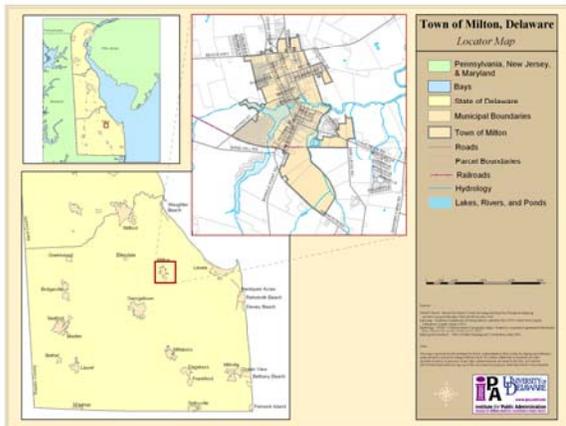


Appendix A: Conducting a Natural Resource Assessment – An Example

The Inventory

The following example describes the process a town might go through in order to conduct a natural resource assessment (NRA). Before you can do an NRA, you need to conduct an inventory of what you have. A natural resource inventory (NRI) is a summary in map form of a municipality's open-space lands, water resources, natural areas, and protected corridors. The town of Milton will be used to demonstrate how to collect data for a natural resource inventory.

Figure 1. Locator Map of the Town of Milton



Data for your natural resource inventory can be collected over the internet and down-loaded into your GIS. Another option would be to download the data and place it within the free ESRI GIS software viewer called ArcExplorer Java Edition. Where GIS is not available, the data can be printed out from the internet onto transparencies (make sure they are at the same scale), which can be overlaid on top of one another. For the example below we have placed the collected data into ArcGIS. With these data, a municipality can start determining areas that are suitable to develop and areas that are best preserved by conducting a natural resource assessment (refer back to Chapter 1).

The maps used in the NRI will display the natural resources within the town of Milton and identify areas that will influence natural resource management, preservation, and protection. The five maps listed below are a good start in identifying the natural resources in and around the town of Milton.

A. Base Map

The town base map will be where you determine your study area to be. Your study area can be at the municipal level or at a watershed level. The base map will include the framework layers from the Delaware DataMIL, datamil.delaware.gov. When you go to the DataMIL web site, click on the "MAPPING" text link on the left hand side, then click on the "Enter Map Production Laboratory" text. This will open the Internet Mapping Site for Delaware Framework Data. All of the following data layers are available for viewing, printing, and downloading through the Delaware DataMIL. Only the digital ortho-photography cannot be downloaded from the internet, so it is recommended that your municipality print this data layer out as a paper map. The layers for your base map should include

- Σ Municipal boundaries;
- Σ Transportation, roads, and railroads;
- Σ Hydrography, lines and areas; and
- Σ 2002 aerial imagery.

Figure 2. Source Information

Municipal Boundaries – Delaware Office of State Planning Coordination

Transportation – Road network and railroads, DelDOT Centerline File

Hydrography – USGS/EPA

Geographic Names – USGS, Geographic Names Information System (GNIS)

2002 Orthoimagery – Detailed aerial photos, 2002 Orthoimagery Project

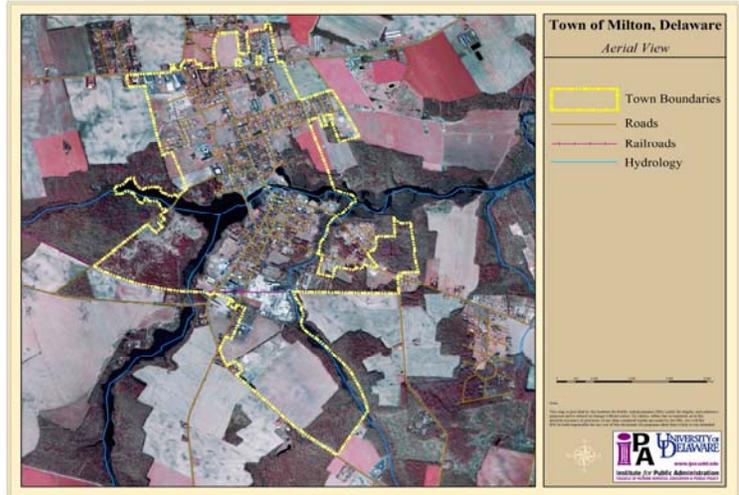


Figure 2. Base Map of the Town of Milton

B. Land Use/Land Cover

Land use/land cover is an important data layer that helps you define the development patterns of your community and provide areas of focus for land-use planning efforts. The land use/land cover data layer in Delaware has been created from digital orthophotography for the years 1992, 1997, and 2002, depicting what is actually on the ground. It is also available on the DataMIL. If you have completed your comprehensive plan, an existing land-use map will be included, with the land use coded by parcel. Examples of the two types of land-use data are shown in Figure 3.

