

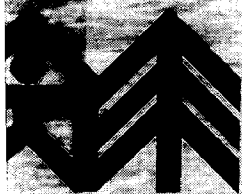
A Planning Tool for Maine Communities

Natural Resources HANDBOOK

COASTAL ZONE
INFORMATION CENTER

Coastal Zone
Management Program

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1979



Maine Association of Conservation Commissioners

Natural Resources HANDBOOK

A Planning Tool for Maine Communities

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Dedication

This handbook is dedicated to Sterling "Tad" Dow, III, the first Executive Director of the Maine Association of Conservation Commissions. Tad was one of the founders of MACC and the first president. During the nine years he served as Executive Director, Tad helped to establish over 200 conservation commissions in communities from Kittery to Caribou.

Acknowledgements

This handbook was written by the consulting firm of Maine Tomorrow under contract with the Maine Association of Conservation Commissions. The author was Gwendolyn R. Hilton, who served as Staff Director for MACC.

The author gratefully acknowledges the assistance of Brian Kent for his editorial comments and advice on layout and design; Jean Oplinger for doing the layout and map work, and the support staff of Maine Tomorrow for their patience in typing the handbook drafts. The author would also like to thank: Josie Quintrell and Hal Kimball of the State Planning Office, the New Hampshire Office of Comprehensive Planning for their permission to use maps and graphics from their publication "The Land Book", Jim Connors and everyone else who gave advice on the production of this handbook.

Financial assistance for the preparation of this document was provided by a grant from Maine's Coastal Program, through funding provided by U.S. Department of Commerce, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.

Cover Photograph by Hal Kimball

Preface

In 1975, the Maine Association of Conservation Commissions (MACC) and the University of Maine at Portland-Gorham prepared a manual entitled "How to Make a Natural Resources Inventory". Following publication of this manual, MACC conducted a series of training sessions around the state. The sessions provided the opportunity to distribute the manuals and to instruct conservation commissions, local officials and interested citizens on how to prepare the inventories. The manual and training sessions were well received and more than fifty commissions prepared natural resource inventories.

This handbook is a follow-up to the first handbook. It has been updated and revised to reflect the availability of new sources of information and current planning needs.

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I. Introduction

Every community needs to know and understand its assets; to protect, conserve and/or capitalize on them. This handbook explains how a community can do this by inventorying their natural resources. Once a natural resources inventory is completed, it can be used to better understand natural systems and their limitations and opportunities for human use.

The natural resources inventory is only one part of a community's effort to plan and manage growth. Comprehensive community planning must consider such things as local politics, land use, population characteristics and municipal services.

What Are Natural Resources?

Air, land, water and vegetation are natural resources. These resources are an essential part of the earth's natural system. All living things depend on these resources. Without these resources, life would not exist.

The quality of the natural resources is important to the maintenance of a healthy environment. Clean water and air are essential to the well being of man and wildlife. Deep, fertile soils, unexposed to excessive erosion, are necessary to

grow food and fiber. Wildlife is also a natural resource. Conservation of these resources is necessary to assure our continued well-being.

Why Are They Important?

It is important to understand the environment so as to adequately and appropriately manage the earth's resources. The natural resources inventory is a tool that can be used to better understand the environment and to make more enlightened decisions on how best to manage natural resources for the long term.

What Is a Natural Resources Inventory?

The Product - The natural resources inventory is a compilation in map and written form, of the natural resource characteristics of an area. The maps visually display the location and extent of each natural resource. These maps show the general characteristics of each resource and are suitable for community-wide planning. However,

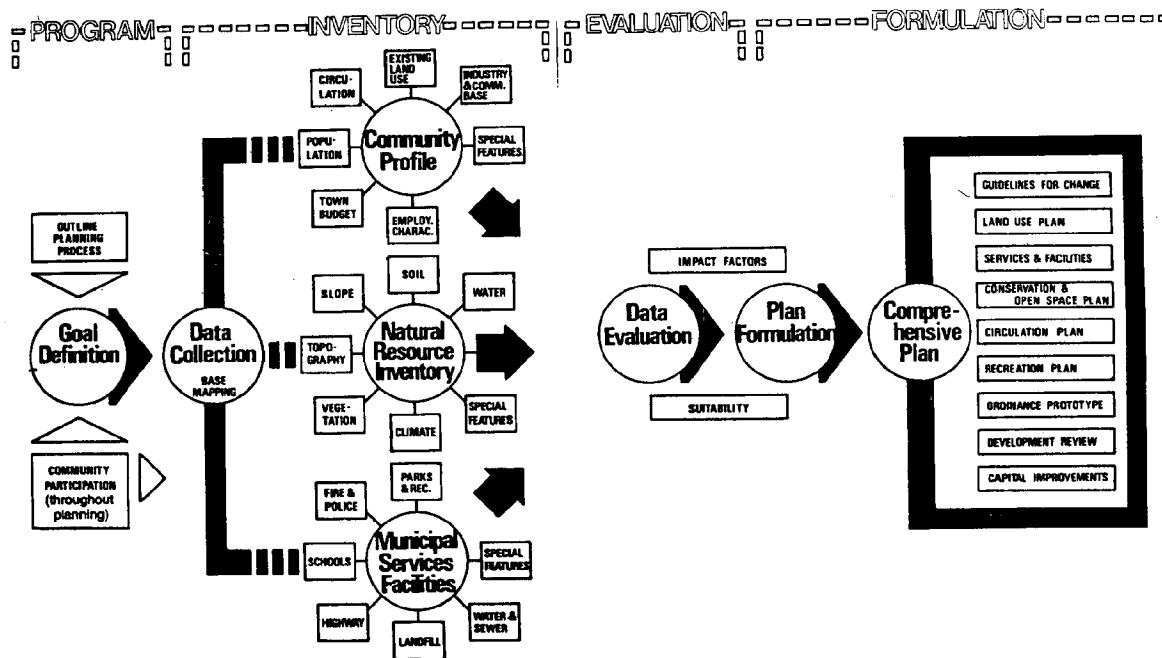
they are not accurate enough for site analysis. The written narrative accompanying each map further describes the characteristics of the resource. Figures, tables and graphs may be used to more clearly and concisely describe these characteristics.

Another product of the inventory can be a single natural resource summary analysis map which displays only the most pertinent natural resource information on a single map. This map can then be used in conjunction with an existing land use map for future land use planning purposes.

The Process - The process of inventorying natural resources involves the accumulation of data available about the resource and the display of that data in as useful a form as possible.

In many cases the information has already been collected and it is just a matter of updating it and/or putting it into a useable form. Sometimes the information is generalized and must be refined by on-site investigations. In other cases it may be necessary to gather first-hand information through field surveys within the community. In some instances, however, the information must be gathered and analyzed by a professional. A good example of this is the hydrologic investigations that may be necessary to complete an adequate ground water inventory.

Inventorying natural resources as a part of community planning, is a continuous process. New needs, new problems, new opportunities and new information are constantly arising. The natural resources inventory should be updated periodically to reflect these changes.



**Critical Path
for
Comprehensive
Community Planning**

What Is the Purpose of an Inventory?

The Natural Resources Inventory has many recognized benefits:

1. It provides a sound basis for town planning and the establishment of ordinances and other land use management techniques.
2. It will identify areas sensitive to some types of development as well as identify areas best suited for various land uses.
3. It shows where problems and opportunities are, and permits alternatives to be suggested which will result in better land use.
4. It can be used to educate landowners and the general public, thereby resulting in improved land use.
5. It involves local people in a common cause which increases commitment for a better community environment.
6. It is an educational tool; it permits young people, new residents, and old timers to learn more about their community and its surroundings.
7. It helps to build appreciation of the Town.

Using This Handbook

This Handbook is designed to help anyone interested in gathering information on natural resources in their community. The Handbook provides a step-by-step procedure for completing a natural resources inventory, a land use inventory, and then explains how to use this information. While the Handbook provides information on the complete process, it may also be used for special projects where only one or several resources must be inventoried.

How This Handbook Is Organized

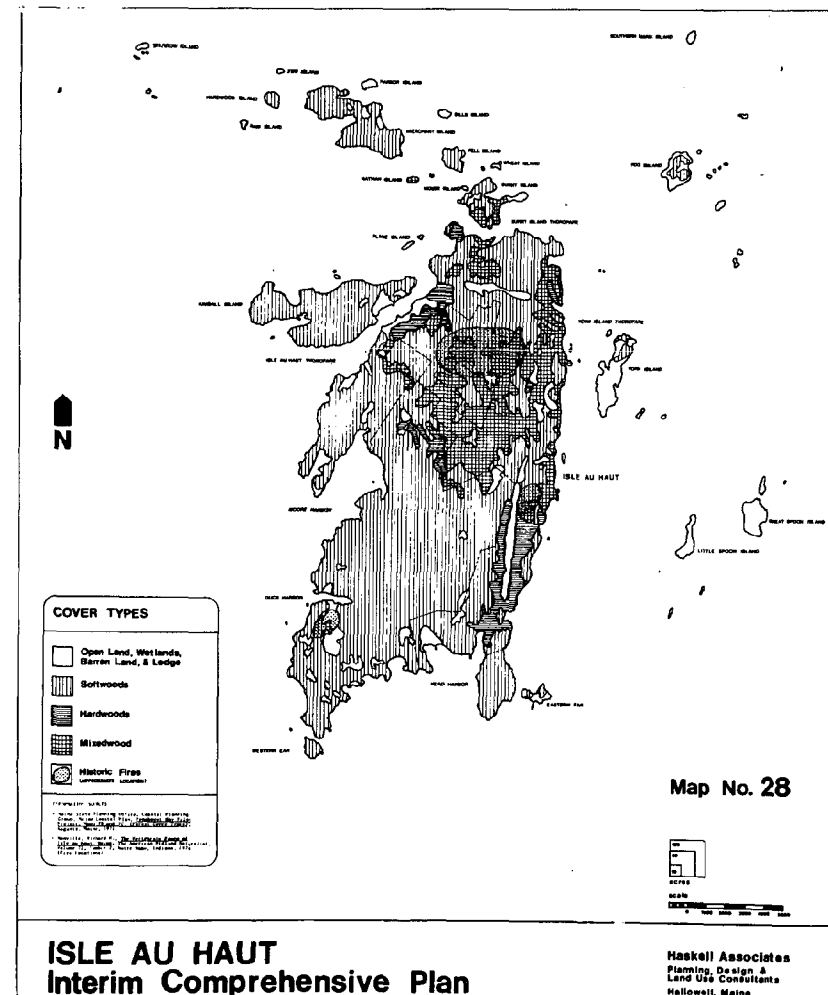
Chapter I consists of the Introduction. Chapter II provides information on how to organize an inventory project, where to go for help, and how to develop a workplan. Maps and mapping are explained in Chapter III. Chapter IV describes each natural resource and explains how to collect available data, prepare maps and write an accompanying narrative.

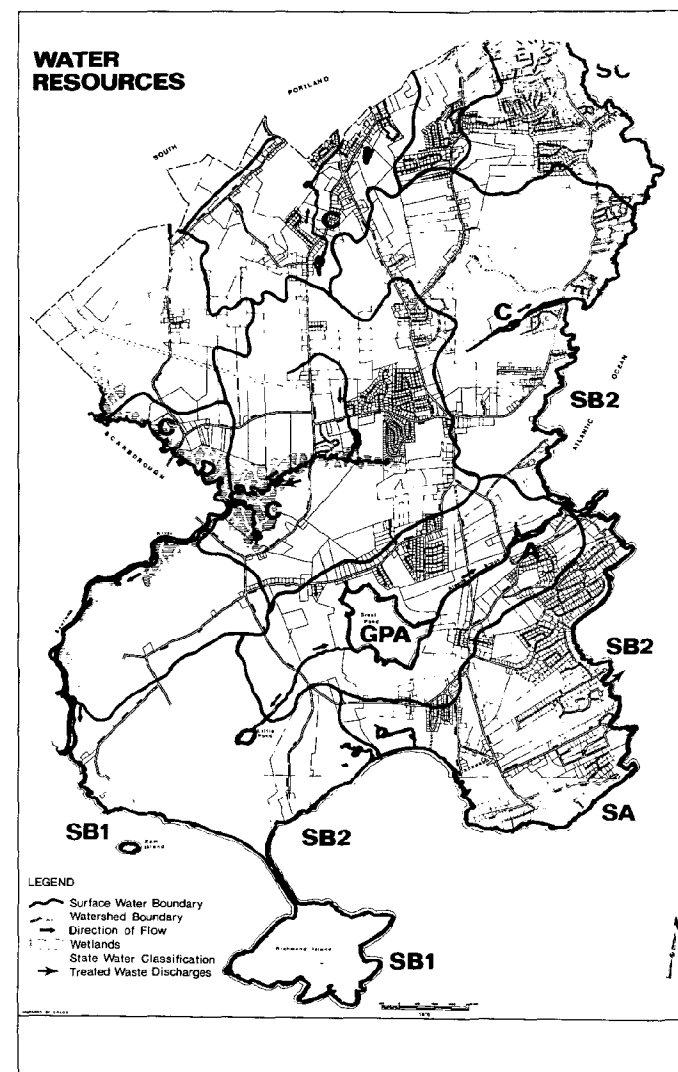
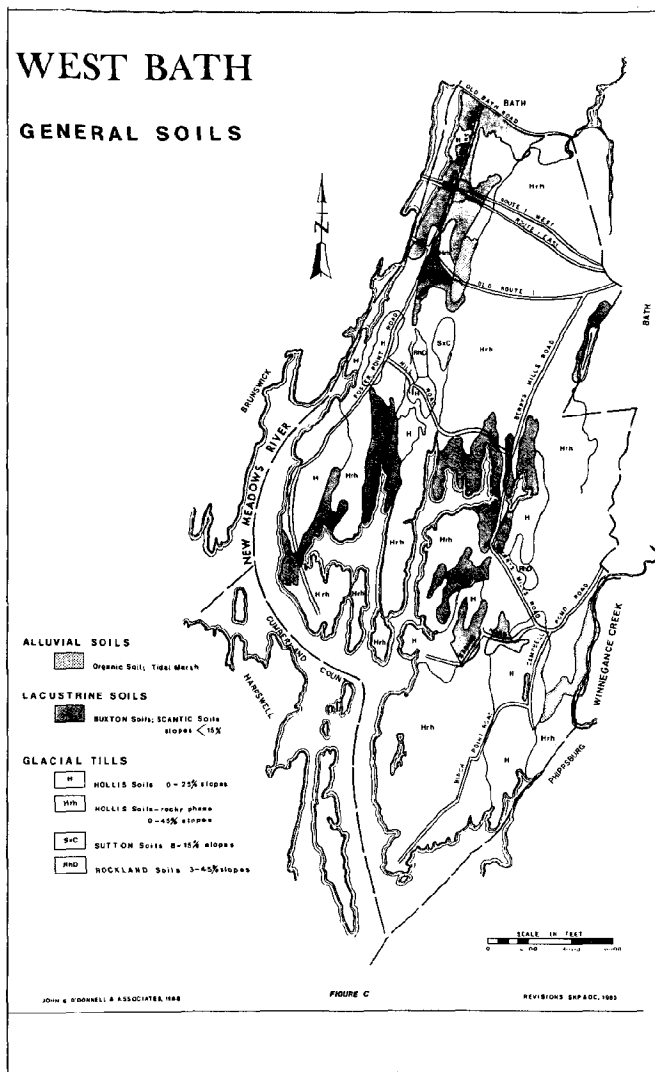
Examples of Natural Resource Inventories

Chapter V explains how to analyze the inventory information by preparing a natural resources summary analysis map, a map which displays the most pertinent information that has been collected. Chapter VI discusses how to make a land use inventory -- an inventory of man's development activities. This chapter is not really a part of a natural resources inventory, per se, but is included to show how the natural resources inventory can be used in land use planning. Chapter VII explains how to combine the land use inventory map with the natural resources summary analysis map for planning purposes.

Chapter VIII, Using The Inventory Results, discusses briefly how the natural resources inventory and land use information is used for comprehensive planning and the administration of land use ordinances.

The Appendices list sources of information and technical assistance, an annotated bibliography, listing of municipal ordinances with resource protection provisions and a legal brief on ordinance application fees.





Cape Elizabeth

II. Conducting The Inventory: The Process

The Natural Resources Inventory process is designed to provide a systematic procedure for collecting and interpreting the best available natural resource and land use information. This procedure involves planning: establishing goals and objectives, setting priorities, organizing people to do the work, getting assistance, developing a feasible workplan and following through.

Determine What You Wish to Accomplish

Prior to conducting the inventory, determine what is to be accomplished. If the community is in the process of drafting a comprehensive plan for the first time, a town-wide inventory of all natural resources may be appropriate. If the town is updating a comprehensive plan or working on a specific project, an inventory of only certain resources may be necessary.

Depending on the focus of the effort, the community may want to emphasize certain components of the inventory. For example, if there is interest in preserving farmland the emphasis should be on the inventory of soils; if there is concern about water supply the focus should be on surface and ground water mapping.

Who Is Going to Conduct the Inventory?

Ideally, a governmental entity should be involved in conducting the inventory, particularly if it is to be a part of the community's planning efforts. The municipal officers (selectmen or council), and planning board should be key participants if the information is to be used for community planning. The planning board, since it is charged with developing comprehensive plans and reviewing development proposals might conduct the inventory. Some towns have town planners who might be assigned the task of inventorying natural resources.

Town conservation commissions have traditionally undertaken such efforts, and are often able to do so where planning boards are very busy. Some communities might choose to appoint a special committee to conduct the inventory. Still other communities might opt to hire a consultant.

As with any planning effort it is very important that community decision-makers (selectmen, council, planning board, conservation commission, etc.) are aware of the inventory effort and given an opportunity to provide input.

Find Out What Help Is Available

There are many sources of information and technical assistance available to help a community in performing a natural resources inventory. As a first step the town should contact its regional planning commission, council of governments or the Maine Association of Conservation Commissions (these organizations provide assistance to member communities and, in some cases, to non-member communities on a fee basis). These organizations may be able to provide some of the resource materials listed in this handbook, give assistance in completing the inventory, and provide the names of contact persons to obtain other information. This handbook lists information sources in Chapter IV, the Natural Resources Inventory and in the Appendix.

It might also be possible to obtain help in conducting the inventory through a nearby college or university (i.e. classroom projects, independent studies, student interns, or work study programs). The County Cooperative Extension Service and county offices of the U.S. Soil Conservation Service may also be able to provide assistance.

Develop a Work Plan

Once you have determined what you wish to accomplish and who is going to be involved, develop a schedule for completing each element of the inventory and decide who is going to do what. Take advantage of any special abilities or expertise of those people involved. Retired professionals are often a very valuable source of expertise.

Begin, by inventorying the natural resources that are most important. Don't try to tackle too much at one time. Conducting an entire natural resources inventory is a time-consuming and lengthy process, particularly for volunteer boards and citizens. Good organization sets a reasonable work plan and time frame that doesn't overtax and discourage participants. Spread out the work between a reasonable number of volunteers and set target dates for completion.

Gather All Existing Information

Since, at the very least, there should be a file of all the information and maps presently available, this should be done first. This is just in case it is not possible to complete the inventory or the information is needed before the inventory is completed.

SAMPLE WORKPLAN			
INVENTORY ELEMENT(s)	WORK TASK	ASSIGNMENTS	COMPLETION DATE
All Elements Topography Water Resources Soils Vegetation Natural Features Land Use	(Gather data from secondary sources)	(names of individuals conducting inventory)	Jan. 31
Topography	Gather any field data; draft map; write narrative		Feb. 28
Water Resources	Gather any field data; draft map; write narrative		Mar. 31
Soils	Gather any field data; draft map; write narrative		Apr. 30
Vegetation	Gather any field data; draft map; write narrative		May 31
Natural Features	Gather any field data; draft map; write narrative		Jun. 30
Summary Analysis	Determine what to map; draft map; write narrative		Aug. 31
Land Use	Draft map; write narrative		Oct. 31
Land Use Review	Determine what to map; draft map; write narrative		Dec. 31

Inform and Educate the Public

Informing and educating the public about your project is very important for several reasons. If the public understands the purpose of the project and what is involved they are more likely to approve it if it is to be voted upon at town meeting. This would be the case if the natural resources inventory was to be part of a comprehensive plan which must be voted upon by the legislative body (i.e. town meeting or council).

Publicity will serve to increase community appreciation, pride and knowledge on environmental issues. Knowledge and understanding about natural resources should encourage more responsible use of natural resources. Publicity may also help to gather volunteers!

Publicity can consist of newspaper articles, letters to the editor, television and radio coverage, speaking engagements, special mailings sending notes home with school kids, or any other way of telling people about the project.

III. Mapping

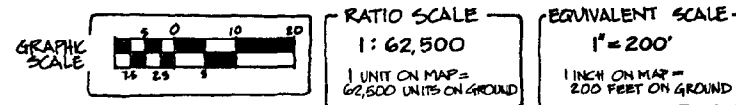
What Is Mapping? Why Is It Important?

Mapping is a method of displaying information. Maps represent on a flat surface, as accurately as possible, physical features on or below the curved surface of the earth. Maps are the best way to display the location and the real extent of natural resources. This chapter explains the different types of maps available for natural resource inventorying in Maine and how to use maps.

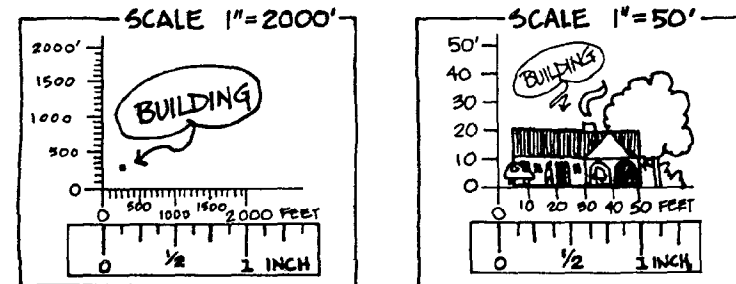
Map Measurements

The scale of the map is the ruler by which distances are measured. The map scale is often expressed as a representative fraction such as $1/62,500$. This fraction or ratio means that one inch on the map is equal to 62,500 inches on the ground. Thus, $1:62,500$ means one inch equals 5,208 feet or nearly one mile. Scale is also expressed in graphical form as a bar graph. If the map size changes the bar graph size must change.

The accuracy of the map as a representation of the earth's surface depends on its scale and the degree of detail to be shown. At any given scale, only a certain amount of detail can be accurately shown. In addition, the scale limits the amount of area that can be represented.



The key then is to match the amount of detail to be shown, with a suitable map scale. Generally, towns map natural resources at a scale of between 1 inch = 1000 feet to 1 inch = 2000 feet.



Area is usually measured in square feet or acres using a planimeter or a dot grid. These tools may be available through the U.S. Soil Conservation Service County Office or the regional planning commission or council of governments.