It is recommended that, if you do not have a GIS, you print this data layer out on a transparency. It is important to make sure when you are printing data from the DataMIL that you use the same scale throughout.

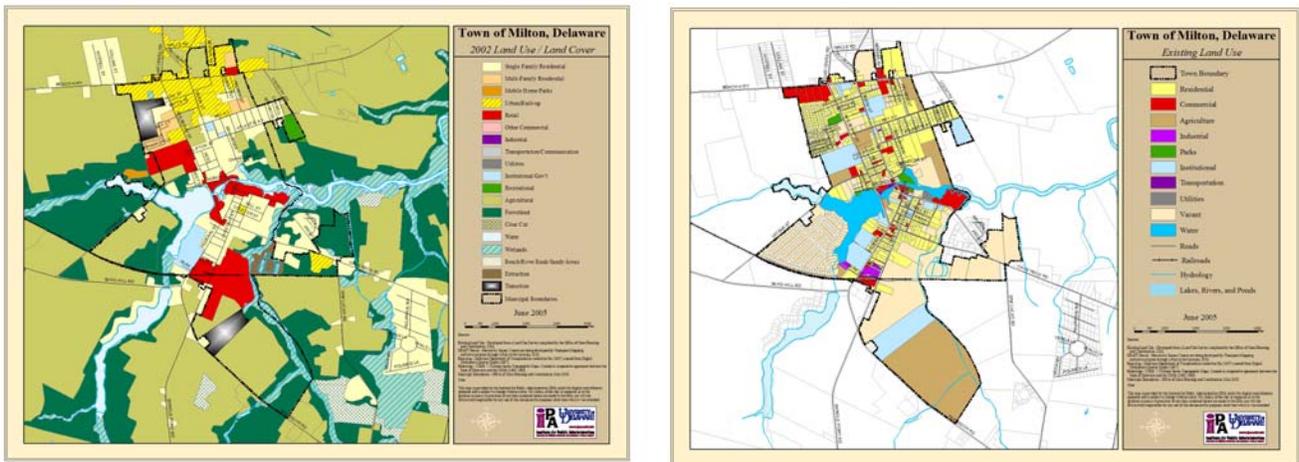


Figure 3. Land-Use Maps of the Town of Milton

Figure 3. Source Information

Left: Land Use / Land Cover – 2002 land use and land cover dataset for the state of Delaware based on the 1997 land-use data of the state and 2002 false color infrared digital orthophotography at a scale of 1:2400. The work was performed by EarthData International of Maryland, LLC, for the Delaware Spatial Data Implementation Team (I-Team).

Right: Existing Land Use – Land use coded by parcel for the town of Milton’s comprehensive plan, 2003.

C. Water Resources Map

This map represents a municipality's surface and subsurface water. If your municipality has completed its comprehensive plan, these data may be included in the environmental features map. Well data is unavailable at this time over the internet. Water resource areas that will be included within this map (and their data sources) are as follows:

- Σ Lakes, ponds, and rivers – *found on DataMIL*
- Σ Wetlands – *found within the land use/land cover dataset also on the DataMIL*
- Σ Groundwater recharge areas – *environmental features map in your comprehensive plan*
- Σ Watershed boundaries – *found on DataMIL*
- Σ FEMA Q3 flood plains – *environmental features map in your comprehensive plan, your county's web site, or FEMA's web site, www.fema.gov/.*

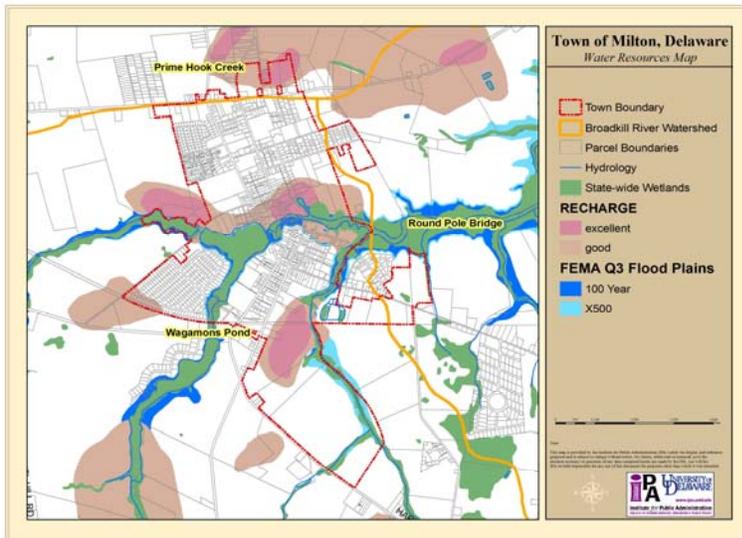


Figure 4. Source Information

Hydrography – USGS 7.5 Minute Series Topographic Maps. Created in cooperative agreement between the state of Delaware and the USGS (1991–1993) and EPA.

Wetlands – Department of Natural Resources & Environmental Control (DNREC), Statewide Wetlands Mapping Project (SWMP), 2000.

Watersheds – DNREC, 1998.

Groundwater Recharge Areas – Delaware Geological Survey, 2002.

Flood Plains – Federal Emergency Management Agency (FEMA).

Figure 4. Water Resources Map of the Town of Milton

D. Unique and Fragile Lands

This map represents areas in your community that provide habitat for unique plants and animals. The DNREC Division of Fish and Wildlife has identified these sensitive habitats where species are listed as threatened, endangered, or of special concern. The identification of the most unique and fragile lands in your town will help you with the prioritization of lands during the open-space planning process. This prioritized list will help to focus the lands targeted for open space acquisition. Due to the sensitivity of these areas, a map is not included within this appendix.

E. Committed Open Space

An outdoor recreation inventory, created by the DNREC Division of Parks and Recreation, can be found through the Environmental Navigator web site, www.dnrec.state.de.us/DNRECeis/. Data layers for this map consist of the following:

- State parks
- Federal parks
- Private conservation
- State forests
- State historic parks
- State reserves
- State fish and wildlife areas
- County parks
- Municipal parks
- Private doughnuts
- Agricultural easements
- Schools

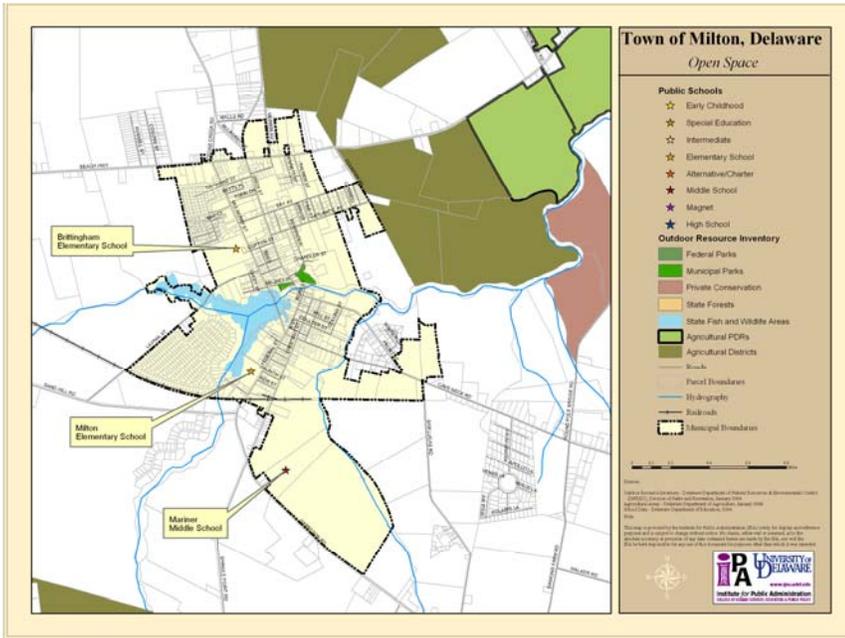


Figure 5. Source Information

Outdoor Resource Inventory –
 Department of Natural Resources
 and Environmental Control
 (DNREC), Division of Parks and
 Recreation, January 2004.