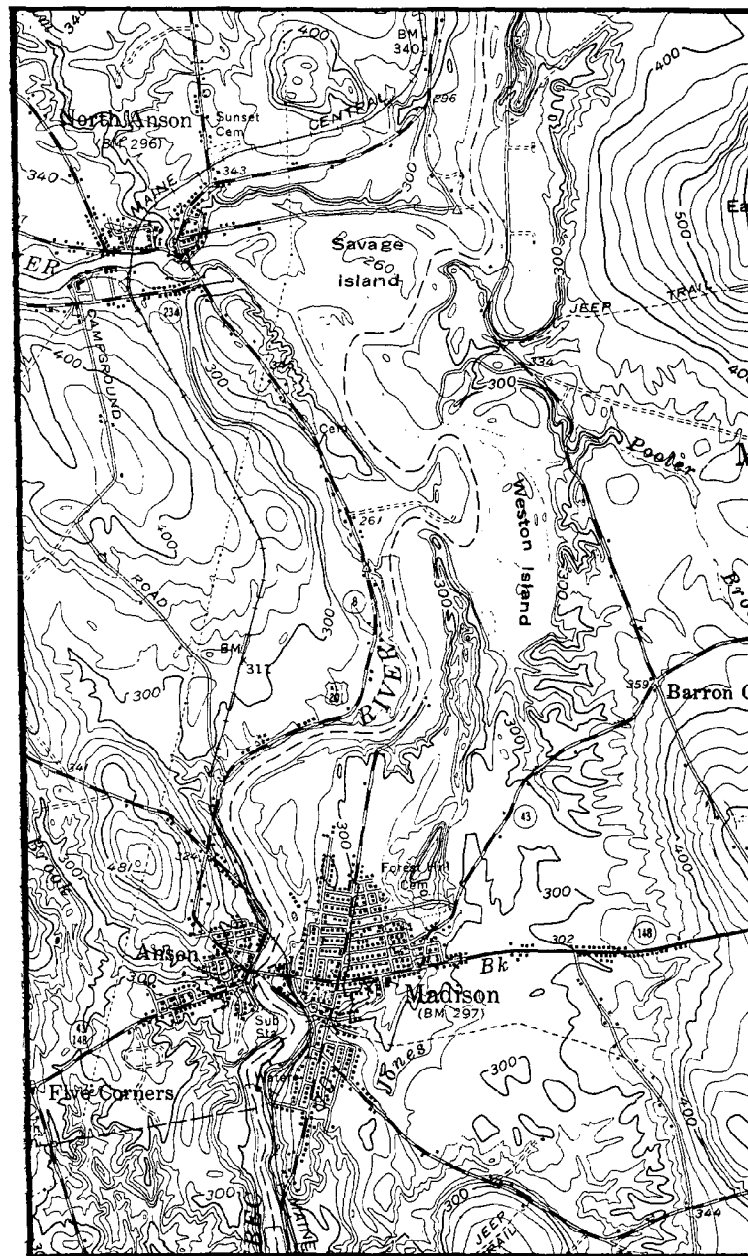
Types of Maps

Topographical Maps

The most common and widely used maps are the topographical maps produced by the U.S. Geological Survey (U.S.G.S.). These topographical sheets depict 15 minute and 7.5 minute quadrangles. The U.S.G.S. topographical sheets show terrain, water features, man-made structures and cultural features using symbols.

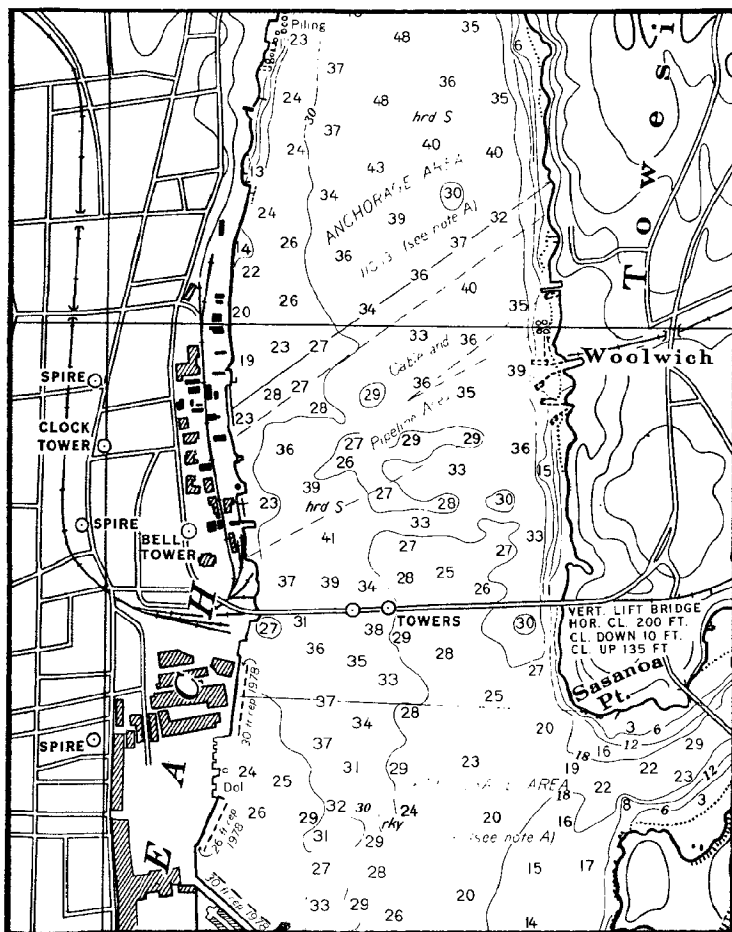
The difference between a 15 minute and a 7.5 minute topographical map is scale. The numbers 15 and 7.5 relate to the amount of latitude and longitude covered by each map. Thus, the 15 minute maps show 15 minutes of latitude and 15 minutes of longitude. The same applies to a 7.5 minute map. The 7.5 minute maps show one-quarter of the area that a 15 minute map depicts. It requires four sheets of 7.5 minute maps to depict the same area covered by one 15 minute sheet. Thus, information can be shown on the 7.5 minute map with more detail and accuracy.

All new topographical maps for Maine are being completed on the 7.5 minute sheets by the U.S.G.S. Index maps that show the location and type of topographic maps are available from local map distributors.



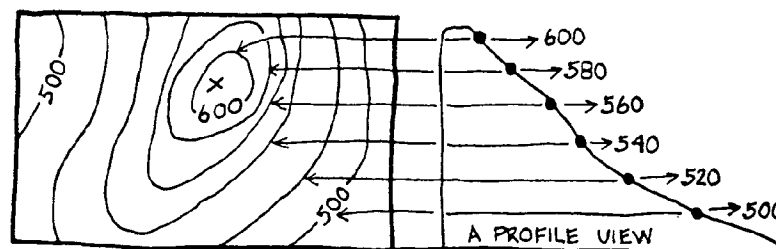
Other types of topographic maps are produced by the Federal government. These show similar data as the 15 minute sheets but at different scales.

The Coast and Geodetic Survey produces maps of coastal areas. These maps show land forms and ocean areas, as well as man-made features and cultural features.



What are contours?

Terrain is shown on maps by the use of contours. Contours are lines connecting points of the same elevation above a given point or Datum, which is usually mean sea level. It may be helpful to think of contours as similar to an island in a lake. When the lake is full a high water line forms around the shore. If the water drops to a new level, a new high water line forms. As this process continues the result will be a series of high water lines, each lower than the other ringing the island. Now, looking down from above, you will see a system of lines which reflect the shape of the island. Some will be close together, which indicates steep sloping sides. Some will be widely spaced, indicating lesser slopes. Hence, contour lines show the shape of the land.



Other Types of Maps

Many other types of maps are produced for special purposes. Some of these are included in Table III-1 and are available from the local town office or different state agencies.

Some of these maps use a U.S.G.S. topographic map as a base, some produce their own base maps, and others use aerial photos.

TABLE III-1

TYPES OF MAPS AND THEIR USEFULNESS

<u>MAP TYPE</u>	<u>USEFULNESS</u>	<u>AVAILABILITY</u>
Natural Resource Maps		
Soils	Display extent and location of soils; good for determining land use suitability based on slope and soil type; type; good for generalized planning (1)	U.S. Soil Conservation Service County Office
Hydrology	Display extent and location of surface and ground water resources; topographic maps good for identifying surface water; ground water maps display aquifers and related information; good for generalized planning (1)	Maine Geologic Survey
Geology	Display extent and location of surficial and bedrock rock formations; good for generalized planning (1)	Maine Geologic Survey
Wetlands	Display extent and location of bogs; swamps; tidal marshes and other wetlands; good for generalized planning, (1&2)	Maine Geologic Survey
Forest	Display extent and location of different forest types different forest types (1)	Major private landowners or from aerial photos
Shoreland Zoning	Display extent and location of zoning districts within state mandated shoreland zoning	Town office
Floodplain Zoning	Display extent and location of zoned flood hazard areas; town floodplain zoning is required if a town wishes to participate in national flood insurance program	Town office

TABLE III-1 (Continued)
TYPES OF MAPS AND THEIR USEFULNESS

<u>MAP TYPE</u>	<u>USEFULNESS</u>	<u>AVAILABILITY</u>
Other Types of Maps		
Tax	Municipal maps display each land parcel; can be very large scale (i.e. 1"=200, 1"=500); good for very detailed mapping	Town office
Land use	Display extent and location of different land uses; good for land planning; many different scales and levels of detail	Town office, regional planning commission, Maine State Planning Office
Road	Display location and names of roads, streets and highways	Town office, Maine Dept. of Transportation
Zoning	Display extent and location of zoning districts within town-wide zoning	Town office
Minor Civil Divisions and County Maps	Display the extent and location of towns, cities plantations and counties; very small scale maps showing large areas with little detail	Maine Dept. of Transportation

***NOTES:**

- (1) The scale of these maps makes them useful for town-wide planning purposes, but not accurate enough for site planning or very detailed mapping.
- (2) Fresh-water wetlands maps have been completed by the State Geological Survey (MGS). The National Wetlands Inventory Maps display both freshwater and tidal wetlands. The maps are also available from MGS.

Mapping Natural Resources

Selecting the Appropriate Base Map

A base map is the map that can be reproduced and used to display the location and extent of natural resources within the town.

Selecting a suitable base map is extremely important. The base map should be up-to-date (particularly on road names and locations), easy to read, at the appropriate scale and reproducible. It is also important to consider what base map or maps are currently being used by the Town. The natural resource inventory maps should be at the same scale, where possible, as existing maps.

Scale - A scale of 1 inch to 1000 feet is probably the best for a community natural resources inventory. In some cases, geographically large towns will fit more conveniently on a scale of 1 inch to 2000 feet. These scales are adequate to display the level of detail inventoried. When selecting an appropriately scaled base map, it is also important to consider what size the map will be and whether it is a size that can be reproduced by area printers.

Reproduction - The base map should be easy to reproduce and should be in the appropriate format. The original should be on mylar which is a transparent plastic material. The mylar should be the type that will accept inked on changes. The original can then be used to make paper copies, additional mylar copies, or sepia paper copies (sepia is a transparent plastic material that is less expensive than mylar). Paper copies can be blue

print copies, which are relatively inexpensive, or PMT (positive mechanical transfer paper) copies which are of higher quality and more permanent. PMT copies are significantly more expensive and therefore most useful for report size maps.

Report size copies, which can be made to fold out, are convenient for wider distribution because they are cheaper to reproduce. Some printers, depending on the size of the original, can make reductions from mylar as well as paper copies.

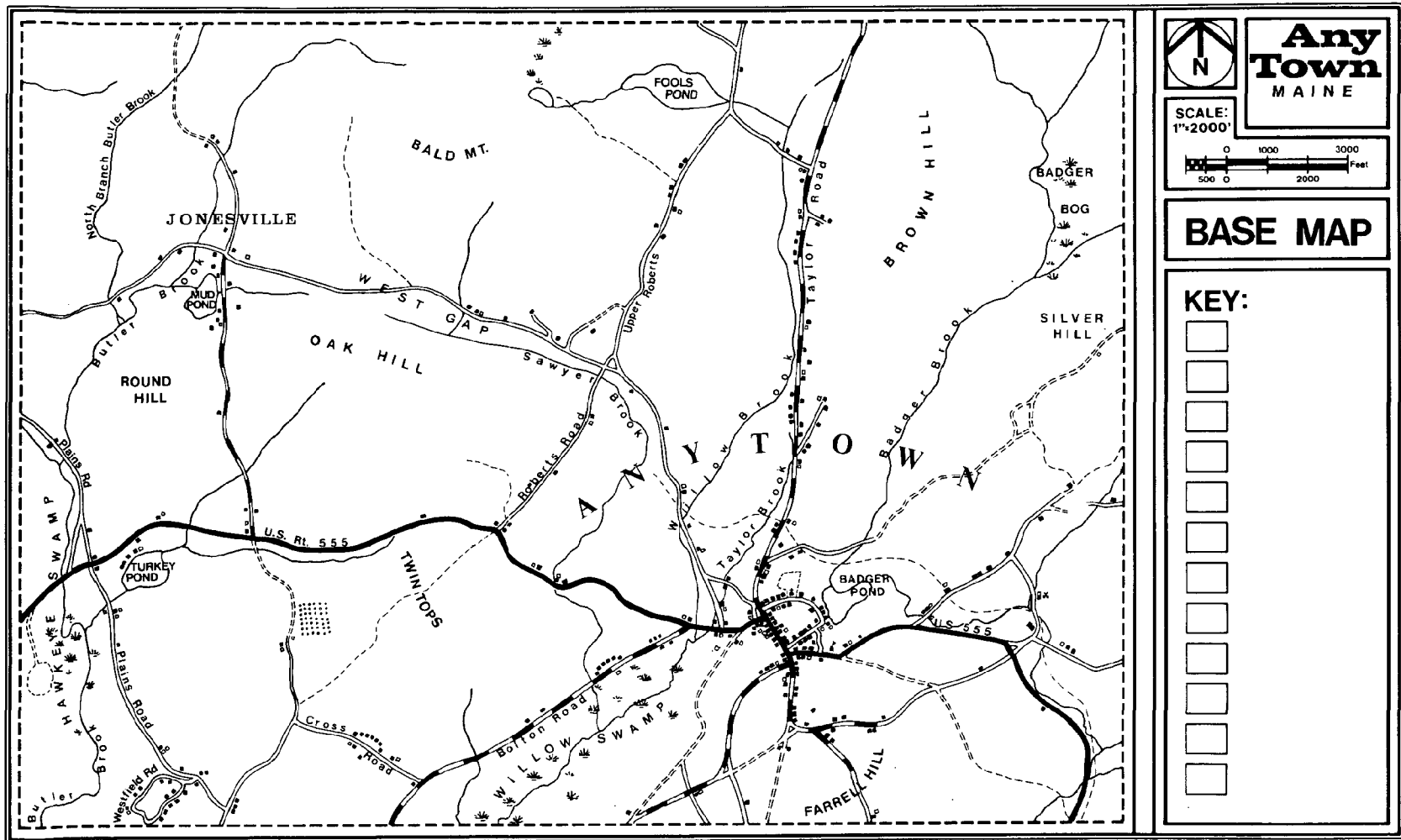
What Should Be Used as a Base Map?

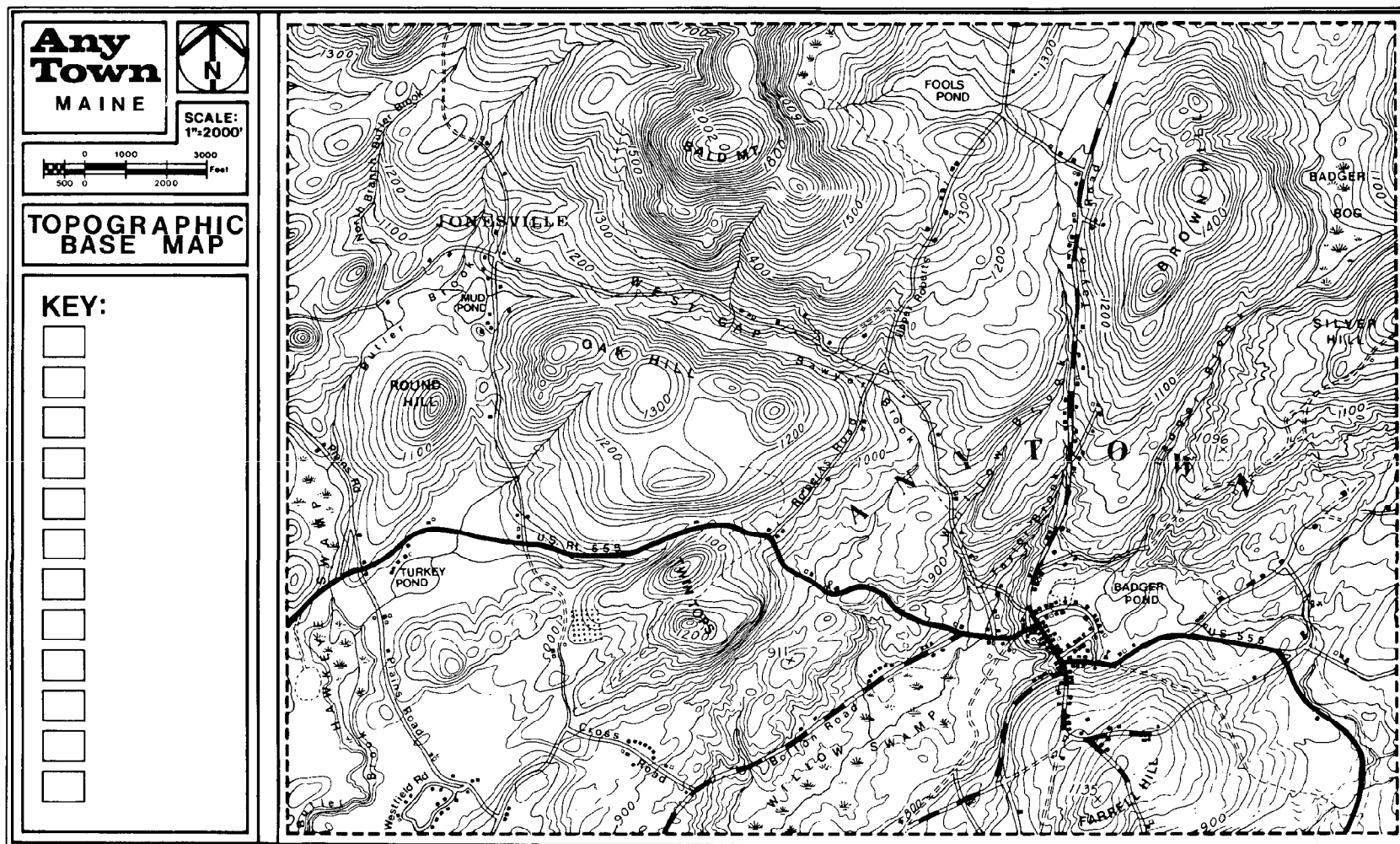
A single base map is most desirable. There are several alternatives in selecting a base map. First, determine what base map the Town is currently using and what information has been gathered using this map. Many towns have base maps developed from the 15 minute or 7.5 minute U.S.G.S. Topographic Map series. The 7.5 minute topographic map series shows more detail and is a better choice.

Before preparing a new base map, investigate what types of base maps may be available through the regional planning commission or council of governments. Consulting firms that are involved in mapping may also be able to provide a suitable base map.

The following procedure can be used if a new base map is to be prepared.

1. Determine what 7.5 minute topographic sheets are needed to cover the entire town.
2. Obtain black line prints (that show contours) of these sheets from the U.S. Geological Survey (1-800-USA-MAPS). At a minimum, the topographic maps should display basic information such as contours, roads and waterbodies.





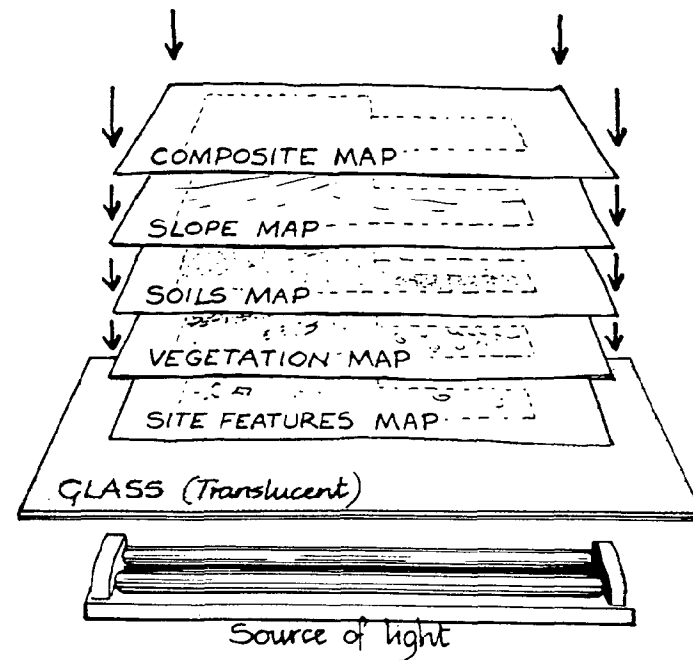
3. Carefully combine the maps into a single map, if there is more than one for the Town.
4. Then, have a mapping specialist* enlarge the map and reproduce it on matte mylar film, to 1 inch to 1000 feet or 1 inch to 2000 feet, (whichever scale has been selected to obtain a map that is a workable size).
5. Once the map has been enlarged, highlight the boundaries of the Town with a dark line and leave space for a title block and legend. The title block should include space for a title (each of the natural resource maps will have a title, map scale - bar scale and numerically stated scale, north arrow, name of the Town, and date). This information should be drafted at the full map size. You may wish to note that the map was produced from a 7.5 minute U.S.G.S. Topographical Map. There should be enough legend space provided for the natural resource information that will be added during the inventory.
6. The base map mylar is now ready. Paper, sepia or mylar copies can now be made and different inventory information mapped thereon.

* The company that produces your town's tax maps can advise you on where to have the base map made.

Making Copies for the Natural Resources Inventory

There are several alternative ways to make inventory maps. Cost and convenience are the two major considerations.

The Paper Copy Approach - A number of paper copies (black line or blue line prints) can be made from the base map mylar.** Each copy can be used to inventory a different natural resource characteristic (i.e. soils, slope, water resources, etc.) Paper copies are good for using color and for display purposes. The major drawback with colored maps however, is that they do not reproduce well in black and white when reduced to a size suitable for a report. Color reproductions are very expensive. Paper copies can also be used as overlays providing a light table or other strong light source is used to produce a composite map.



The Sepia Copy Approach - Sepia copies can be produced from the mylar base map.** Black line or dot shading, patterns and symbols can be used on the sepia (be sure to specify a matte sepia that accepts ink). Color should not be used on sepia copies. Paper prints suitable for coloring and display purposes can be produced inexpensively from sepia copies. Since sepia copies are transparent, they are excellent for making overlays.

Both paper and sepia maps can be reduced inexpensively, photographically, for use in a report, provided clear black lines and bold lettering is used throughout.

**** Note:** It is often wise to have the base map printed with a 60 percent to 75 percent screen (on either paper or sepia). This method makes the base map lines appear grey and allows the new data that's superimposed to stand out.

Plotting and Transferring Data

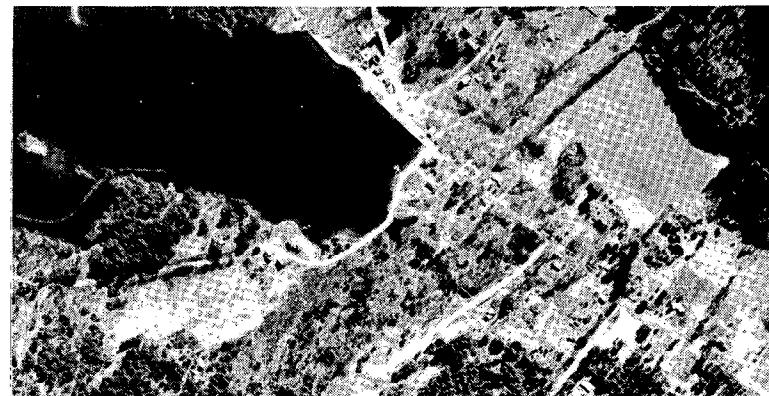
Basic raw data on natural resources is collected either in map form, written form, or both. In map form this data exists at various scales and presentations. It must be converted to a standardized scale and presented in a way which will make subsequent analysis easier. Conversion to the base map scale can be done photographically or by simply using a grid, scaled appropriately, on each map.

This information can be placed on a work map, and then transferred to the final map or the information can be done in pencil on the final map and inked or colored in later. Once the information is collected and preliminarily mapped, it can then be finalized by outlining in ink, coloring or shading.

Using Aerial Photography

Aerial photography is taking photographs of the earth's surface at some height above the ground. Aerial imagery is produced for a wide range of applications and at various scales.

Aerial photos can be used to produce and update base maps; to map the location of structures and other land use activities; and to inventory vegetation types, surface and ground water resources and geologic features. Aerial photography is used extensively in computer-aided mapping and data management.



DRAFTING TECHNIQUES

LINES

Lines are used to denote boundaries (town limits), linear location (roads), and as a frame for a finished map (neat line). By varying the line width or thickness, differences of degree can also be shown, for example, improved road, State route, or Interstate highway. Lines can also combine arrangements of dots and dashes to show different categories. Lines should always be drawn in black and there are now available a wide variety of pens: technical drafting pens with interchangeable points for work requiring high accuracy; felt tip pens in various widths (preferably with permanent ink) as well as markers.

Also available are pressure sensitive tapes in varying degrees of width which are easy to use. All of these can be supplied by an art supply store, as well as larger office and business suppliers.



LETTERING

Letters are used for map titles, legends, and on any information on the map; for labelling on the map face itself, and also as a point label (A for auditorium, T H for town hall, etc.). Lettering should be consistent throughout a map series, both in size and type.

Hand lettering is very acceptable, provided it is neat and legible. Free hand lettering may be done, or a lettering guide, template, or Leroy mechanical lettering system can be used. These all require pen and ink and although permanent India ink is preferred, felt-tip or calligraphy felt-tip pens are also suitable.

As with shading film, patterns and symbols, lettering is available on "press-on" sheets. The variety in typeface is almost unlimited, and after a little practice for spacing, a professional looking product is easily achieved. The more commonly used typefaces are available at art supply stores and some business and office suppliers. The larger art suppliers will usually be able to order anything which is shown in the manufacturer's catalogue.

A
"press-on"
lettering

FREE-
HAND
lettering

"Leroy"
type
lettering

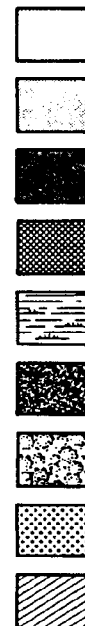
ZONING (July 1987)

B-1 General business
B-2 Highway business
SB Shoreland business
R-1/2/3 Residential

AREA LOCATIONS

Whatever is not a line location or a point location, is an area location; forested land, wetlands, slopes, agricultural land and built-up land are examples. Generally, these will be the major part of a mapping project. Shading film is used primarily to denote changes in intensity of degree, from lighter to darker, as in a slope map or density maps. Available on preprinted "press-on" sheets at art supply stores, the selection ranges from 10% coverage (light) to 90% coverage (dark) and they are easy to use--cutting out areas with an X-acto knife is recommended.

To show differing categories, shading patterns are used and these can be representative such as is used for wetlands or forest, or abstract--dot patterns, directional lines, cross-hatching, etc. Most any pattern, representative or abstract, is available on press-on sheets; the patient person can do dot patterns (hand stippling), directional lines, or cross hatching by hand. Select the patterns carefully, so that each is clearly distinguishable from another.

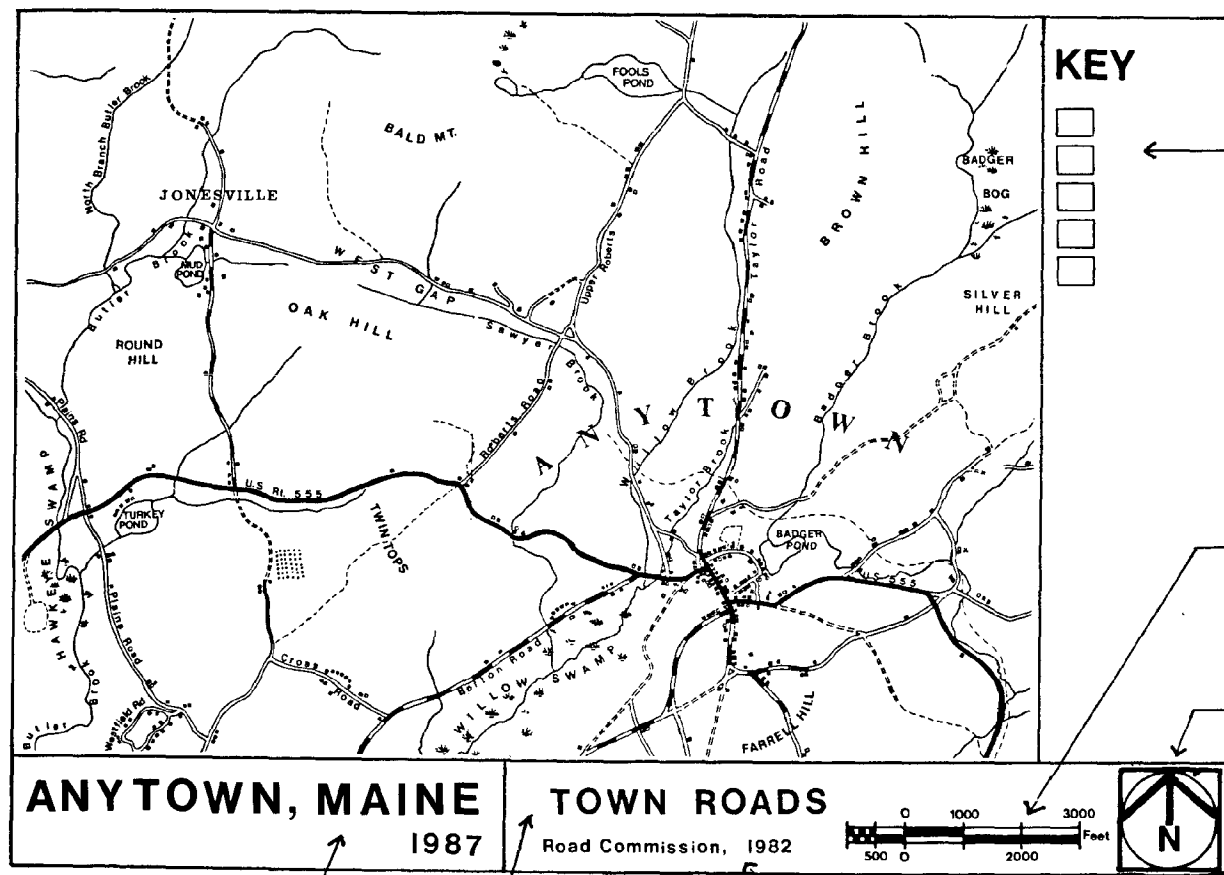


POINT LOCATIONS

These are separate and discrete locations, such as the Town office, and historic site, or the Town cemetery (unless it covers a large area). These can be easily represented by an abstract symbol such as a filled circle, a box, triangle or a star. These can be drawn with a template, or preprinted sheets of "press-on" symbols can be used. Representative symbols are frequently used and for the most part are hand drawn. These could be a cross for a church or cemetery, a flag for the town office, school, etc., or the USGS symbol used for gravel pits. Some of the more commonly used symbols are available on preprinted sheets. An art supply store will either have these on hand or can order them for you. Remember, no matter what you choose for a symbol, it needs to be included in the key.



MAP ESSENTIALS



Key or Legend

Leave plenty of space for different categories of information and for notes and references.

Map Size

Allow for 1/2" space around border. Make least dimension no longer than 32".

Scale

Use a graphic scale that will be accurate and useful if the map is reduced.

North Arrow

Try to design your base map so north is up.

Town Name and/or Project Title

Be accurate and date your work. (Include town seal if appropriate.)

Map Title

Be specific. You may wish to add a map number to cross reference to the text.

Map Source

Cite where the information comes from and include a date.

Aerial photography is particularly useful for inventorying community natural resources if it contains enough detail. The two best sources of detailed aerial photography are (1) the 9 inch by 9 inch contact prints (and any enlargements) used in producing municipal property tax maps and (2) the U.S. Agricultural Stabilization and Conservation Service, and U.S. Soil Conservation Service (county offices) photography taken for mapping soils or inventorying farmland. The local tax assessor or regional planning commission should be contacted to determine when and by whom the latest aerial photos were taken.

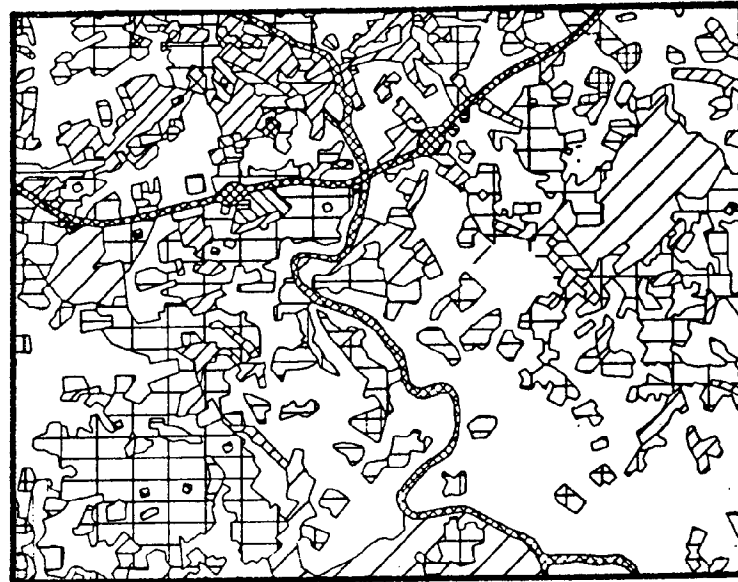
Aerial photographs are also available from the U.S. Geological Survey as well as private companies. Some towns opt to have their own aerial photography flown. The cost is over \$5,000.

Computer Mapping

The use of computer-aided mapping and data management is becoming increasingly widespread. There are several reasons for the growing popularity of computerized information systems. The quantity of natural resources information available today and the increasing need to use this information makes computerization attractive. Additionally, land use and natural resource inter-relationships are becoming more complex in communities experiencing a lot of growth and development.

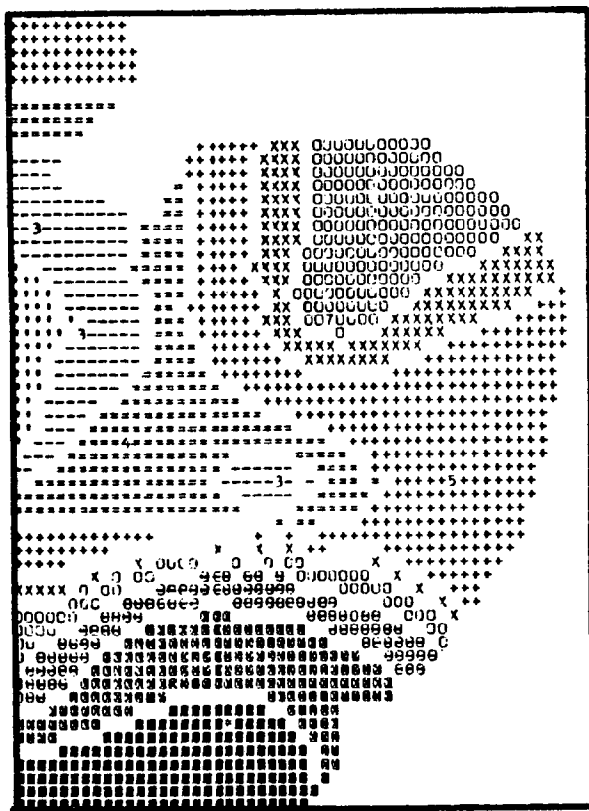
Computerized data management has many advantages. Computerized systems are able to handle large quantities of information efficiently and cost-effectively. The major expense is setting the system up and entering the data. Once the

natural resource and land use information has been entered into the computer, the cost of retrieving or manipulating the information is reduced significantly as compared to hand methods. Additionally, the ease of analyzing the land use and natural resource information encourages more thorough investigations into land use and natural resource alternatives.



Computerized information systems have the capability to produce maps, graphs, charts, and tabular files. There are a number of different computer systems available. These range from smaller setups using personal computers (like those found in many small offices) to larger more sophisticated computer systems and programs used by some state and federal agencies, large consultants and some large municipalities.

Larger towns, in particular, should probably explore computerization alternatives prior to undertaking a natural resources inventory or comprehensive planning effort. The natural resource information and mapping, performed as is explained in this handbook, may not be detailed or accurate enough to be useful for computerization. Accuracy is extremely important in computerizing data. Aerial photography is usually used in this type of mapping. Other information, such as what would be gathered through an inventory as is suggested here, would probably be used to supplement the aerial photography.



Sources of Information

Maine Geological Survey (MGS)

Topographic Maps and information on other types of maps (i.e. ground water maps, wetlands maps, etc.) are available from MGS. MGS also has a number of brochures that explain the types of information available through the National Cartographic Information Center of the U.S. Geological Survey. The "Coastal Mapping Handbook" (ed. Melvin Ellis, U.S. Government Printing Office, 1978) is a good source of information on mapping. Aerial photographs can be ordered from:

National Cartographic Information Center
U.S. Geological Survey
507 National Center
Reston, Virginia 22092
Telephone: 703/860-6045

User Services Section
EROS Data Center
U.S. Geological Survey
Sioux Falls, South Dakota 57198

County Offices of the U.S. Agricultural Stabilization and Soil Conservation Service

These offices are good sources of aerial photography. Usually, the photography is fairly current and at a scale large enough to be useful.

(see Appendix 1 for addresses)

Private Consultants

Private companies can be contacted to obtain aerial photography, computer-aided maps and mapping information, and computer hardware and software for natural resources applications.

IV. The Natural Resources Inventory

Introduction

The natural resources selected for inventorying, and the categories used for presentation are chosen based on a well recognized need. This is reflected in the need for problem-solving which communities face today regarding proper use of their natural resources.

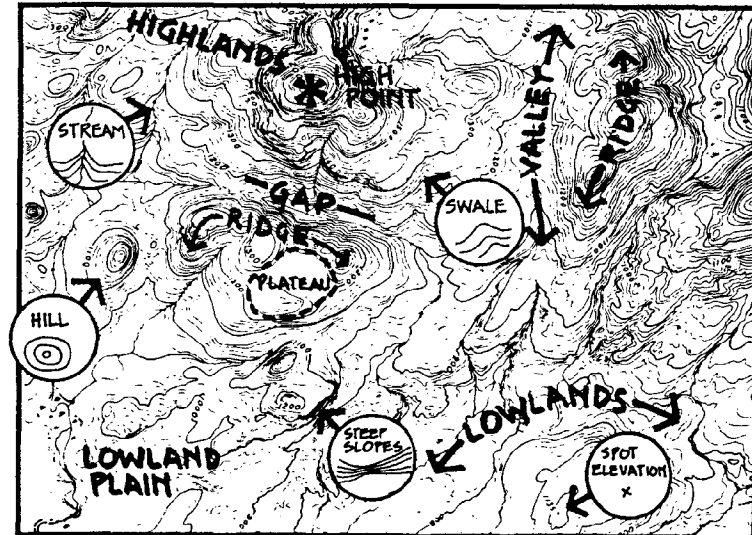
The most important natural resource characteristics of the land are topography including slope and relief, soil and water resources, vegetation and special features. The special features category is a "catch-all" category for important characteristics, such as wildlife habitat and scenic areas, not covered in the other categories.

Each of these characteristics are examined separately in the following chapter. The resulting information can then be combined to show how the characteristics interact and to reveal the limitations and opportunities for various land uses.

Topography

What Is Topography?

Topography refers to the lay of the land or the land forms as they exist. It is the slope of the land, its ups and downs, hills, valleys and plains.



Why Is It Important?

Topography is important because of its influence on views, aesthetics and the suitability of different slopes for development. Slopes, for example, affect the economy and functioning of septic systems and placement of roads and structures. Relief and land form affect climate, success of farming, and development (aesthetics, drainage, general characteristics). Combined with other data such as soil characteristics, and hydrology, the effects of slope and elevation on erosion potential become apparent. Soil erosion is detrimental because it creates surface water contamination, loss of topsoil, and sedimentation of surface waters.

U.S.G.S. Topographic Maps are the primary tool for inventorying topographic conditions. A topographic map is the presentation of land form by symbols on a map. Topography can be depicted by contours or shading. (Topographic Maps and contours have been discussed in Chapter III, Mapping.)

What Is Relief?

Why Is It Important?

Relief is an expression of elevation or height above a given datum or plane. In most cases mean sea level (average high water level) is the datum. Relief shows the height of land forms above sea level and the relative height of land forms to the surroundings.

Relief identifies significant or dominant physical features that may form natural barriers

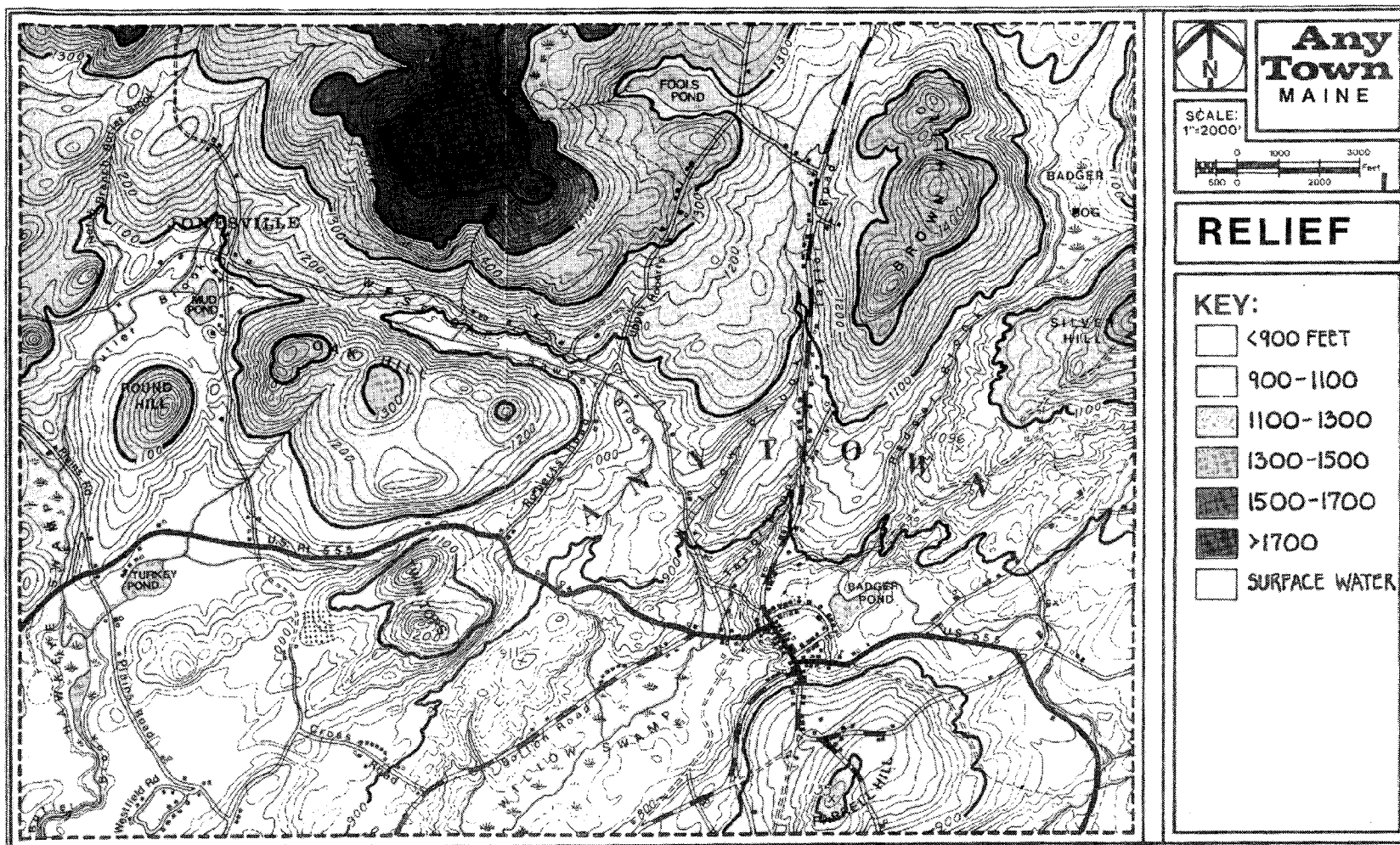
that hinder development or valley corridors that permit easy access. The height of the land and its relation to the sun affects the citing of houses, living conditions, the time when snow melts, the readiness of soils to be worked, types of vegetation, snow run off patterns on the land, etc. Relief, combined with vegetation, reveals areas of scenic quality both as viewed and as view points. Relief also determines drainage patterns.

Inventorying Relief

Mapping

1. Locate and note the elevation of the highest and lowest points on the U.S.G.S. topographic base map.
2. Intervals of elevation are found in even hundreds of feet; i.e., 100, 200, 300, etc. Determine the number of hundred foot intervals needed to include in the town's range of elevation. For example, if the lowest point is 250 feet, and the highest is 850 feet, there are seven intervals, beginning with 200 feet and going to 900 feet.
3. If the number of intervals is five or less, then the relief map should be done in 100 foot intervals. If the number of intervals is six to ten, the map will be done in 200 foot intervals. In the example in #2 above, the categories would be:

200 - 400 feet
400 - 600 feet
600 - 800 feet
800 - 1000 feet



Relief

MAPPING COMMENTS:

This is a color map that has been reproduced in black and white. A heavy line was added to the map in order to more clearly delineate relief zones.

In some towns 300 foot or 400 foot intervals will be required.

4. To delineate the categories draw a heavy black line along the appropriate contour line. Do this for each interval as needed.
5. Shade or color each area starting with the darkest shade for the highest elevation.
6. Attach a legend and title to the map.

Narrative

The narrative should explain the different categories used to map relief. It should describe the general lay of the land including the highest and lowest points, and the names and locations of mountains, ridges, terraces, valleys and other important land forms.

The narrative might also relate existing land use to relief. For example, it might explain how certain mountains or ridges have served as barriers and how valleys have served as corridors. The narrative might describe how the town center may be located along a river or bay where there is a good harbor and a wide floodplain. The relief map can also be used to show how relief will affect future land use.

What Is Slope?

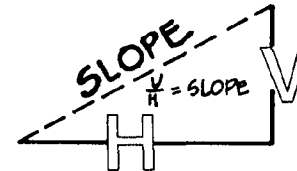
Why Is It Important?

Slope is the amount of rise or fall in feet for a given horizontal distance. It is expressed in percent. An 8 percent slope means that for a 100 foot horizontal distance, the rise (or fall) in height is 8 feet.

Slope can also be expressed in degrees. The number of degrees refers to the angle between the horizontal plane and the incline plane. A 45 degree slope would be a 100 percent slope.

Slope affects the suitability of land for many uses. As stated previously, it affects the economy and functioning of septic systems and placement of roads and structures.

In devising a community land use plan, a slope map can be used to delineate areas of greater than 25 percent slope for designation as preferred for open space. The map can also be used to identify gently (3-8 percent) to moderately (8-15 percent) sloping areas that may be well suited for development. Flat areas (0-3 percent slopes) and areas of 15-25 percent slopes should be evaluated more carefully in terms of ponding or erosion potentials. The slope map can also be very useful in laying out new roads or adjusting the alignments of old ones; by avoiding the steeper areas, cuts and fills can be reduced, and construction and maintenance costs lowered. The map can be used in reviewing site plans as an initial check for potential drainage or erosion problems.



$$\frac{\text{VERTICAL DISTANCE}}{\text{HORIZONTAL DISTANCE}} = \frac{V}{H} = \text{SLOPE (\%)}$$

One good and valid reason for slope consideration is the limitation for septic system placement on steeper slopes. The Maine Plumbing Code does not permit septic systems on slopes greater than 25 percent. On slopes up to 15 percent, on-site septic systems often can be installed with a minimum of special engineering. More excessive slopes require special engineering on a case-by-case basis. Thus, the slope limitations for plumbing create real limitations on building.