Agricultural Easements –
 Delaware Department of Agriculture,
 June 2004.

School Data – Delaware Depart-
 ment of Education, October 2004.

Figure 5. Open Space Map of the Town of Milton

Other data that is important for your inventory that could be collected at a later time would be the following:

- Σ Land ownership by parcel
- Σ SSURGO soil classification from NRCS
- Σ Drainage basins with direction of flow
- Σ Areas with limitations for development
- Σ Productive wildlife habitat
- Σ Proposed cultural resource protection areas
 - Sites of archeological or historical importance
 - Areas that define community character

The Assessment

Below is an example of a proposed development and how a municipality would work through the data collected in their inventory to assess potential impacts on some key natural resources. The town of Milton will continue to be used as the example.

The Issue

For purposes of illustration, a new residential development has been proposed in the southeast section of Milton indicated by the arrow in Figure 6.

The 139-acre parcel within the Milton town boundary is presently agricultural, but is zoned for residential use. Lot sizes for single-family residences typically are 0.25 to 1 acre, with each parcel comprising about 20 percent impervious cover.

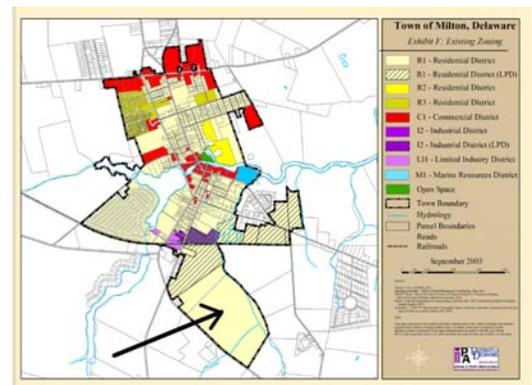


Figure 6. A new development is proposed on a large parcel zoned Low-Density Residential.

State Natural Resource Goals

The town of Milton has decided that one of its natural resource goals is to protect its water resources. Milton's drinking water is derived from groundwater, and fishing is a popular recreation in the community. Some areas of the town have experienced flooding during heavy rainfall episodes. The main goals of the town are to reduce pollutants, maintain a healthy stream habitat, increase recharge to groundwater, and decrease flooding. A natural resource assessment will be conducted to guide Milton in planning this and other developments in a manner that will help protect water resources.

Milton's natural resource goals could include the following:

- Σ Reducing pollutant loads, which helps to maintain healthy drinking water, groundwater, and fish populations. Runoff washing over debris-laden impervious surfaces can cause stormwater pollution, which infiltrates into groundwater and into stream channels.
- Σ Reducing the amount of impervious cover and maintaining forested riparian zones, which helps to reduce the amount of pollution that will be picked up in stormwater runoff.
- Σ Maintaining groundwater recharge, which is essential for adequate water supplies in aquifers and adequate base flows in streams.
- Σ Keeping recharge areas free of impervious cover, so that the water infiltration that is necessary for proper recharge can occur.
- Σ Maintaining open space and pervious cover, which reduces the potential for flooding.
- Σ Balancing development with the protection of natural resources such as wetlands and forests, which helps to reduce the intensity of stream flooding.
- Σ Creating and maintaining a viable stream habitat, which is necessary for stream health and allows fish and other aquatic life to survive.
- Σ Maintaining a healthy stream habitat, which will increase the economic and recreational value of the town.

Assemble Data Layers

The next step in the natural resource assessment is to determine what data layers will be needed to perform the analysis. The planning group will select the layers from data described in the natural resources inventory (see Chapter 1) that pertain to the natural resource goals. In this example GIS is not being used, so the layers of data will be downloaded from an internet mapping site and printed on the paper of choice.