The angle of slope effects soil erodability. Basically, for an unvegetated site, as the slope increases, so does erodability. Other soil characteristics modify this effect, and will be covered in the soils section.

The accuracy of the slope map is limited. At the project level on-site investigations of conditions should be made before reaching final decisions regarding specific land use proposals. Land that appears steep on a map may nevertheless be usable when properly planned and engineered. Conversely, land that appears gently sloping may nevertheless have a potential erosion problem because of the underlying soil conditions. There is no substitute for on-site investigation of all factors.

Inventorying Slope

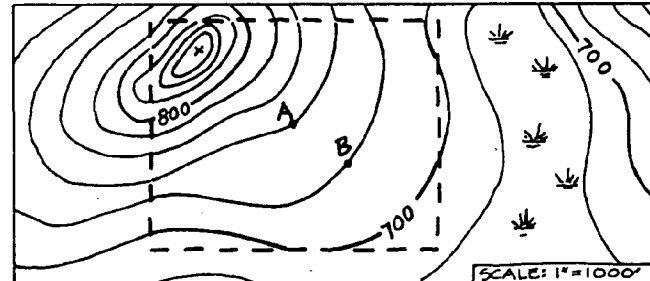
Mapping

1. Inspect the U.S.G.S. topographic base map to get a feel for the land forms. Are there hills and valleys, flat areas, cliffs, etc.?
2. Calculate various slopes on the topographic map using the following methodology.

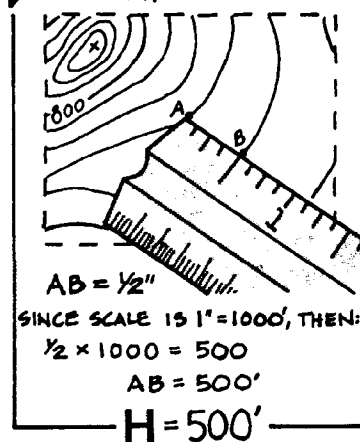
* CALCULATION OF SLOPE PERCENTAGE

$$\frac{V}{H} = \frac{\text{VERTICAL DISTANCE}}{\text{HORIZONTAL DISTANCE}} = \frac{V}{H} = \text{SLOPE (\%)}$$

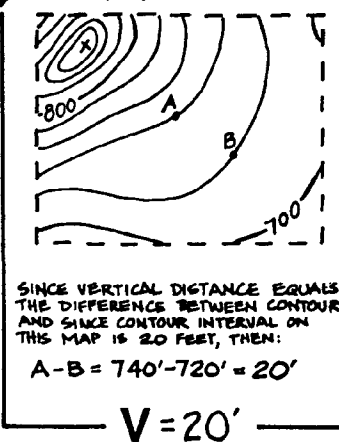
PROBLEM ► TO FIND SLOPE OF AB



STEP 1: ESTABLISH HORIZONTAL DISTANCE

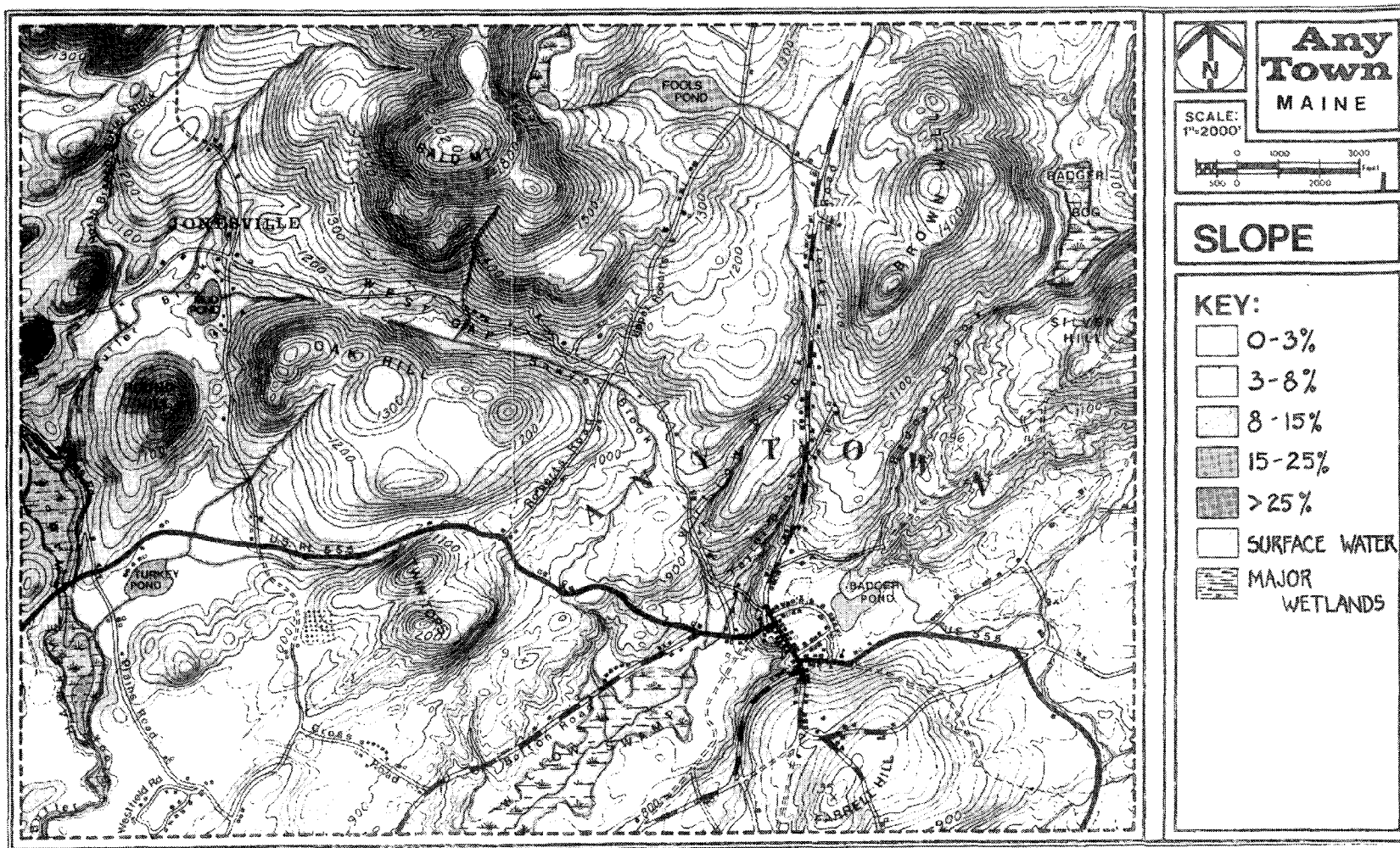


STEP 2: ESTABLISH VERTICAL DISTANCE



$$\frac{V}{H} = \frac{20'}{500'} = .04$$

SOLUTION ► SLOPE AB = 4%



MAPPING COMMENTS:

This is a color map that has been reproduced in black and white. No heavy lines were added to this map to delineate the differing slope zones. Lighter colors, and colors with relatively little black or red in the pigment fade when photographed in black and white. The steeper slopes stand out primarily because of the closeness of contour lines to each other.

3. Roughly delineate the following categories of slope by marking off the slope boundaries in pencil.

0 - 3%
3 - 8%
8 - 15%
15 - 25%
25% and over

4. Refine the slope boundaries and draw a heavy solid line around each area of slope category. For a map with a scale of 1 inch to 1,000 feet, the smallest area that can be conveniently and accurately shown is approximately 6 acres or 1/4 square inch, for example, areas with the following dimensions, 1/2 x 1/2 in. or 1/8 x 2 in.
5. Shade or color each slope category using the darkest shade for the steepest slope and the lightest color for the least slope.
6. Attach a legend and title to the map.

Narrative

The narrative should describe the purpose of the slope map and the categories of steepness. It should also describe the major characteristics of the slope map. Areas with slopes over 25 percent should be described as very steep and generally not suitable for development. Slopes of 15 percent to 25 percent should be noted as having potential problems for certain types of development. The narrative might also point out the location of flatter areas where drainage might be a problem.

Soils

What Are Soils? Why Are They Important?

Soil is a basic resource of major importance to land use activities. It is the underlying material upon which roads, buildings, sewage and waste disposal, and recreation occur. Because a soil layer underlies most activities on the earth's surface, it is important to understand its properties and limitations.

Soil is the layer of the earth's surface that has been modified by weathering processes. Five factors determine the kind of soil to be found in a given area. They are the parent material, the climate, the vegetation, the topography, and time. Thus, soil is formed through the action of climate and vegetation on parent material. This action is affected by local topography. In addition, time determines how well "developed" a soil becomes.

Parent materials are the unweathered deposits from which soil is formed. The source of most parent materials are surficial deposits. Glacial till is probably the most commonly occurring parent material in Maine. Some soils, however, are derived directly from the weathering of bedrock. Organic deposits are the basis for peat and muck soil types.

Climate has the greatest influence on soil formation. The cool summers and long cold winters with annual precipitation of 40-45 inches evenly distributed through the year create Maine's soil types. The rain-fall leaches through the parent material. Some minerals are dissolved and carried

deeper into the soil layer where they are deposited. This leaching action creates the layers found in a soil profile. This results in an infertile, acid layer near the surface.

Vegetation generally contributes organic matter to the soil. This material can interact to create acid conditions. It also can alter the texture and composition of the existing soil. For example, soil conditions under softwood vegetation are more acidic than under hardwood vegetation. Accumulated organic material also releases acids, making the soil even more acidic. It is for these reasons that Maine soils tend to be acidic.

Topography determines the natural drainage of the soil material and, thus, influences soil type. Shallow, stony soils, occur on ridge tops and tend to be better drained. Deeper, heavier or wetter soils occur on lower slopes, valleys and stream bottoms.

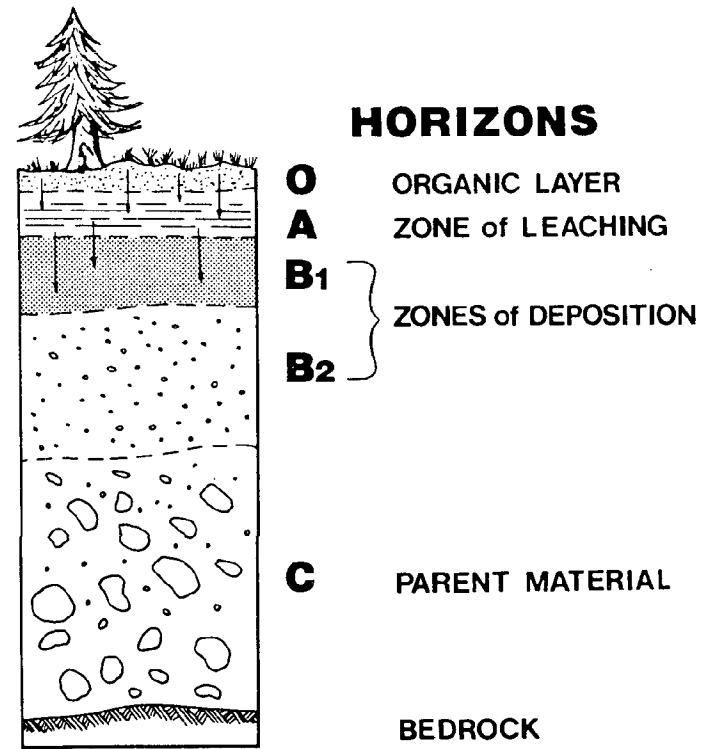
When climate and vegetation have acted for a long time on parent material, a strong soil profile is developed. This is an indication of the acids that are produced and the elements that are leached from the upper layers. Thus, a well developed soil has distinct layers or horizons.

Physical Properties of Soil

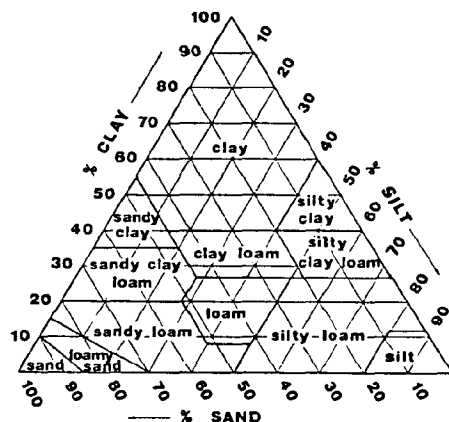
A soil is described by its physical appearance and properties. This characterization is the basis for establishing soil types.

Color: Color indicates soil age, drainage, amount of organic matter, and, most importantly, the height of a seasonal water table. Mottling is a color characterization which identifies a fluctuating water table.

Texture: Texture refers to the relative amounts of sand, silt and clay in a soil. Textures range from coarse to fine or from light to heavy. Sand is the most coarse and feels gritty to the fingers when rubbed. Silt is finer and feels like flour or talcum, smooth but not sticky when wet. Clay is the finest and is microscopic. It feels smooth when dry and sticky when wet. There are 20 classes of soil texture. In Maine, four are commonly found. These are sand, loam, silt loam, and silty clay loam. Loam is a balanced mixture of sand, silt and clay and has average characteristics for drainage, as well as moisture holding capacity.



Structure: Structure is the arrangement of particles in the soil. It is the way in which sand, silt and clay "fit" together. This fit is influenced by moisture and organic content. Normally, particles tend to clump together. A soil with a crumbly structure is best for soil drainage, workability, etc. The addition of organic matter can improve the soil structure resulting in better plant growth.



Moisture: Moisture holding capacity is influenced by texture and structure of the soil. Moisture classes are described in terms of drainage. These are: excessively well drained, well drained, moderately well drained, poorly drained and very poorly drained. Depending on the proportions of soil, silt and clay and how they fit together, the ability of the soil to hold and release water is determined. Finer textured or heavy soils are usually poorly drained and lighter sandy soils are unusually well drained.

In addition to the above general soil conditions, several other factors about soils should be considered.

A fragipan is an impermeable layer in the soil. This layer restricts water movement downward and causes an artificially high ground water table. Thus, a "pan" can cause soil to be wet and poorly drained although the soil below the pan can be well drained.

Occasionally a soil is influenced by a "perched water table". This occurs when water movement is blocked by an underlying layer, usually ledge. The result is again a wet soil.

Soil Names

The name of a soil is established at the time a new soil is identified. The name generally refers to the geographic area where the soil is first found.

There is a hierarchy in defining soils and establishing names. The first and more general system of soils classification is the soil series. Each series includes soil types with similar physical properties but different texture. Once the texture is named, the soil type is established. Thus, the Bangor series of soils; for example, is further classed as a type, such as Bangor silt loam.

In summary, the reasons for acquiring soils data are:

1. To locate areas best suited to specific activities;
2. To identify areas where additional investment in development will be necessary and/or where environmental hazard is the greatest;
3. To direct land management activities to the most productive sites.

Sources of Information on Soils

SCS County Soil Survey Reports

The Soil Conservation Service is the government agency in charge of undertaking surveys of the location and extent of soil types. Presently, the State of Maine is partially surveyed. Published Soil Survey reports have been completed, for the following counties: Penobscot, Aroostook, Cumberland, Androscoggin, Sagadahoc, Somerset (Southern Part), Kennebec, York, Waldo, Lincoln and Knox.

During the process of the soil inventory, town reports are published as interim soil surveys. Many towns are surveyed on this basis. This information is often available for use where the county report has not been completed.

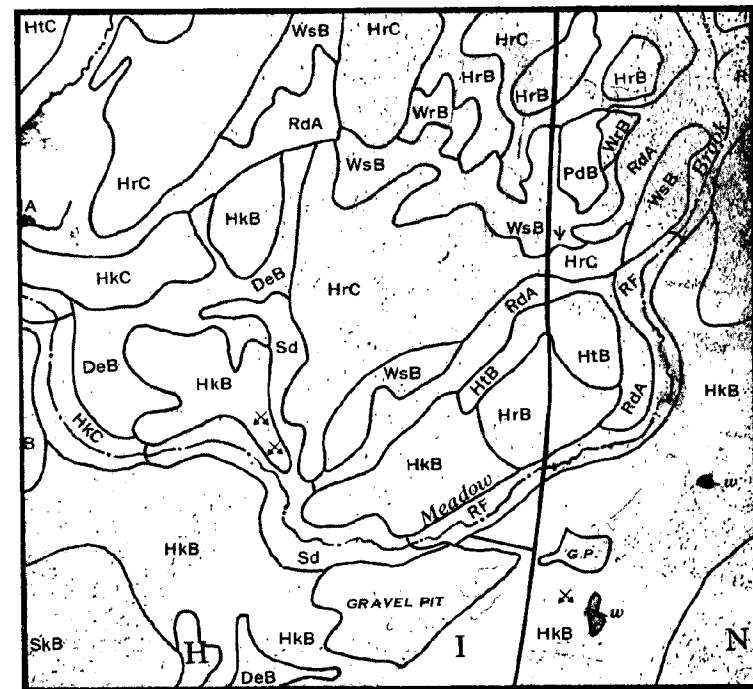
The Soil Survey Report is the primary tool for inventorying soils. The report contains soils maps and descriptions, and information on soil suitability for a wide range of different land uses.

The soil survey maps show the locations of different soil types in the community. The lines on the map indicate the boundaries between one soil type and another. The symbols are keyed to written soil surveys that identify the type of soil and the general slope condition within the soil boundary. The soil boundaries are approximations where soils may blend together over a distance of 50 to 200 feet.

The designation of soil types and slope conditions represents the dominant soils characteristics of an area. There may be pockets of other soil types within the boundaries of what is

designated as the predominant soil type. Similarly, actual slopes may vary from the range of slopes indicated for the designated soil type of an area.

The narrative portion of the soil survey contains descriptions of the physical properties of each soil, such as its content of silt, clay, sand and gravel and other conditions, such as the presence of hardpan or a seasonal high water table. The soil survey also contains information and tables on the suitability of each soil for a variety of uses. Soils are ranked according to their limitations for residential development, recreation, roads, septic systems and a number of other uses.



Suitability is expressed in terms of the limitations that a soil poses for different uses. The degree of limitation is rated as slight, moderate or severe. According to the Soil Conservation Service, a "slight" rating means that a soil has a slight limitation for the intended use. The degree of limitation is minor and can be easily overcome.

A "moderate" rating means that the soils have properties favorable to the intended use. Limitations can be overcome or modified by special planning, design, construction or maintenance. A "severe" rating means that the soil is least suitable for a specific use. Use of these soils generally requires extensive soil reclamation, special design and construction, or intensive

maintenance. A severe rating does not mean that an intended use cannot occur, but that major measures must be taken to overcome the limitations.

Lastly, soil survey map analysis does not eliminate the need for on-site testing or examination to determine actual soils conditions. As stated previously, the soils maps are generalized and pockets of different types of soils with different characteristics may be present in area.

Contact the Soil Conservation Service County Office for a copy of the County Soil Survey Report and/or any other information they may have available. Additionally, the County, SCS Soil Scientist may be available to assist in preparing maps.

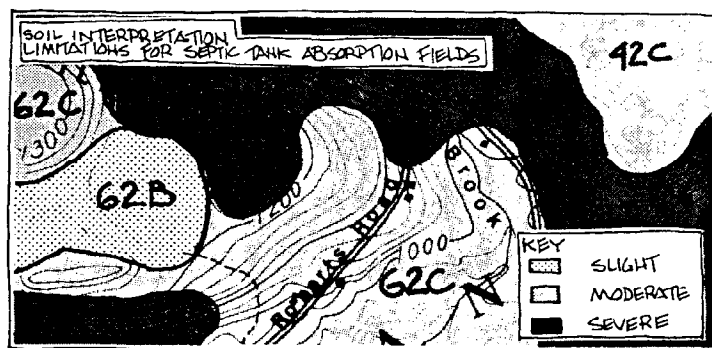
TABLE 8.—Land use planning

Soil series and map symbols	Limitations to use of the soils for—				Limitations to use of the soils for—Continued		
	Septic tank absorption fields	Sewage lagoons	Buildings of three stories or less ¹		Shallow excavations	Sanitary landfill	
			Houses with basements	Small commercial buildings		Trench type ²	Area type
Berkshire: BkB.....	Slight.....	Severe; moderately rapid to moderate permeability.	Moderate; moderate potential frost action.	Moderate; slope; moderate potential frost action.	Slight.....	Severe; moderately rapid to moderate permeability.	Severe; moderately rapid to moderate permeability.
BkB.....	Moderate; very stony	Severe; moderately rapid to moderate permeability.	Moderate; moderate potential frost action; very stony.	Moderate; slope; moderate potential frost action; very stony.	Moderate; very stony.....	Severe; moderately rapid to moderate permeability.	Severe; moderately rapid to moderate permeability.
BkC.....	Moderate; slope; very stony.	Severe; moderately rapid to moderate permeability; slope.	Moderate; slope; moderate potential frost action; very stony.	Severe; slope.....	Moderate; slope; very stony.	Severe; moderately rapid to moderate permeability.	Severe; moderately rapid to moderate permeability.
BkD.....	Severe; slope.....	Severe; moderately rapid to moderate permeability; slope.	Severe; slope.....	Severe; slope.....	Severe; slope.....	Severe; moderately rapid to moderate permeability; slope.	Severe; moderately rapid to moderate permeability; slope.
Biddeford: Bo.....	Severe; slow to very slow permeability; seasonal high water table.	Slight.....	Severe; very poorly drained; high potential frost action.	Severe; very poorly drained; high potential frost action.	Severe; very poorly drained; clayey material.	Severe; high water table; clayey material.	Severe; high water table.
Buxton: BuB2.....	Severe; slow to very slow permeability; seasonal high water table.	Moderate; slope.....	Severe; seasonal high water table; high potential frost action.	Severe; seasonal high water table; high potential frost action.	Severe; seasonal high water table; clayey material.	Severe; seasonal high water table; clayey material.	Severe; seasonal high water table.
BuC2.....	Severe; slow to very slow permeability; seasonal high water table.	Severe; slope.....	Severe; seasonal high water table; high potential frost action.	Severe; seasonal high water table; slope; high potential frost action.	Severe; seasonal high water table; clayey material.	Severe; seasonal high water table; clayey material.	Severe; seasonal high water table.

Inventorying Soils

The Soil Survey can be used in a number of ways to inventory soils. A basic inventory should definitely include a map and description of soils existing within the community. The inventory might also include a map and description of depth to bedrock, and a map and description of depth to water table. The first map will be useful for a variety of uses, as will be discussed below. The inventories of depth to bedrock and depth to high water table are important because of their relevance to many land use activities.

There are several other inventories that can be performed using the Soil Survey information. For example, a map and analysis can be done displaying prime agricultural soils or soil suitability for septic systems, residences or other uses for which the Soil Survey rates soils.

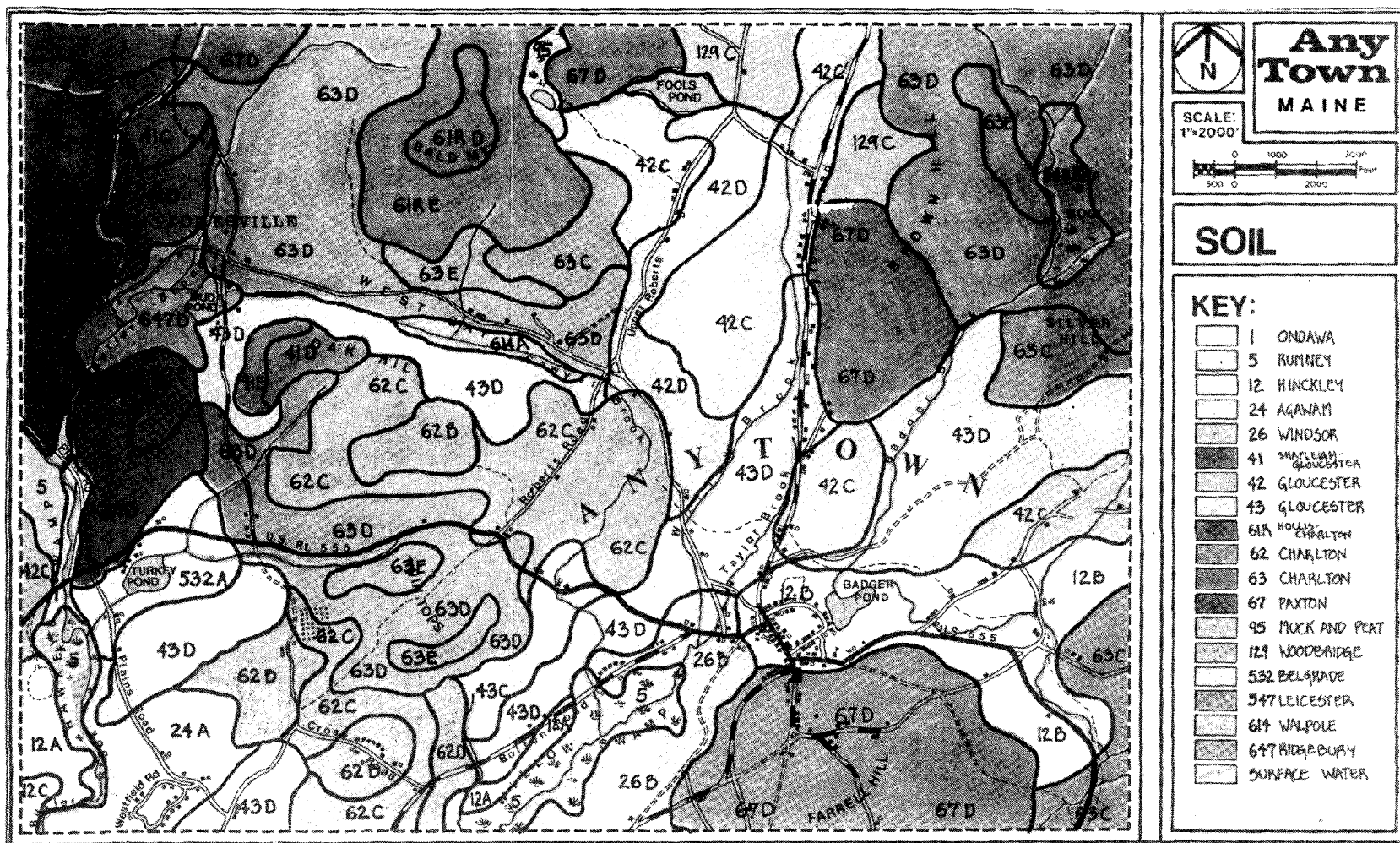


General Soils Inventory

Mapping

The soils map should be at the same scale as the base map being used to inventory other characteristics in the community. Since at least three copies of the soils base map will be needed for this inventory, the base that is prepared should be reproduceable.

1. To prepare the soils map have the Soil Conservation Service or a cartographer prepare a photo-mosaic mylar at the same scale as the base map from the Soil Survey Maps. A photo-mosaic is each of the separate aerial photos for the community pasted together, with soil boundaries and symbols inked on them. This mylar can then be combined with the topographic map mylar to make the final soils base map.
2. One of the base maps should be titled "Soils Map". (The other two maps will be used to map depth to bedrock and depth to water table.)
3. The "Soils Map" should display soil symbols and boundaries. The legend should be keyed to the map and should contain the name of each of the soils.



Soil

MAPPING COMMENTS:

The letters used with the soil number, as an example, 12A, refer to the slope of the terrain.

A represents slopes of 0-3%
 B represents slopes of 3-8%
 C represents slopes of 8-15%

D represents slopes of 15-25%
 E represents slopes of 25-35%

Narrative

The accompanying narrative should include a description of the soils occurring within the community. This information can be summarized in a table similar to the one below. The Soil Survey should contain information that can be used to write this narrative. The narrative might also include an explanation on why it is important to inventory soils.

TABLE			
<u>Soil Symbol</u>	<u>Soil Name</u>	<u>Description*</u>	
BuB BuC2	Buxton	Deep, moderately well drained to somewhat poorly drained, gently sloping, medium-textured soils. BuB soils have 0-8 percent slopes and BuC2 soils have 8-15 percent slopes	

What Is Depth to Bedrock?

Why Is It Important?

The depth of soil above bedrock is an important consideration for building and development activities. Roads, utilities and cellar foundations, for example, are difficult and expensive to install when bedrock is present. Septic systems are also difficult to place and may easily pollute ground water.

Shallow depth to bedrock is considered to be 0-20 inches and presents severe limitations for foundations and septic system installation. Special or alternative ways of construction are usually more expensive and perhaps more damaging. Areas having moderately deep soils (20-40 inches) are more suited to housing uses. These areas are suitable for septic disposal fields but may have limitations for other types of land uses. Areas having deep soils (greater than 40 inches) are generally suitable for development, at least from a depth point of view.

Inventorying Depth to Bedrock

Mapping

1. Determine the depth to bedrock for each soil by examining the table titled, "Estimated engineering properties of soils" within the Soil Survey report for your County. When no bedrock information is given, contact the county office of the Soil Conservation Service for the information.
2. Prepare a table listing all soil types having 0-24 inches depth to bedrock, 24-36 inches, and greater than 36 inches. For example:

DEPTH TO BEDROCK	SOIL TYPE
0 - 24 inches	Hollis
24 - 36 inches	
36+ inches	Sutton Ridged

3. Using a soils base map showing soils boundaries, shade or color each area with the darkest shade for the shallowest category and the lightest shade for soils in the deepest category.

4. Attach a legend and title to the map.

What is Depth to Water Table?

Why Is It Important?

The depth to the water table is extremely important because of the potential for ground water pollution from septic systems, salt piles, storage of oil and other toxic materials, and other land use activity. Ground water in the soil fluctuates in height and drains through the ground. Thus a source of pollution can be carried to other areas by the moving ground water.

Wet, very poorly drained soils where the water table is at or within 9 inches of the surface for some part of the year are inherently unusable for septic system use and house building.

Poorly drained soils (9-18 inches depth to water table) also place severe limits on the use of the land. Frequent fluctuations in water level as well as frost heaving can be damaging to buildings, roads and the proper functioning of septic systems.

Moderately well drained soils (18-30 inches to water table) have less severe limitations on land uses, and deep, well drained soils present few problems. The latter have a depth greater than 30 inches to water table.

Inventorying Depth to Water Table

Mapping

1. Determine the depth to water table for each soil by examining the table titled "Estimated engineering properties of Soils" within the SCS Soil Survey report for your County. When no water table information is given, contact the county office of Soil Conservation Service for the information.
2. Prepare a table listing all soil types having greater than 30 inches depth to water table, 18-30 inches, 9-18 inches, less than 9 inches. For example:

DEPTH TO WATER TABLE	SOIL TYPE
0 - 9 inches	Biddeford Ridgebury
9 - 18 inches	
18 - 30 inches	Sutton
30+ inches	Charlton

3. Using a base map showing soils boundaries, shade or color each soils area with the darkest shade for soils in the shallowest category and the lightest shade for the soils in the deepest category.
4. Attach a legend and title to the map.

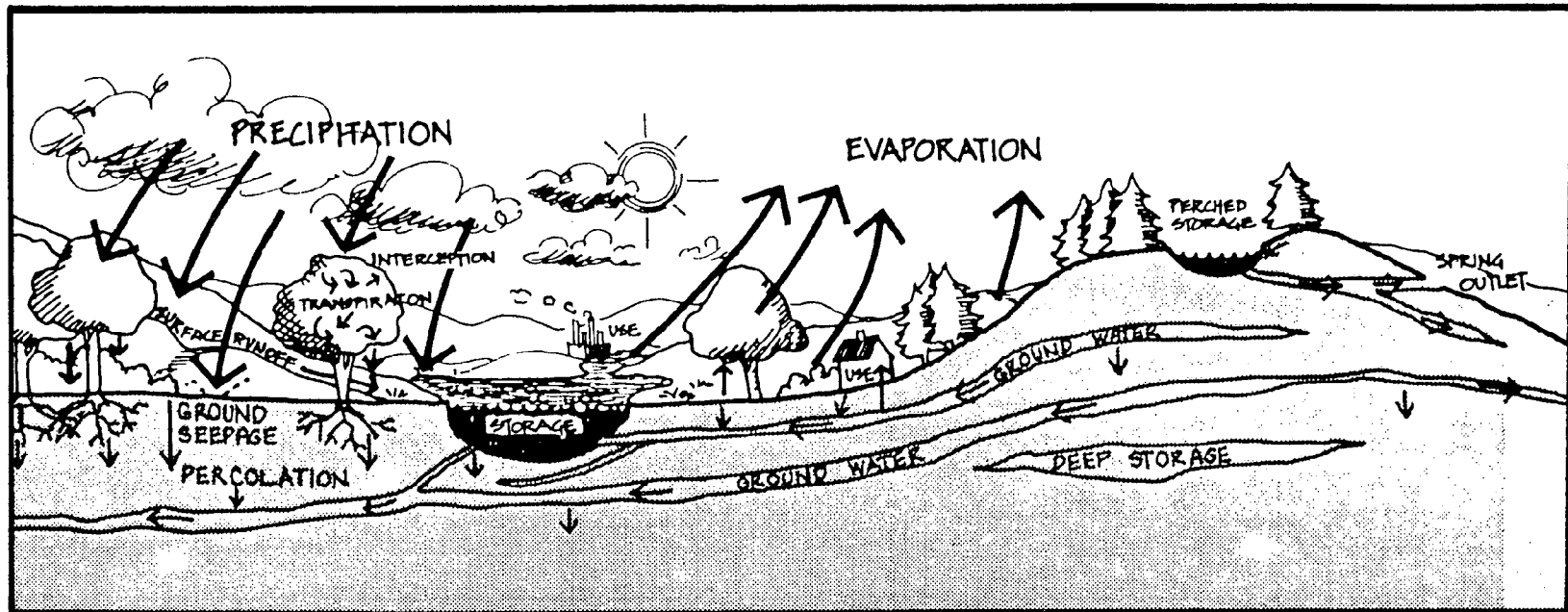
Water Resources

What Are Water Resources? Why Are They Important?

Precipitation in Maine is approximately 45 inches per year, with roughly half being rain and half being snow. Falling rain hits the earth's surface and then some of it penetrates into the soil, and the rest collects in brooks and streams. This surface water or runoff is temporarily stored in lakes and ponds, and eventually reaches the

ocean. During all these stages, water can be evaporated into the atmosphere to return again as rain or snow. Water that soaks into the ground is stored for a temporary period as ground water; then it seeps out and becomes surface water, or is used by plants or removed by well pumps.

The purpose of this inventory is to locate important water resources and to determine their relationship to land use. A study of water resources is an integral part of land use planning. With proper management, plentiful clean water will always be available for domestic and commercial consumption, for wildlife habitat, and for recreational and scenic enjoyment. With no planning, precious water sources can become polluted.



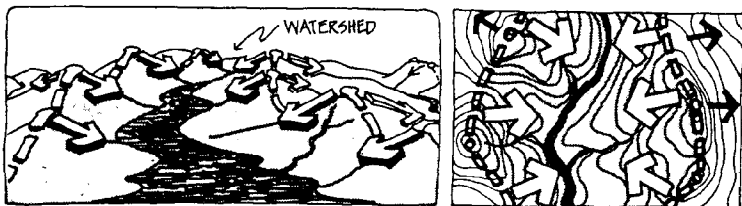
What Are Surface Water Resources? Why Are They Important?

An inventory of surface water resources must include a study of watersheds; rivers, streams, ponds, lakes and tidal waters; wetlands; and floodplains and shorelines.

Watersheds

The runoff from rain water is directed by slopes and water channels. When all the runoff from an area drains to one point, the area above that point is known as a watershed. Watersheds are bounded by ridge lines or divides. Examples of watersheds include the drainboard which carries dishwater back into the sink, or the area within ridge lines of a roof where all run-off has a common drainpipe.

The surface of the land is, in fact, a series of watersheds which adjoin one another. All land is a part of a watershed. Smaller watersheds accumulate or add up to larger watersheds. Thus, the Penobscot River Watershed is comprised of smaller watersheds, including the Piscataquis and Mattawamkeag; these, in turn, are comprised of yet smaller watersheds.

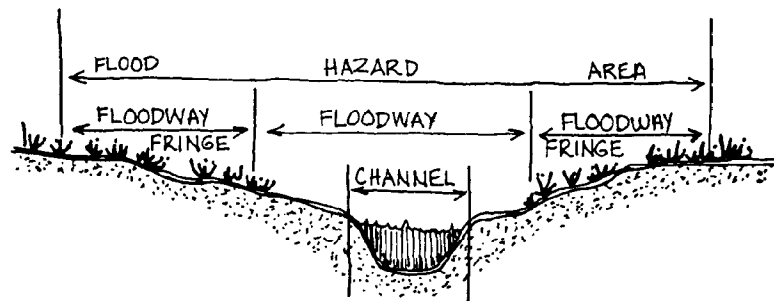


Each brook has a watershed area, no matter how small it is. As each brook becomes a tributary to a larger stream, the watershed enlarges. Because of these downstream connections, a chain of effect or impact is created. For example, a change in water quality in the brook will affect the water quality in the stream and, potentially, all the rest of the way down the stream. This is why it is important to identify and map watersheds.

Flood Plains

Surface water runoff is often stored for some time in lakes and ponds. The levels of flowing surface waters fluctuate with each rain storm or snow melt. When streams fill and overflow their banks the condition is known as a flood and the area flooded is the floodplain.

A floodplain is an area that is inundated periodically, usually during spring runoff. Many areas are flooded occasionally and are called flood prone or flood hazard areas. In either case, the damage to life and property is equally severe. Floods are a natural and normal phenomenon; they become a problem to man only when competing with streams and rivers for the use of floodplains.



To summarize, the location and extent of floodplains is important because of potential damage to buildings, roads and equipment; the effect on further development; water pollution and downstream damage; and flood damage insurance.

Wetlands

Generally, wetlands are land areas where ground water is at or near the surface of the ground for enough of every year to produce wetland vegetation. There are salt water and fresh water wetlands. Common names for wetlands include swamps, marshes, bogs, tidal flats and rocky shores. Wetlands are important in the hydrologic cycle because they slow down and store runoff, which is then released slowly to feed brooks and other surface waters.

Wetlands are vital natural resources which have both ecological and economical importance. They provide a unique habitat for a broad spectrum of plants, animals and fish, including waterfowl, shellfish, fish, insects, reptiles, amphibians and many mammals. Wetlands also serve as water purifiers and storage areas that reduce flooding by absorbing and dispersing excess rainfall.

The sensitive ecological balance of a wetland can be easily and disastrously disrupted by many human activities. Therefore, wetlands should be maintained as open space.

Shorelines

The shorelines of flowing and standing waters are also environmentally fragile areas that require special consideration. Many shorelines, and particularly those with steep slopes and/or highly erodable soils, should be maintained as open space. Natural vegetation on shorelines maintains water quality by holding the soil in

place. Development on shorelines often increases the amount of nitrogen and phosphorus entering the waters and can lead to algae bloom.

Therefore, it is important to protect flowing and standing waters by maintaining "buffer zones" which are undisturbed areas along shorelines. These buffer zones serve to protect water quality from run-off and sedimentation from adjacent activities.

Shorelines also serve as important wildlife habitat. Undisturbed shorelines are vital to a great number of wildlife species. For this reason, shorelines often have a greater diversity of wildlife than most other areas. Some studies have recommended that relatively undisturbed shoreline corridors for freshwater streams be an average of 330 feet wide to protect important wildlife habitat. Within this area the first 100 feet should remain undisturbed and the remaining 250 feet can receive very limited cutting. The Maine Department of Inland Fisheries and Wildlife has recommendations on the type of cutting that would be permissible.

Some commercial and many recreational uses depend on direct access to the water. Such development can be accomplished in an environmentally sound manner, if the activities are governed by criteria which ensure water quality.

Inventorying Surface Water Resources

Mapping

1. Inspect the U.S.G.S. topographic map and locate lakes, ponds, rivers, streams, brooks and tidal water. Enhance these surface water features by outlining them with a fine tip black marker. Lakes and ponds as well as wide

places in rivers may be shaded. In most cases base maps will depict these surface waters.

2. Use the topographic map to identify the boundaries of watersheds. Do this by marking the highest ridges between watersheds and then extending these lines down slopes to tributary confluences. Mark these divisions with dashed lines. Indicate primary watersheds of major rivers as well as secondary watersheds of tributaries to those rivers.
3. Wetlands can be identified using the Maine Department of Environmental Protection Fresh Water Wetlands Maps, Maine Inland Fisheries and Wildlife Wetlands maps, the U.S. Fish and Wildlife Service Maps and the Soil Conservation Service County Soil Survey Reports. U.S.G.S. topographic maps and aerial photos can also be used to identify wetlands. Field check the wetlands that you have identified to assure accuracy. Transfer this information onto the base map.
4. Use the National Flood Insurance Program Flood Hazard Area Maps for the town to identify floodplains. Transfer this information onto your base map by using cross hatching or shading to identify the floodplains.
5. Map all shorelines by shading an at least 250 foot band along all major flowing and standing waterways. Further refinement in the designation of shoreline areas should provide the basis for the town's shoreland zoning. The state has established three designations for shorelands of streams with watersheds greater than 25 acres: general development, limited residential and resource protection. The natural resources inventory should provide the supporting data for the designation of these districts.

Surface water mapping may require professional assistance. Regional planning commissions, the Soil Conservation Service, Resource Conservation and Development Districts, private consultants and universities are possible sources of this type of assistance.

Narrative

The narrative should describe the characteristics of the surface waters displayed on the map. Describe the networks of flowing and standing water within watersheds. In addition to describing those characteristics displayed on the map discuss any available information on water quality and water classification that can be obtained from the Department of Environmental Protection (DEP) Lake Quality Program, DEP Water Classification Program, Soil Conservation Service, special independent studies done by universities or private consultants, or other sources.

The narrative should describe any existing or anticipated sources of public surface water supply. Areas with public water supply potential should be noted. Contact the local water district to obtain information on water quality and supply, watershed management, and any other information pertaining to the quality and quantity of the resource. The Drinking Water Program of the Maine Department of Human Services may also have information.

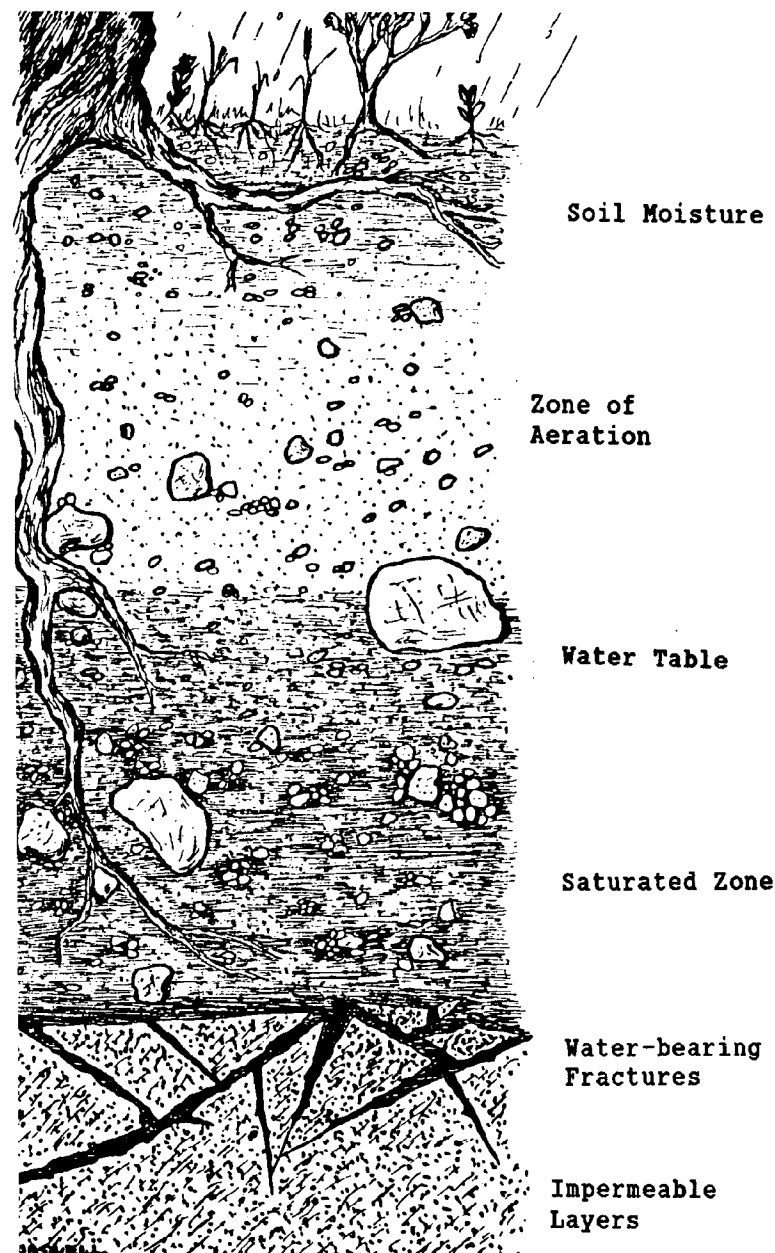
Other characteristics that should be noted in the narrative might include; the location of scenic or unusual surface water resources (these will be mapped in the section on Special Natural Features), and areas with recreation and or public access potential.

What Are Ground Water Resources? Why Are They Important?

As water enters the soil it either evaporates, is used by plants, adheres to soil particles, or percolates downward to the upper boundary of the saturated zone which is known as the water table. In this zone all free spaces or pores are filled with water. The water in the saturated zone is termed ground water. The lower boundary of ground water is formed by an impermeable layer of rock which water cannot enter. Areas of the earth's surface where water enters the soil and, in turn, enters the zone of saturation are known as areas of recharge.

Saturated geologic formations are termed "aquifers" when they yield adequate quantities of water. Aquifers are very important because they store water, allow for the movement of water, and under natural conditions, yield high quality ground water. A satisfactory supply may, in large part, depend on the demands placed on the aquifer. In other words there are high and low yield aquifers.

Both bedrock and sand and gravel aquifers are known in Maine. Sand and gravel aquifers tend to yield greater quantities of water to individual wells than do bedrock aquifers. In cases where aquifers are of the bedrock variety, the rock is fractured or cracked. Normally bedrock aquifers yield only limited quantities of water. Such aquifers are nearly always satisfactory for home water supplies. Only in certain areas are they suitable for large municipal or industrial water supplies which need 200-500 gallons per minute.



Land use activities that discharge pollutants into an aquifer recharge area may affect the quality of drinking water. The impact of a pollutant on an aquifer depends on the size and characteristics of the aquifer and on the nature and amount of pollutant. Sources of pollution are often located on the ground surface directly above or contiguous to the aquifer. Septic tank effluent, landfill refuse, salt from salt/sand stockpiles, leakage from ruptured fuel tanks, agricultural fertilizer and wastes are possible sources of ground water pollution. The locations of aquifers and their depths are important to know so that measures can be taken to prevent degradation of water resources.