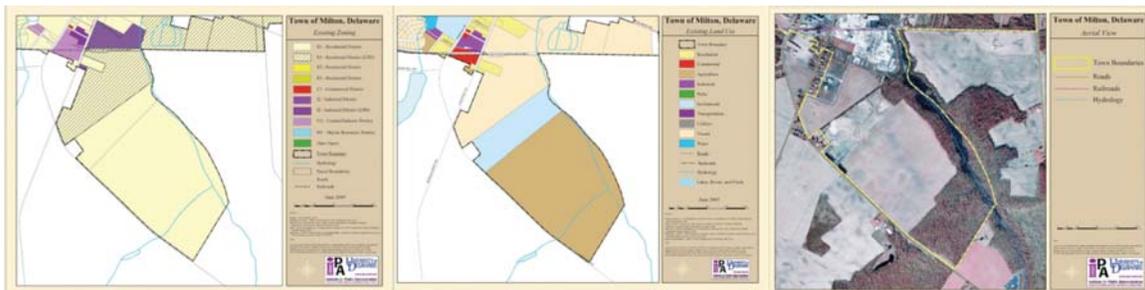


Figure 7. Base maps that include zoning, land use, and aerial photography of the town of Milton can be printed on plain white paper.

GIS layers that depict floodplains, wetlands, excellent and good recharge areas, and parcels will be printed onto clear film. The clear film layers can be overlaid onto the base maps in Figure 7, so that land uses beneath and within water resources can be assessed. The overlays will allow the town to analyze the land uses that are affecting water resources and where future development might be placed to limit harmful effects of development on water supplies. Multiple transparencies can be overlaid simultaneously to view two or three layers at one time over the base maps.



Figure 8. Water resource locations, parcels, and future town boundaries and land use are printed on clear film and are overlaid onto base maps shown in Figure 7. This method is useful for natural resource assessment when GIS is not available.

Conduct Your Assessment

In this analysis, floodplains will be used to simulate the riparian zone that could be created with GIS, if GIS were being used. It is good practice to maintain healthy riparian areas with trees and shrubbery, to act as a filter to storm runoff as well as protecting against flooding (Chapter 3). Land use within the riparian zone ideally would be limited to forest, but since development is necessary, best management practices can be used to limit the impacts of impervious surfaces. The floodplain and recharge layers were printed on clear film in order to view the zoning and land-use features within these critical resource areas. Planners can determine if the proposed development layout will place impervious surfaces within the riparian area. In Figure 9 below, the map image depicts recharge areas and floodplains overlying zoning data. The map shows the parcel in question contains both floodplains and recharge areas within it.

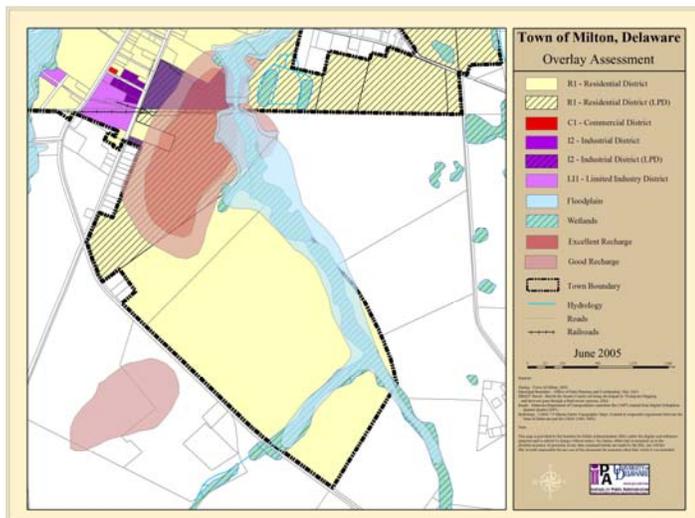


Figure 9. Clear film layers depicting floodplains and recharge areas can be laid atop zoning to identify critical areas that might require development best management practices to meet natural resource goals as listed above.

This sort of simple assessment allows town planners to visualize what development best management practices could be applied to best protect water resources. Perhaps town planners will decide that the actual development could be set back from the stream and clustered, leaving the floodplain and recharge areas as open space. This not only would protect the floodplain, but also would allow growth of a forested riparian area as well as a peaceful park area. If this is the case, the planner might opt for a different development plan, one that will create open space within the riparian buffer and cluster houses away from the stream channel. If GIS were to be used, a 100-foot buffer could be created around the stream channel to be used as the riparian zone data layer. Computer-aided design (CAD) drawings can be imported to the GIS to get a feel for varying development scenarios, in order to determine which would best protect the stream system.