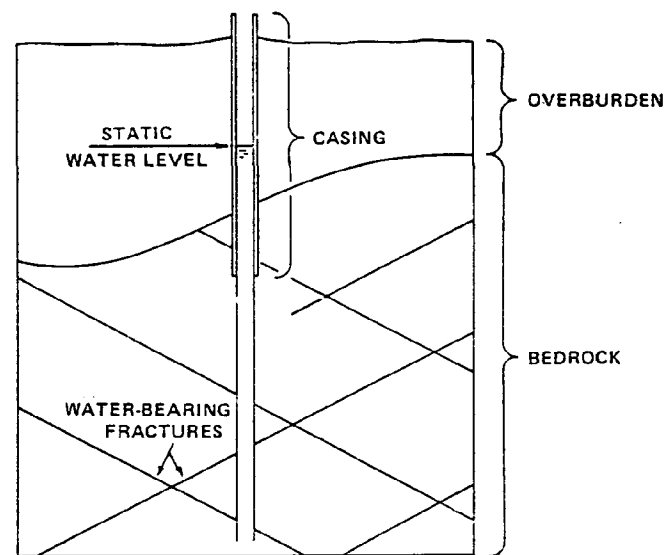
Inventorying Ground Water Resources

Mapping

1. Inspect the Maine Geological Survey's (MGS) Sand and Gravel Aquifer Maps and carefully transfer the location of sand and gravel aquifers onto the base map. Ground water resources can be mapped on the same map with surface water resources or they can be mapped separately. Two maps should be used if there is a lot of information to be mapped. Sand and gravel aquifers can be identified by shading.
2. Identify any existing or potential sources of public water supply on the base map. This information can be obtained from the local water district/company or town officials. These sites may also be identified on the Maine Geological Survey's Sand and Gravel Aquifer Maps. Use a star or an asterisk to identify these sites.

3. An inventory of ground water resources can also include the mapping of drilled wells. This information can be used by a professional hydrogeologist to conduct more detailed mapping of ground water. Plot the locations of drilled wells on the base map. You may also want to gather information on the depth of the well, the depth to the water table, the depth to bedrock and the well yield or flow rate. This information can be obtained from Maine Geological Survey, well drillers, and well owners.

The depth to the water table can be measured by sticking a tape measure down the well to measure the distance from the ground surface to the water. The depth to bedrock can be measured by measuring the length of the well casing. This is a measure of the "loose" materials that protect the ground water. Be sure to get the well owner's permission before attempting to examine the well.



Map and display well data by locating the well with a dot on the map, assigning the well a number and keying it to accompanying survey sheets that contain other information. (see sample survey sheet)

SAMPLE WELL SURVEY SHEET	
Tax Lot/Identification # _____.	
Town: _____	
Owner: _____	
Location: _____	
Type of Well:	<input type="checkbox"/> bedrock <input type="checkbox"/> sand & gravel <input type="checkbox"/> dug <input type="checkbox"/> other (spring, etc.)
Is well cap exposed <input type="checkbox"/> , or buried <input type="checkbox"/> ? If buried, is location known or unknown <input type="checkbox"/> ?	
Depth of water table: _____ feet, Spring _____ Summer _____ Fall _____ Winter _____ Unknown <input type="checkbox"/> .	
Depths to water producing veins (from well log): _____.	
Casing length: _____ feet Depth to bedrock: _____ feet.	
Overlying material: clay <input type="checkbox"/> till <input type="checkbox"/> sand <input type="checkbox"/> gravel <input type="checkbox"/> other <input type="checkbox"/> .	
Yield: _____ gallons per minute, according to well driller	
Sewer: _____ septic system _____, distance from well _____ ft.	
Additional material from well log if available.	

4. Attach legend and title to the map.

Professional Evaluation of Inventory is Necessary

Professional evaluation of the ground water inventory results is recommended. Assistance is available from the State Groundwater Coordinator the Maine Department of Environmental Protection Water Bureau hydrogeologist, and the Maine Department of Human Services Health Engineering hydrologist. The review should consider the adequacy of the data base, the projected future demand for water supplies, and the potential for contamination of water supplies.

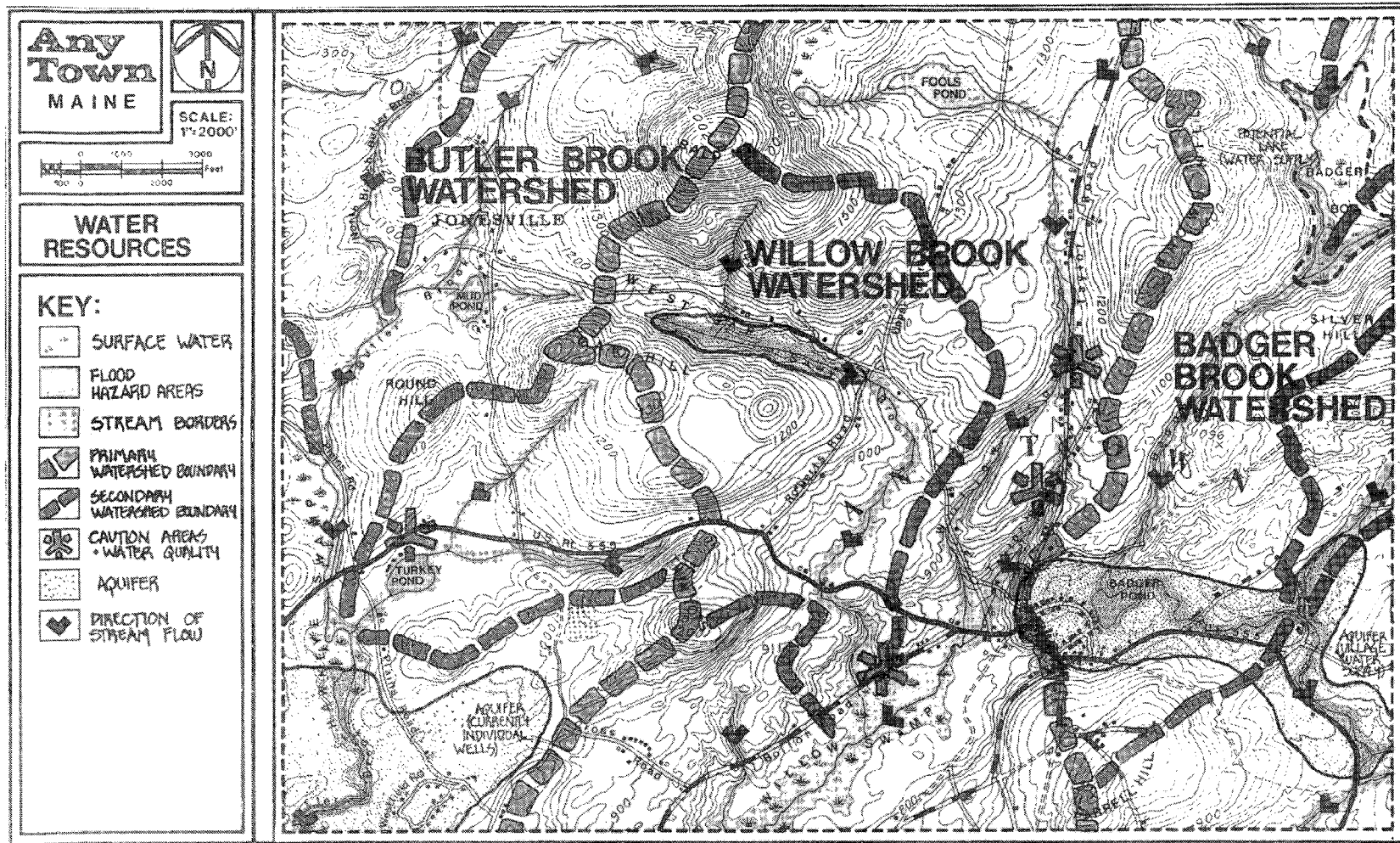
Narrative

The accompanying narrative should describe the ground water resources located within the community. This should include a general description of any sand and gravel aquifers, sources of public water supply, and a summary of information obtained through the well survey.

Inventorying Threats to Water Resources

An inventory of threats to water resources should be conducted in conjunction with the natural resources inventory. Locating potential threats to water resources is the first step in protecting water supplies. Once these potential threats have been identified, they can be evaluated by a professional and steps can be taken to eliminate or reduce the threat of water contamination.

"Ground Water Quality: A Handbook for Community Action", available from the Maine Association of Conservation Commissions, contains an extensive listing of potential ground water threats and provides a step-by-step procedure for conducting an inventory.



Sources of Information

(See Appendix 1 for Addresses)

Maine Department of Environmental Protection (DEP)

DEP wetlands maps display the location of wetlands that are larger than ten acres in size and that have all of the following characteristics: a) wetland soils defined by the USDA Soil Conservation Service (see County Soil Survey) as very poorly drained; b) wetland vegetation, but not forested, and; c) water-logged or water-covered areas. These maps were completed in 1984 by the Maine Geological Survey (MGS) and the Maine DEP. Copies of the maps are available from MGS. The maps identify wetlands that are regulated by the DEP under the Act to Protect Freshwater Wetlands. Contact the Bureau of Water Quality Control of DEP for a copy of the regulations.

The Bureau of Water Quality Control maintains information on water quality and water classification for all rivers and most streams. The water classification system is goal oriented and pertains to water quality (i.e. Is the river swimmable and fishable?).

The Division of Environmental Evaluation and Lake Studies (Water Bureau) has information on the classification and water quality of lakes. The Division also manages a volunteer monitoring program designed to assist communities in monitoring degradation of water quality of lakes. The Division is designing a manual on reviewing subdivisions in lake watersheds.

The Bureau of Water Quality Control's hydrogeologist is available to provide planning assistance and information on ground water

contamination to communities. Assistance can include review of inventory information and review of development proposals with regard to their impacts on ground water.

The Bureau's of Oil and Hazardous Materials Control and Land Quality Control, Technical Services Division have information on known contamination.

Maine Department of Human Services, Division of Health Engineering

The Division maintains records from its well testing program that contain information on water quality, well type and depth. This information includes the name of the well owner but not the location of the well. The Department also has information on public water supply systems and is able to provide limited technical assistance on protecting water supplies.

Maine Geological Survey (MGS)

Sand and Gravel Aquifer Maps - Two levels of mapping have been done for sand and gravel aquifers. A reconnaissance level of mapping has been completed for most of the state. These maps identify sand and gravel aquifers that in all probability can supply useful volumes of ground water. Other information pertaining to wells, springs, test borings and test pits is also displayed on the maps, and additional geologic information is included in a text that accompanies each map. Aquifer yield designations and boundaries are generalized from available information and, as such are subject to modifications based on on-site hydrogeologic investigations. It is estimated that aquifer boundary lines may be inaccurate up to 250 feet of either side of the line shown on the maps.

The second level of mapping is more detailed and has been completed for parts of southern and south central Maine. These maps more accurately characterize sand and gravel aquifers by: describing the depth and three dimensional shape of the aquifer; defining the boundaries; distinguishing between the aquifers and the recharge areas; and assessing ground-water flow directions and regional water quality. Several reports have been prepared to accompany these maps. These reports include information on regional geology, hydrogeology, aquifer properties, water quality, seismic surveys, and monitor well logs.

Ground Water Resource Maps - The only published information available on bedrock aquifers are the Ground Water Resource Maps. These maps represent a preliminary investigation of bedrock aquifer characteristics for coastal counties, including portions of Androscoggin, Kennebec and Penobscot Counties. These maps display well yields, depth, thickness of overburden bedrock surface topography and other information. While the individual well information is relatively accurate the interpretations are not based on enough data to be statistically adequate. Therefore, the best use of this information is to use it to supplement the well inventory described in the previous section.

The Maine Geological Survey has other published reports and unpublished data that might be valuable in conducting a ground water inventory. It would be wise to contact them to find out what other information is available.

State Planning Office Groundwater Coordinator

The State Groundwater Coordinator can provide protection planning assistance to communities. This includes information on mapping ground water

resources and potential threats to those resources, the vulnerability of ground water, and appropriate ground water protection measures.

Maine Coastal Zone Water Supply and Demand Maps - Maine Coastal Zone Water Supply and Demand maps are available to coastal communities. These maps detail the water supply sources, delivery systems, a few known contamination sites, and some projected future water supply sources and likely areas of community expansion as of 1977. Your local town office or water utility may have a copy of your community's map or copies may be obtained by contacting the State Groundwater Coordinator.

Maine Department of Inland Fisheries and Wildlife (IF&W)

IF&W Wetlands Inventory - In the late 1960s IF&W mapped and assessed wetlands based on their suitability for wildlife habitat. This information is probably the most geographically complete assessment of wetlands in the State. It can be obtained from the IF&W Regional Office or the head office in Augusta.

National Flood Insurance Program

National Flood Insurance Program maps display the location of floodplains or flood hazard areas. Towns are required to have Floodplain Management Ordinances to participate in the Federal Flood Insurance Program through which residents are eligible for flood insurance. A copy of your town's floodplain maps and ordinance should be available through the town office.

A community may want to improve the accuracy of these maps, particularly where inaccuracies are clearly evident, as a part of the natural resources inventory. Contact the Floodplain Management Coordinator, Maine State Planning Office, for more information.

U.S. Fish and Wildlife Service (F&WS)

F&WS Wetlands Maps - The U.S. F&WS mapped wetlands in all of coastal Maine and the entire Saco River watershed in the 1970s. These maps display freshwater and tidal wetlands.

U.S. Geological Survey (USGS)

The USGS located in Augusta has some hydrological information available and can provide limited assistance in interpreting the data.

U.S. Soil Conservation Service (SCS)

SCS Soil Survey Maps - The Soil Survey maps can also be used to identify the location of wetlands and floodplains. Wetland soils include muck and peat, marsh, and mineral soils that are poorly or very poorly drained, as defined by the SCS. The Survey can be used to preliminarily identify flood hazard areas which are "alluvial" soils as defined by the SCS. Since this soils information does not indicate the frequency of floods or the depth of flooding it should only be used for general planning purposes and not where a great degree of accuracy is needed.

The Soil Survey can be obtained from the County Soil Conservation Service. SCS staff may also be able to assist in the delineation of wetlands and floodplains.

Vegetation

What Is Vegetation? Why Is It Important?

Vegetation is the plant life that covers the surface of the land. In Maine the land area is 89 percent forested with natural and plantation forest stands. Agricultural land accounts for less than 5 percent and urban or built-up areas account for the remainder. A great deal of vegetation is used to provide food and fiber products. The type of vegetative ground cover is an expression of climate, soil, and past history.

The forests of Maine are of two general types. These are boreal or northern forests of conifers (evergreens) in the north and east, and northern hardwood forests in the south and west. These generalized forest types have been modified by past cutting history and fires, resulting in a complex mix of forest stands.

The existing forests of Maine are third and fourth generation stands that resulted from cutting "virgin forests." The forest lands supply fiber, building materials and recreation opportunity.

Forest land is also the habitat for many wildlife species which are valued for food, beauty, and sport. Many forested areas are crucial links in the survival of important wildlife species. Forest trees help maintain water quality by regulating run-off and by preventing undue warming. These cooler waters provide suitable habitat for fish and other aquatic life.

The science and art of forestry is the body of knowledge that guides the management of a forest. The principal management technique used in the past has been the cutting and harvesting of standing trees. The proper removal of mature and useful trees provides room for a new, more vigorous growth.

Agricultural activity involves planting, tending, and harvesting of many vegetables and grains. Row crops and grains are good examples of plants established and harvested on a yearly cycle. Other areas such as hay fields, pastures, and orchards are created and managed to provide food over a longer period.

Agricultural activity usually requires periodic disturbances of the land surface by plowing or some other means. During these periods the soil is exposed to the weather and the potential for erosion is greatly increased.

Likewise, the harvest of forest trees usually involves the disturbance of the soil. Road building and machinery operations are major causes of soil exposure. Again, exposure of the soil creates a potential for erosion.

Maintaining a continuous ground cover is essential to protect the soil from erosion and the resulting degrading of surface water by sedimentation. Erosion and sedimentation often occur as the result of the misuse of forest and agricultural lands.

Although agriculture and forestry activities can cause erosion, it is the wholesale bulldozing of areas for development that results in the most serious erosion problems in Maine. When ground cover is removed, the site is exposed and unless precautions are taken, a very severe case of erosion and sedimentation may occur.

Erosion preventive measures are well documented by the Soil Conservation Service (SCS). The SCS can recommend the right ground cover for an area based on the soil type and the expected uses of the area.

Vegetative ground cover can provide screening for homes and other developed sites. Vegetative buffer zones reduce noise as well as blot out unwanted scenes. Trees and other vegetation use up carbon dioxide in the atmosphere and generate oxygen. This action results in a purification of the atmosphere. In Maine, it is the vegetation that determines the natural beauty of an area. For example, large tall trees along a lake shore, or hardwood vegetation in fall coloration along a ridge, or hillside orchards in bloom, add character to a region, and provide pleasing visual experiences.

Classification of Ground Cover

There are a variety of ways to classify vegetative characteristics. For example, foresters interested in locating areas to be harvested break forest land down according to type, height, and density. Thus, forest type maps will show:

Softwood	(SW)
Hardwood	(HW)
Mixed wood	(M)
Alders	(A)
Cedar Swamp	(CS)
Other	

plus a number and letter code as to height and crown closure (density). For example, M2B means mixed wood of medium height and medium density.

For planning purposes a more general descriptive system is desirable. For example:

- | | |
|-----------------|--|
| Mature forest | - large harvestable, but scenic trees |
| Young forest | - smaller, non-harvestable trees |
| Cut-over forest | - recently cut-over where there is evidence of tree removal (roads and exposed areas). |

This classification can be expanded to include the types of trees such as hardwood, softwood or mixed wood.

Agricultural land can also be classified according to its condition. The classes of agricultural land are:

- | | |
|-----------|---|
| Tilled | - flat, uniform surface capable of being tilled |
| Pasture | - sloping, uneven land not capable of being tilled |
| Abandoned | - land in the early stages of returning to forest cover |
| Orchard | - land used for the cultivation of fruit |

With this system, land used or available for agriculture is identified. These classes give some indication of the extent that the earth's surface will be disturbed, hence, the potential for erosion hazard is indicated.

To complete the classification of ground cover, several additional cover types must be identified. These are:

- | | |
|-------------------|--|
| Wetlands | - including swamps, bogs, and marshes |
| Urban or Built-up | - houses, buildings, roads, etc.; as well as open space, cemeteries, junkyards, etc. |
| Barren Land | - such as rock outcrops, gravel pits, and sandy areas |
| Surface Water | - lakes, ponds, rivers, streams, brooks and tidal areas |

Another classification system developed through the Maine Natural Heritage Program of the Nature Conservancy focuses on vegetative ground cover as wildlife habitat. The Natural Community Classification is fairly detailed and goes beyond naming broad categories. It may be used to make important distinctions between two habitats that may superficially appear similar, yet are ecologically quite different. For example, a pitch pine barren is a softwood forest, but is certainly much more rare and threatened than second growth spruce and fir.

The classification can also give a town some idea as to the relative rarity, and thus importance of a particular habitat under consideration. Nature Conservancy staff are available to help interpret the classification, especially since it will be continually updated as new data become available.

Inventorying Vegetation

Mapping

1. Transfer and plot cover types from sources onto a topographic base map.
2. Outline with a heavy black line the cover types on the base map and label according to a legend. (see suggested legend, below)
3. Prepare a legend and title, and attach to the map.

Suggested Vegetation Map Legends

F - Forest land
A - Agricultural Land
U - Urban and built-up
W - Wetland
O - Other

OR

FOREST LAND

Softwood
Hardwood
Mixed wood

URBAN & BUILT-UP

AGRICULTURAL LAND

Tilled
Pasture
Orchard
Abandoned

WETLAND

Bog
Swamp
Marsh
Mudflat

Narrative

The narrative should explain how vegetation or ground cover has been classified on the map. It should note the predominant types of ground cover and their locations within the community. Any past and future trends in land cover change should be explained. For example, the narrative might note whether there is more abandoned farmland today than in the past, or whether wetlands decreased in size due to filling for development. The narrative should also identify and describe any areas of town-owned forest, farmland or wetlands.

Sources of Information

(See Appendix 1 for addresses)

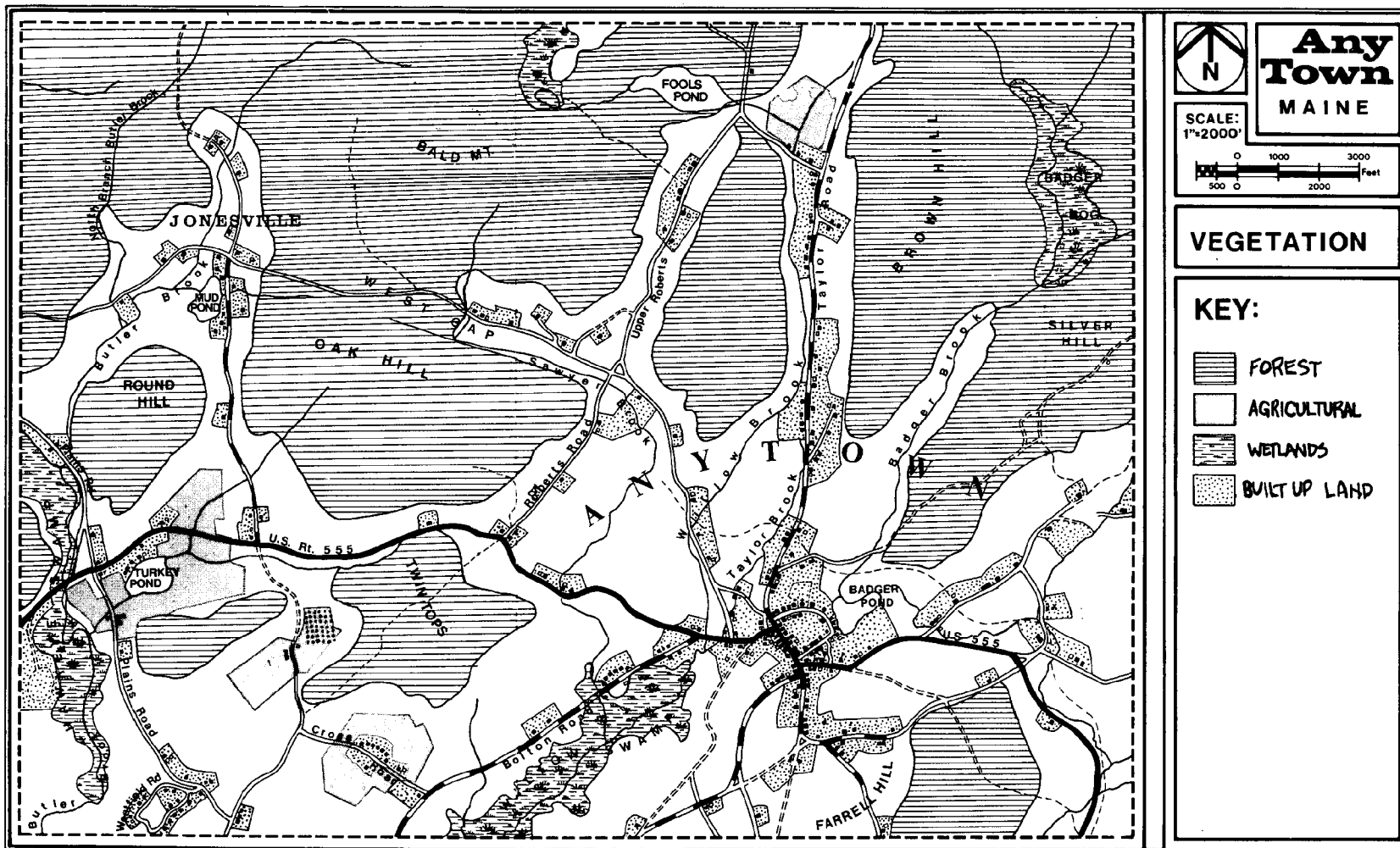
In many cases ground cover information will not be available. The following sources, however, may be of help:

Major landowners may have forest type maps that classify mixed woods, softwoods and hardwoods

Municipal Tax records may identify forest types, wetlands, agricultural land, urban and built-up areas

Recent (within 10 yrs) USGS topographic sheets show forest and agricultural land, and wetlands.

U.S. Agricultural Stabilization and Conservation Service/U. S. Soil Conservation Service have aerial photographs with farmland designations. Aerial photographs flown in the fall and winter can also be used to determine hardwoods, mixed wood and softwoods.



Special Natural Features

What Are Special Natural Features? Why Are They Important?

Most towns possess natural features that contribute to the community's unique character. These areas may be outstanding scenic open space areas, excellent wildlife habitat, a sandy beach, an unusual rock formation or some other feature that has special value to the community.

These areas are important because they are a part of the community's natural heritage. Unusual natural features can be used for educational purposes for students, organizations and professional researchers. Some areas may be suitable for recreational uses such as hiking, canoeing, picnicking, swimming, sightseeing, photography and art.

There is no set list of all the special features that should be included in an inventory; it will vary from community to community. However, areas that have been identified as being of statewide significance should definitely be mapped. (See the section on "Sources of Information on Special Natural Features.")

Special natural features can be categorized as scenic, geologic, botanic or zoologic. Scenic features might include overlooks, coastal areas, country roads with expanses of farmland or open space, gorges and waterfalls. Since the designation of scenic areas is very subjective, it may be helpful to survey community residents to identify these areas.

Geologic features are those relating to rock formations. Areas with concentrations of fossil deposits, large boulders or rock outcrops, jagged coastal areas, unusual rock deposits, or pebble beaches are good examples of notable geologic features.

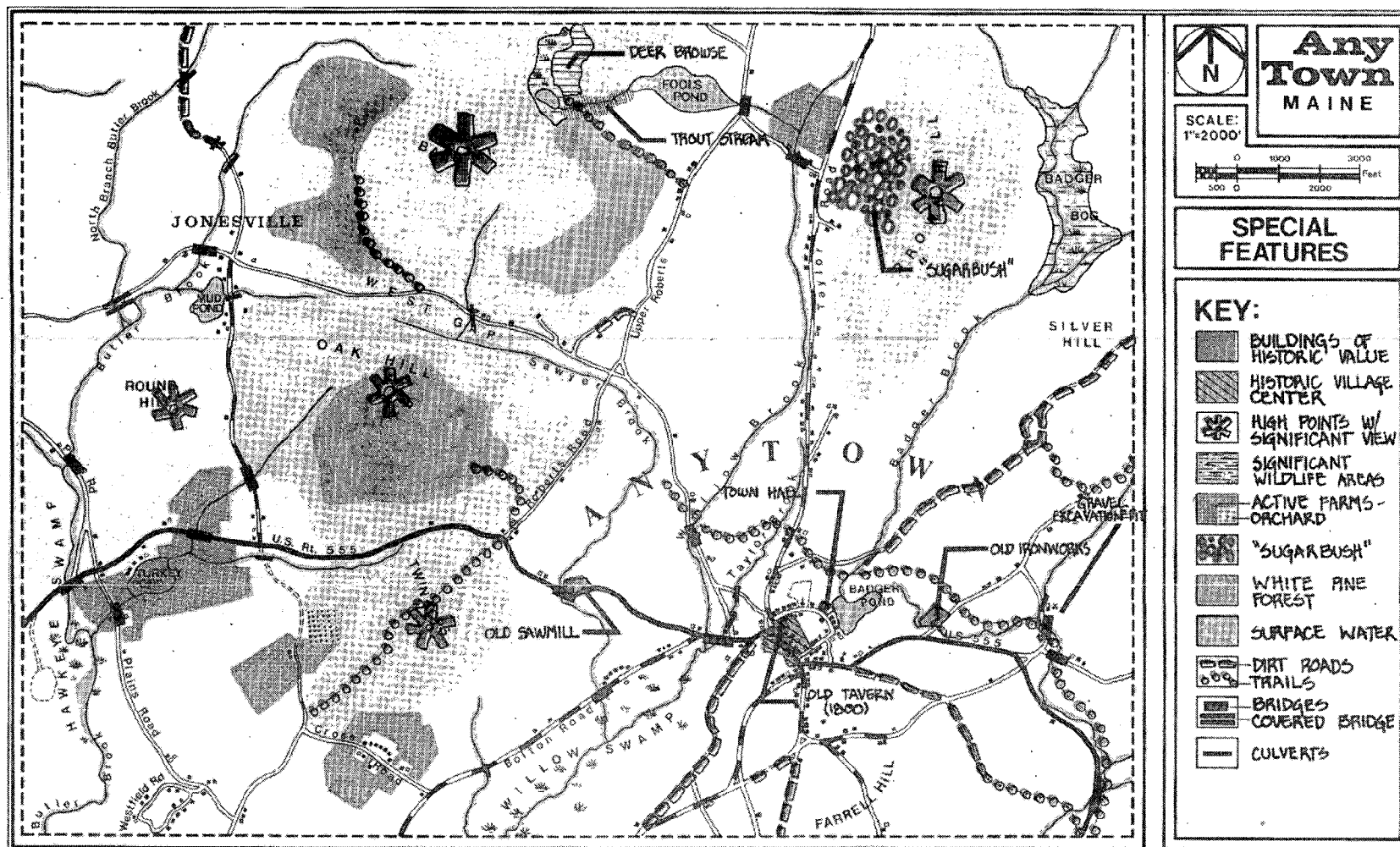
Botanical features are those relating to plant life. Old growth forests, rhododendron stands, "sugar bush" or sugar maple stands, or endangered plant species are special botanic features that might be included.

Zoologic features are those wildlife areas relating to animal life. Deer yards, waterfowl habitat, salmon runs, clam flats are good examples of important zoologic features.

Inventorying Special Natural Features

Mapping

Special Natural Features should be mapped on a single base map. Various types of shading and cross hatching can be used to identify areas of special features and symbols can be used to locate specific sites. These areas and sites can then be numbered and keyed to a listing or table that contains more detailed information. Be sure to put a title and legend on the map.



Special Features

MAPPING COMMENTS:

This is a color map that has been reproduced in black and white. Shading film and shading patterns were added in order to show areas which would fade out with a black and white camera. A light shading film was used on "active farms" and diagonal hatching used for "historic village center".

Narrative

The narrative should describe each of the natural features displayed on the map. It should explain the importance of the features and their sensitivity to land use activity. The sources of all information should be noted.

Sources of Information

(See Appendix for addresses)

There are several sources of information on special natural features of statewide significance. There may also be other features not listed that are of local significance and therefore deserve special treatment. In some cases, the community may identify a natural feature that should be brought to the attention of the statewide groups.

The Critical Areas Program, State Planning Office

Critical areas are officially recognized and registered areas which contain natural features of state significance - either highly unusual natural features, or outstanding examples of more common features. Critical areas, on both public and private land, may include exceptional plant or animal habitat, areas of great geological or historical interest, and outstanding scenic areas. They may or may not be well-known to the public. Some examples of critical areas include colonial bird nesting sites, naturally occurring rhododendron stands, significant fossil deposits, and scenic gorges and waterfalls.

The Program has produced over 200 reports, brochures, and fact sheets. These reports contain a substantial amount of scientific information on rare features in Maine. Copies of all the program's publications are available in 18 libraries, and are available to the public to borrow. The Maine State Planning Office will provide copies of the program's reports. There is a charge for the larger reports.

The three types of reports available are:

Planning reports provide technical scientific background on particular species or land features. They are primarily designed for scientists and researchers.

Botanical Fact sheets are two page summaries of the biology of particular species of rare plants in Maine that provide a description of the plant, its distribution in Maine and assessment of its rarity and significance.

Educational brochures are designed to provide general information about some of Maine's plants, wildlife and natural features, both rare and familiar, to meet the interests of the general public.

The program also publishes an Index of Critical Areas by town and county.

Maine Natural Heritage Program, the Nature Conservancy

The Maine Heritage Program inventories the status and locations of rare animals, plants and natural communities. The major objectives of the program are to gather information about the occurrence of rare species and to make the information available for conservation and land use purposes.

The Heritage Program data base can provide locational and life history information on endangered and threatened other species and significant ecosystems for a town. The program can also provide comprehensive lists of all Maine's plants, birds, mammals, fish, reptiles and amphibians, and selected invertebrates, as well as a detailed classification of Maine's terrestrial and wetland community types. These lists can be useful in inventory planning and analysis.

To request information from the Heritage Program, call or write the Program and include:

- . Name and address of user or organization
- . Special features or types of information for which data are needed
- . Geographic area of concern including a map of the area and a precise description
- . Brief explanation of how the data will be used

The Department of Inland Fisheries & Wildlife (IF&W)

The regional offices of IF&W have information on fisheries and wildlife habitat. IF&W also maintains the Maine Wetlands Inventory, a continuous study identifying and rating wetlands for their value to waterfowl.

IF&W conducts annual wintering waterfowl surveys, and fisheries surveys. Statistics are kept on deer and furbearing harvest and fish stocking. The Department is also conducting an inventory of terrestrial habitat. Based on these studies, IF&W biologists are often able to make wildlife projections for various amounts of available wildlife habitat within the community.

IF&W is conducting a study of marine wildlife - shorebirds, seabirds and seals, for some coastal areas. The study identifies habitat areas and ranks them according to importance and recommends management. The study will be an excellent source of information on Marine species.

The Endangered and Non-game Wildlife Program is also administered by the IF&W. Non-game wildlife includes all terrestrial, freshwater, and salt water species which are not captured or killed for sport or profit. This program has mapped sites that are critical to species continuation and sites that are highly valued as wildlife habitat. The program is also developing management guidelines for these sites. Contact the nearest Regional IF&W office for all information from IF&W.

Maine Department of Marine Resources (DMR)

Area biologists for DMR are a source of information on marine fisheries including commercial shellfish beds, marine worms, smelt, shad, alewives, salmon and other fish species. The report, "An Ecological Characterization of Coastal Maine," by the Fish & Wildlife Service, U.S. Department of Interior, 1980, is also a good source of information on marine species. However, area biologists should be asked to update this information. This publication is available through the State Library System or can be reviewed at the Maine Association of Conservation Commissions' office.

Town Clam Flat Inventories - Coastal towns that are regulating clam flats are required to have completed clam flat inventories. These inventories should be available from the town office or from DMR.

River Fisheries Management Plans - River fisheries management plans have been prepared for most major rivers in the state. These plans contain extensive inventories of river ecosystems. These plans are available through the State Library System.

Maine State Planning Office (SPO)

Two reports produced for the SPO might be helpful to towns inventorying scenic and wildlife resources. While the studies were done for specific areas in Southern Maine, they still provide methodologies and/or recommendations that might be useful. The reports are:

"The Cumulative Impacts of Development: A Scenic Landscape Assessment on Mousam River Watershed," Mary F. Droege, 1987

"The Cumulative Impacts of Development: Important Wildlife Areas in Southern Maine," Jody Jones, 1986

Putting It All Together: **The Summary Analysis** **Map**

What Is a Summary Analysis Map?

Why Is It Important?

The Natural Resources Summary Analysis Map graphically displays the physical features and characteristics that have the greatest relevance to land use in the community. It should summarize the most significant aspects of the topography, soils, hydrology, vegetation and special natural features by highlighting (in map form) where the land is most sensitive to development pressure and where there are impediments to new construction.

The preparation of the Natural Resources Summary Analysis Map is an important part of the land use planning process. Summarizing all the information on one map makes it easier to analyze the information.

What Information Should Be Mapped?

At a minimum the Natural Resources Summary Analysis Map should include:

1. Slopes greater than 25 percent
2. Flood hazard areas
3. Major wetlands
4. Large volume aquifers
5. Shorelines
6. Special natural areas

All these areas should be considered for open space because of their critical function within the ecosystem and sensitivity to land use activity. Special natural areas should be included if the intention is to preserve or protect them.

Other characteristics that should be considered for inclusion on the summary map include:

1. Slopes of 15% or greater
2. Soils with certain severe limitations (i.e., high water table, shallow depth to bedrock)
3. Other aquifers and wetlands

These latter areas may be problematic and should be approached with caution. They will probably warrant further investigation to determine if site conditions may limit development or other certain land uses.

Communities may want to seek the assistance of their regional planning commission, council of governments or Soil Conservation Service county office in preparing this map. These agencies may be able to assist in selecting the information to be mapped that is appropriate for the area.

How Should the Information Be Mapped?

The Natural Resources Summary Analysis Map is prepared by transferring the above information from each of the resource maps onto a single new base map which will be the summary map. The following is a step by step description of the procedure.

1. Transfer those areas with slopes greater than 25 percent and slopes of 15-25 percent from the Slope Map onto the Natural Resources Summary Analysis Base Map (a topographic base map). These areas can be outlined in black and shaded, with darker shading for the greater than 25 percent slopes and lighter shading for the 15-25 percent slopes.
2. Transfer the information on flood hazard potential, major wetlands and shorelines from the Water Resources Map onto the Natural Resources Summary Analysis Map. These areas can be identified by crosshatching and shading. Other wetlands may also be identified.
3. Transfer those areas with large volume aquifers from the Water Resources Map onto the Natural Resources Summary Analysis Map. These areas can be identified by a thick black dotted line. Other aquifers can also be identified.
4. Transfer those areas with soils with high water tables and soils with shallow depth to bedrock from the Soils Maps onto the Natural Resources Summary Analysis Map. Those areas can be identified by hatching or shading.
5. Transfer those areas designated as special natural areas from the Special Natural Features Map onto the Natural Resources Summary Analysis Map. These can be identified using symbols such as circles and stars or with suitable cross hatching.
6. Attach a legend and title to the map.

Narrative

A narrative should accompany the map and explain its purpose. It should also explain what information was and was not included and the reasoning behind these decisions.



VI. Land Use Inventory

What Is a Land Use Inventory?

Land use refers to human activity on the land. A Land Use Map records those areas where the land is used to produce goods and services and support buildings and other human activities.

The Land Use Inventory is the identification, location and mapping of land uses in a community. The inventory is based on a standard classification system that groups uses with similar characteristics into several basic categories.

Why Is It Important?

The Land Use Inventory is important for three major reasons: 1) it records existing conditions making it easier to upgrade certain areas due to the problems and opportunities that may arise; (2) it makes it possible to anticipate where future growth may occur; and (3) it helps assess how new proposals will fit into the natural and man-made community.

When existing land use is inventoried and superimposed on other maps, such as the Natural Resource Summary Analysis Map, it is easy to identify where conflicts may have occurred or where growth may be at odds with other natural values. (see Section VII).

Inventoried Land Use

Mapping

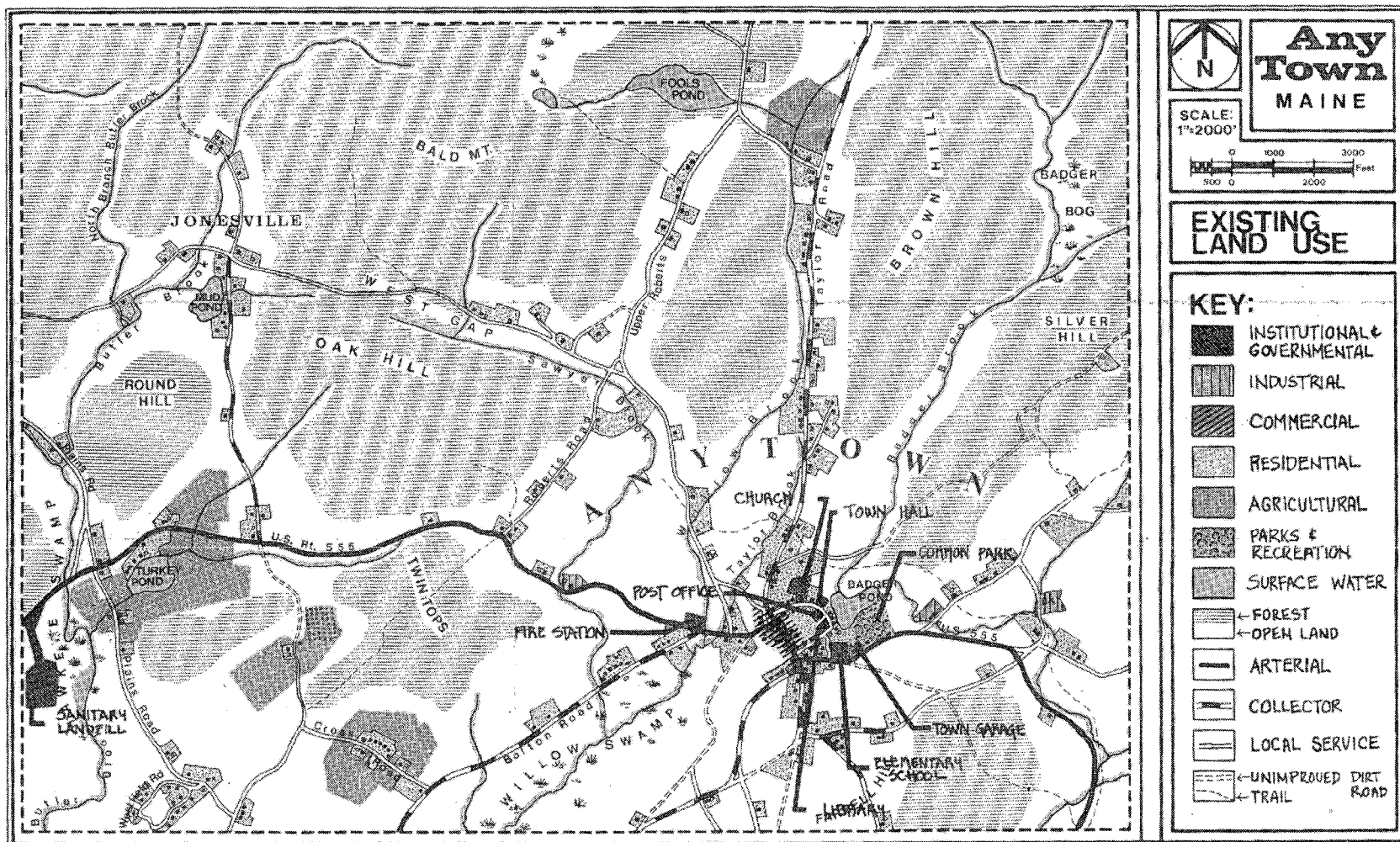
1. Gather and transfer available land use information onto a base map.
2. Up-date and correct this land use map by driving or walking around the community.
3. Based on information gathered, place land uses on the base map according to a legend. The legend can be based on Figure VI-1, and can utilize symbols, numbers, colors or shading. In areas of dense land use, each site cannot be plotted. Thus, a generalized area should be outlined. Examples are residential areas,

FIGURE VI-1

SUGGESTED LEGEND CATEGORIES FOR A LAND USE MAP

<u>CATEGORY</u>	<u>EXAMPLE</u>	<u>COLOR</u>	<u>SYMBOL</u>
RESIDENTIAL	single family year round multi-family year round seasonal residential	Yellow	R
MANUFACTURING	industrial activity warehouses sawmills	Purple	M
TRANSPORTATION, UTILITIES	highways and roads pipelines powerlines sewer lines railroads	Black lines (solid,dotted & dashed to designate different uses)	
TRADE	retail stores department stores gasoline stations restaurants	Dark Red	T
SERVICES	doctors lawyers hospitals	Pink	S
CULTURAL, ENTERTAINMENT, RECREATIONAL	parks ball fields open space for public ski areas cemeteries	Light Green	CER
RESOURCE PRODUCTION & EXTRACTION	farms tree farms gravel pits quarries	Dark Green	RPE
UNDEVELOPED LAND AND WATER AREAS	historic sites natural areas water supplies game preserves	No Color	ULWA

SOURCE: Based on "Standard Classification System for Land Use Coding in Maine,"
Maine State Planning Office.



MAPPING COMMENTS:

This is a color map that has been reproduced in black and white. Patterns and shading have been added, for purposes of photographic reproduction. Patterns were used on land use categories, "institutional and government", "industrial", "commercial", and "parks and recreation". A light shading film was used on "agricultural" and the "residential" use was hand stippled.

downtown (central business district), industrial, etc. When an area of land use is identified, outline it with a dark solid line. Label, color or shade the area according to a legend.

4. Attach legend and title to the map.

The Narrative

The accompanying narrative should describe the overall existing land use within the community. It should describe the general location of built-up areas including the town center and any clusters of development at crossroads, rural areas and areas where development appears to be spreading into undeveloped areas. The narrative section might also include a table that shows the number of uses and/or number of areas of different land uses; such as the example below:

<u>TABLE</u>			
<u>Land Use</u>	<u>No. of of Uses</u>	<u>No. of Acres</u>	<u>% of Land Area</u>
Residential			
Services			
Manufacturing			
Resource Production			
			etc....

Sources of Information

(See Appendix I for addresses)

In many cases land uses may have already been inventoried by the town planning board, regional planning commission or as a part of a special study. The planning board probably inventoried land uses in preparing a comprehensive plan for the town. In some cases comprehensive plans are prepared for the town by the regional planning commission or by a private consultant.

State Planning Office

Land use inventories have been completed for coastal communities through the Coastal Zone Management Program administered by the State Planning Office.

A useful guide to land use classification is the "Standard Classification System for Land Use Coding in Maine", also available from the State Planning Office.

U. S. Agricultural Stabilization and Conservation Service/U. S. Soil Conservation Service

Agricultural land use information can often be obtained from the County Soil Conservation Service and the County Agricultural Stabilization and Conservation Service. These federal agencies maintain records on the number of acres in agricultural production and the type of livestock produced. They may also have aerial photography that can be helpful in locating various land uses.

VII. Evaluating The Inventory Results: The Land Use Review Map

What Is a Land Use Review Map?

The Land Use Review Map is a combination of the Natural Resources Summary Analysis Map and the Land Use Map. By combining the information on these maps it is possible to identify the opportunities and limitations (constraints) for land use activity within the community. The Land Use Map displays existing land use and the Natural Resources Summary Analysis Map displays areas where there may be limitations on land use activities. By combining this information it is possible to identify:

1. Existing Problem Areas
2. Areas That Should Be Preserved in Their Natural State
3. Areas That Need Special Treatment

To some extent subjective decisions will need to be made on how an area should be classified. Some areas such as wetlands, should obviously remain in their natural state. Other areas might be suitable for certain types of uses or providing special precautions are taken to eliminate or reduce environmental degradation. For example, a steep slope might be suitable for pastureland or a moderately steep slope might be suitable for residential use if soil erosion control measures are taken and adequate sewage disposal is available. The town may want to contact their regional planning commission or council of governments for assistance in determining how different areas should be treated.

It is important to re-emphasize that these maps and this analysis has been designed for general planning purposes. The maps will display areas where a major portion of an area has certain characteristics. This information is not a substitute for on-site inspections and, in some cases field testing, to determine the on-site capacity of an area to be used or treated in a certain way.

Existing Problem Areas

These are areas where there already is, or potentially is, a conflict between the existing land use activity and the natural environment. For example, existing problem areas might be where a home is built on a fragile shoreline where erosion of the shore threatens to undermine the structural integrity of the home, or where an old underground storage tank located over an aquifer that serves as the community's water supply.

Areas That Should Be Preserved in Their Natural State

These areas have been identified on the Natural Resources Summary Analysis Map and are those areas that have not already been altered from their natural state. Areas such as wetlands, slopes greater than 25 percent, and certain areas identified through the State's Critical Areas Program should be left largely undisturbed in their natural state.

Areas That Require Special Treatment

Some of the areas identified on the Natural Resources Summary Analysis Map may be suitable for certain land use activities if they are compatible with the natural environment or if precautions are taken to prevent environmental harm. For example, crop farming on a floodplain is a suitable activity as long as the shoreline remains well vegetated and undisturbed. Residential uses would be inappropriate on a floodplain but low density residential uses may be appropriate for an area of moderately sloping forestland. Slopes of 15 percent to 25 percent, areas with high water tables, or shallow depth and bedrock and smaller aquifers and wetlands might be included in this category.

Combining the Maps

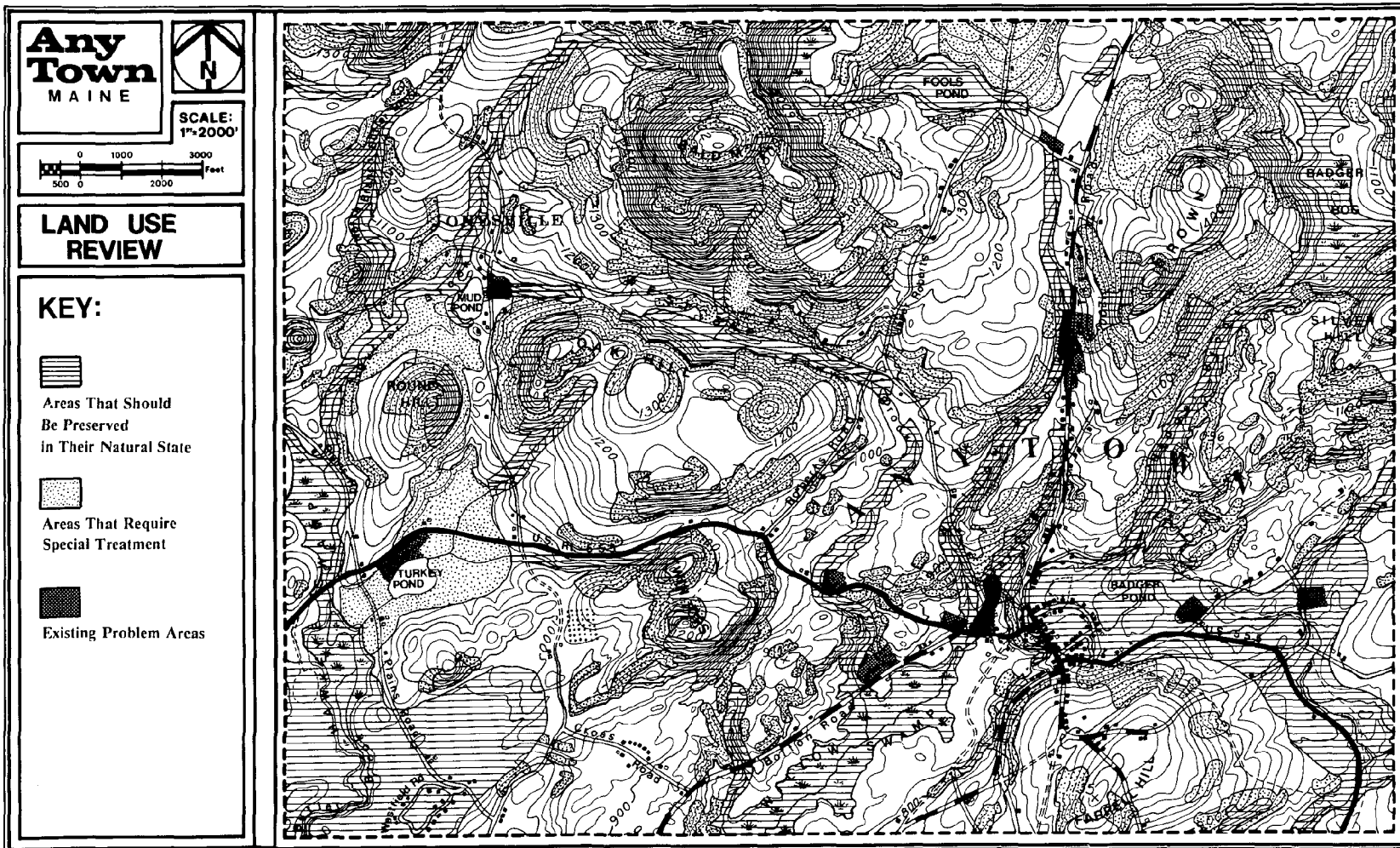
The Land Use Review Map can be made by combining the information from Natural Resources Summary Analysis Map and the Land Use Map. The information can either be transferred from both maps onto one map or they can be overlaid if the maps have been prepared on transparent materials. The result of combining the maps is a visual statement of the options.

Prepare a legend and title for this map. You may want to use various degrees of shading or different colors for each of the four categories. For example:

- (Color red) = Existing Problem Areas
- (Color green) = Areas That Should Be Preserved in a Natural State
- (Color yellow) = Areas That Require Special Treatment
- (Color white) = Other Areas

Narrative

The accompanying narrative should describe the Land Use Review Map and explain its purpose. The Narrative should also include definitions for each of the categories as well as descriptions of all of the major areas included in each category.



VIII. Using The Inventory Results

The Natural Resources Inventory is a vital component of community planning. It is an important part of the comprehensive plan and provides a foundation for regulatory and non-regulatory approaches to planning.

Comprehensive Planning

What is Comprehensive Planning?

Comprehensive planning includes all aspects of community growth and development, including land use, population characteristics, municipal services and education. It involves conducting research on the characteristics of the community (community profile, natural resources inventory, and municipal facilities and services), evaluating the data, establishing future goals and policies, and implementing measures designed to achieve those goals.

Comprehensive planning is a process, a process which must be continued over time, a process that

should reflect the changing desires of the public, and a process that's capable of assimilating more and new data as that data becomes available.

The comprehensive plan is a document that is the product of comprehensive planning. The plan helps a community guide growth in an orderly, constructive manner. It offers guidelines for community decision-makers that present coordinated policies for development, transportation, environmental protection, community facilities, and fiscal management. The plan document must constantly undergo change and refinement to reflect the comprehensive planning process and changing community demands.

Maine Law (Title 30 M.R.S.A. (4961) defines the comprehensive plan as follows:

4961. Comprehensive plan

1. Definitions. As used in this subchapter, unless the context otherwise indicates, the following terms have the following meanings.

A. "Comprehensive plan" means a compilation of policy statements, goals, standards, maps and pertinent data relative to the past, present and future trends of the municipality with respect to its population, housing, economics, social patterns, land use, water resources and their use, transportation facilities and public facilities prepared by

the municipal planning board, agency or office. The plan, being as much a process as a document capable of distribution, may at successive stages consist of data collected, preliminary plans, alternative action proposals and, finally, a comprehensive plan to be adopted. In its final stages, it may consist of a series of subsidiary but interrelated plans such as, but not limited to, a water and sewage system plan, a land use plan, a shoreland management plan that considers functionally water-dependent uses and public access to and use of the shoreline, a community facilities plan, a transportation plan, an urban renewal or rehabilitation plan, an air or water pollution control plan and a park and open space plan. The comprehensive plan shall include recommendations for plan execution and implementation such as, but not limited to, planned unit development, site plan approval, transfer of development rights, open space zoning, clustered development, conditional zoning, contract zoning and zoning to protect access to direct sunlight for solar energy use.

B. "Functionally water-dependent uses" means those uses that require, for their primary purpose, location on submerged lands or that require direct access to, or location in, coastal waters and which therefore cannot be located away from these waters. These uses include but are not limited to, commercial and recreational fishing and boating facilities, finfish and shellfish processing, storage and retail and wholesale marketing facilities, dock and port facilities, shipyards and boat building facilities, marinas, navigation aides, basins and channels, industrial uses dependent upon water-borne transportation or requiring large volumes of cooling or processing water that cannot reasonably be located or operated at an inland site and uses which primarily provide general public access to marine or tidal waters.

2. Public participation. In the preparation of a comprehensive plan, the public shall be given an adequate opportunity to be heard.

The comprehensive plan isn't an ordinance and can't be used to regulate land use by itself. It only has regulatory bearing to the extent that it has information tied to a review standard in some ordinance or statute.

Why is Comprehensive Planning Important?

The comprehensive planning process enables citizens to collectively take charge of the destiny of their community. A well conceived comprehensive plan that's been developed with the involvement of the municipal officers, citizens, the planning board, and the conservation commission will help to insure a healthy community with a high quality of life.

Another significant reason for comprehensive planning is a statutory one. Maine law requires that a municipality's governing body adopt a comprehensive plan prior to the adoption of town-wide zoning. Maine law also requires that a comprehensive plan be prepared and adopted by the planning board prior to the adoption of shoreland zoning and subdivision controls in shoreland areas.

Such ordinances must be pursuant to and consistent with the comprehensive plan. The plan should show a general development scheme for the town; that the town has thought about a particular control; that it is fitted into some larger frame of reference; that it is not arbitrary or capricious; and that it has some legitimate purpose in achieving the public's health, safety and general welfare.

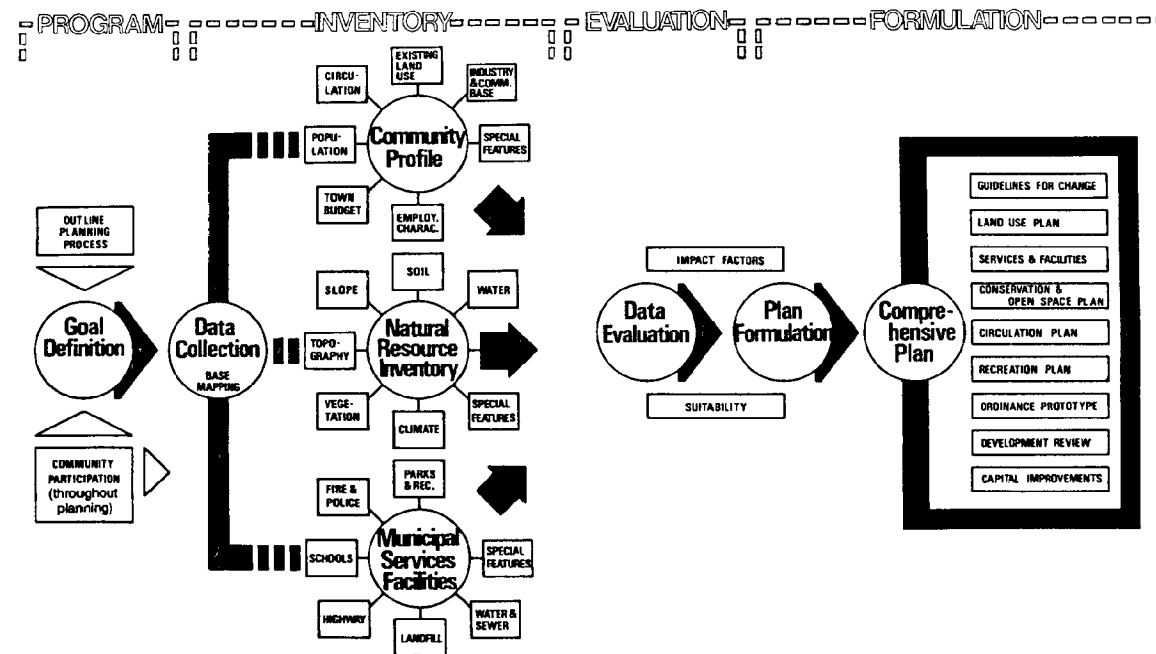
Comprehensive planning also has educational benefits. The preparation of a comprehensive plan helps people become more aware of the community and its assets and liabilities. Moreover, if planning is to have any real impact, the public must have an understanding of the dynamics of their community.

How Does a Natural Resources Inventory Fit Into the Comprehensive Planning Process?

A natural resources inventory is a key component of comprehensive planning. In some communities the preparation of a natural resources inventory may be the first step in the planning process.

The process of inventorying natural resources and then analyzing the information, as has been explained in this handbook, involves deciding what natural resource characteristics are relevant to land use planning, examining these characteristics with regard to existing land use and then making recommendations on the best future use for the land. The analysis makes it possible to identify areas requiring protection or special treatment, as well as existing problem areas.

As can be seen from Figure VIII-1 the natural resources inventory is but one portion of the comprehensive planning process. The community profile must be completed and municipal services and facilities must be inventoried and analyzed before an overall plan with recommended policies and goals can be made.



**Critical Path
for
Comprehensive
Community Planning**

Regulatory Approaches to Planning

What are Municipal Ordinances?

Municipal ordinances or regulations are laws enacted by the legislative body (i.e. town meeting or council) of a municipality. Municipal ordinances and regulations are tools for implementing the comprehensive plan.

Two state laws, the Mandatory Shoreland Zoning Act and the State Subdivision Law require that all municipalities administer and enforce shoreland zoning ordinances and subdivision ordinances that meet the state's mandated minimum requirements. These ordinances provide the sole basis for review of development proposals in many of the smaller Maine communities.

There are other types of ordinances which are "local option" land use controls such as town-wide zoning, floodplain management ordinances, site plan review ordinances, and wetlands and aquifer protection ordinances. All of these ordinances deal with the protection of natural resources. Appendix 3 contains a listing of municipal ordinances that contain provisions to protect natural resources.

Why Are Municipal Ordinances Important?

Municipal ordinances enable citizens to collectively control the future of their community. By devising rules and regulations governing land use the community can control the

quality of life by maintaining the health, safety and welfare of its citizens.

What a person does with his/her property can affect neighbors and the community as a whole. For example, salt piles, underground fuel or chemical storage tanks, or landfills should not be placed over a vulnerable aquifer or a community's water supply, because of the threat to ground water. A community can maintain its character and protect its natural resources through municipal ordinances.

How Does the Natural Resources Inventory Relate to Municipal Ordinances?

The purpose of the shoreland zoning and subdivision laws is to control development occurring in shoreland areas and to eliminate or minimize the adverse environmental impacts of subdivision development. The effectiveness of these laws depends in large part on whether the municipality's decision-making board has sufficient natural resources information available when reviewing development applications.

The Mandatory Shoreland Zoning Act requires that municipal shoreland zoning ordinances must be "pursuant to and consistent with a comprehensive plan". While most towns and cities have shoreland zoning ordinances, some either have not prepared a comprehensive plan to support their ordinance or have prepared a plan that does not conform to the statutory definition of a comprehensive plan. Consequently, if a developer or landowner violates the provisions of a shoreland zoning ordinance and the municipality initiates legal action seeking a court order to stop the violation, it is possible that the municipality's lawsuit would not be successful. If the ordinance is held to be unenforceable because it did not conform to a comprehensive plan as defined in the statutes, the

proposed use could occur without local review under the shoreland zoning ordinance.

The lack of a comprehensive plan also hampers a municipality's ability to evaluate subdivision applications effectively. The Municipal Subdivision Law requires review of proposed subdivisions by all municipalities and specifically authorizes planning boards, in reviewing a proposed subdivision, to determine that the subdivision "(i)s in conformance with a duly adopted subdivision regulation or ordinance (or) comprehensive plan, ...if any..."

The board is also required to make findings about the environmental impact of a subdivision which are related to the natural resources data generally included in a comprehensive plan. If the municipality has prepared and adopted a comprehensive plan which has catalogued such information as the nature and extent of its community and natural resources, the planning board is better equipped to conduct a meaningful review of the project using all of the statutory subdivision guidelines because data is available to help the board interpret those guidelines. The board is also in a better position to know what conditions it should impose in approving a project in order to protect the environment. Those conditions are more likely to be sustained by a court, if challenged, if they can be supported by data on natural resources in the comprehensive plan.

"Local Option" Land Use Ordinances

A natural resources inventory provides valuable environmental information to support additional local land use ordinances that communities may wish to adopt. Local regulations governing the use of prime agricultural lands, fresh water wetlands, aquifer recharge areas, floodplains, and other ordinances, such as

town-wide zoning and site plan review ordinances, enable towns to review projects which do not fall within the scope of the Subdivision Law or Shoreland Zoning Act.

Towns that adopt these types of local option ordinances, in many cases, must have comprehensive plans. A comprehensive plan is legally necessary for town-wide zoning and some courts have held that other land use ordinances, such as minimum lot size and site plan review ordinances, fall within the definition of zoning and, therefore, require a comprehensive plan. Zoning is defined as "...the division of a municipality into districts and the prescription and reasonable application of different regulations in each district, (30 M.R.S.A. 4962)."

The natural resources inventory, as a part of the comprehensive plan should provide the information necessary to support the designation of districts and prescription of regulation for those districts. For example, the boundaries of wetlands and aquifers identified through the natural resources inventory should correspond with the appropriate district within the zoning ordinance.

Additionally the natural resources inventory also helps ensure that decisions made by a local planning board, under these ordinances, are legally sound and that decisions to deny an application or to approve it with conditions can be justified.

Non-regulatory Approaches to Planning

What Are Non-regulatory approaches to Planning?

Ordinances are not the only method of influencing land use. There are a number of non-regulatory approaches such as municipal policies and expenditures (i.e. land acquisition, capital improvements program) and landowner options (i.e. conservation easements, deed restrictions, etc.)

Municipalities can control land use by outright purchase of land, or less than fee simple purchase, such as the purchase of a conservation easement. Land banking is a form of public acquisition where a town purchases property outright and then inserts deed restrictions limiting future uses prior to reselling the property, or leases the land to a user, such as a farmer.

Municipalities can guide future land use through their capital improvements program. Roads, sewers and waterlines can be improved and extended in areas where a town wishes to encourage development.

Communities can also work to influence land use by encouraging private landowners to protect their property. Landowners have numerous options to legally control what happens to their land when they no longer own it. The various approaches

include conservation easements and deed restrictions, which are restrictions attached to a property, mutual covenants, which are agreements between neighboring land owners, and outright donation to a conservation organization, the municipality or some other appropriate group.

Citizens in some communities have banded together to establish land trusts. Land trusts are nonprofit organizations devoted to protecting and preserving land. Land trusts usually hold land or easements for a variety of conservation purposes.

Why Are Non-regulatory Approaches Important?

Generally, a combination of carefully conceived land use management techniques, both regulatory and non-regulatory, is most effective for controlling and guiding land use. The use of many different techniques allows more flexibility and creativity and therefore assures greater success in achieving the desired results.

How Does the Natural Resources Inventory Relate to Non-regulatory Approaches?

The natural resources inventory can be used to identify areas of importance to the community. The locations of natural resources and environmental constraints are major considerations in planning capital improvements. For example, roads, sewer and water lines should be placed in areas with soils, drainage and slopes suitable for development.

Additionally, a municipality can use the natural resources inventory to identify areas to be acquired for recreation, conservation and educational purposes. The natural resources inventory can also be used to identify landowners that should be encouraged to protect their land.

Limitations of the Natural Resources Inventory

The natural resources inventory, as described in this handbook, has its limitations. For example, while the inventory maps are at a scale that is useful for community planning, they are not accurate enough to show site-specific characteristics. Government generated maps, such as the soils maps and sand and gravel aquifer maps, are examples of generalized maps.

Furthermore, it is often too expensive for towns to perform mapping that would be accurate enough for site-planning. State imposed ordinances and regulations and some towns' ordinances clearly place the burden of proof on the developer. Thus, if there is any question as to the suitability of a site for a use, the developer is responsible for hiring experts to do site investigations to prove that a site is suitable for the proposed use. Other towns have enacted ordinances that allow the town to charge a fee to pay for any necessary site-investigations. Appendix 4 contains a "legal brief" that explains the ability of towns to charge application fees to cover the cost of experts and includes two sample ordinance provisions.

Sources of Information

(See appendix 1 for addresses)

State Planning Office

The State Planning Office distributes a wide variety of planning and land use publications and

provides technical assistance on land use planning including growth management and floodplain management.

The Critical Areas Program identifies areas of special significance to Maine's natural heritage. Designation as a Critical Area is non-regulatory and advisory. The Program does not own land, but it cooperates with other organizations in efforts to protect the unique natural heritage of Maine. Its professional staff can provide assistance to landowners interested in assessing the ecological significance of their properties.

Regional Planning Commissions or Councils of Government

Regional Planning Commissions and Councils of Government provide technical planning assistance to member communities. Assistance can include help in drafting and revising ordinances, and in reviewing development proposals.

Maine Municipal Association

The Maine Municipal Association provides limited legal assistance to member communities. Assistance can include (1) providing sample ordinances and comprehensive plans and (2) reviewing and commenting on ordinances and comprehensive plans drafted by towns.

Department of Conservation

The Bureau of Parks and Recreation acquires land for public parks and memorials. In some instances it will consider accepting donations of land and conservation easements if the means to manage the land or oversee the easements are available and if the public benefit of such gifts is clear.

The Bureau of Public Lands manages public lands owned by the State of Maine and not administered by other state agencies. These lands primarily include multiple-use forest lands in western and northern Maine. Along the coast, the Bureau manages a number of small islands and ledges. In general, it is interested in acquiring land that has minimal management costs.

Department of Inland Fisheries and Wildlife (IF&W)

The Department acquires land for inclusion in its statewide system of wildlife management areas and other lands that protect important wildlife habitat. It has accepted conservation easements on undeveloped shorelands, wetlands used by wildlife, large upland areas, and other parcels that are of particular value to wildlife or for hunting and fishing.

The Nature Conservancy Maine Chapter

The Nature Conservancy acquires land and easements in order to protect rare or threatened species and to preserve natural diversity. It also acquires property for transfer to other conservation agencies or to sell with appropriate restrictions. Conservancy staff is available to consult with landowners regarding the preservation of natural areas.

The Conservancy's Maine Natural Heritage Program maintains a comprehensive data base of the locations of rare species and exemplary natural communities in Maine. The data base is both mapped and computerized for quick and accurate analysis. In addition to rare species and communities, the Heritage Program data base contains locations and information on natural areas managed by public and private organizations. Heritage Program staff can provide site-specific

rare species data and technical assistance in natural resources inventory planning and interpretation.

Maine Coast Heritage Trust

The Maine Coast Heritage Trust promotes conservation of the islands and coastline of Maine by holding interest in land and by negotiating gifts of land and easements to other conservation organizations.

The Trust offers professional advice and assistance, generally free of charge, to landowners, land trusts, municipalities, and other agencies interested in protecting Maine's coastal landscape.

Appendix 1

Public and Private Agencies

Regional Agencies

Regional agencies include regional planning commissions or councils of government, soil and water conservation districts, the soil conservation service, and the Cooperative Extension Service of the University of Maine.

1. **Regional Planning Commission(RPC)/Council of Governments(COG)**. These regional agencies are designed to serve in an advisory capacity to local planning boards, and in some cases, conservation commissions. Mapping facilities, project review, shoreland zoning procedures, planning assistance, comprehensive plan and natural resource inventory assistance, flood-plain information, open space and recreation planning, and subdivision regulations are only a few of the many services available to member municipalities. (Non-member communities may be able to obtain assistance for a fee.)

Androscoggin Valley COG, 70 Court Street, Auburn, ME 04210	Tel: 783-9186
Greater Portland COG, 233 Oxford Street, Portland, ME 04101	Tel: 774-9891
Hancock County RPC, 69 Main Street, Ellsworth, ME 04605	Tel: 667-7131
Eastern Mid Coast RPC, 9 Water Street, Rockland, ME 04841	Tel: 594-2299
North Kennebec RPC, 7 Benton Avenue, Winslow, ME 04902	Tel: 873-0711
Northern Maine RPC, P. O. Box 779, Caribou, ME 04736	Tel: 498-8736
Eastern Maine Development Corporation, Penobscot Valley RPC 10 Franklin Street, Bangor, ME 04401	Tel: 942-6389
Southern Kennebec Valley Planning & Development Council, 125 State Street, Augusta, Maine 04330	Tel: 622-7146
Southern Maine RPC, Box Q, 2 School Street, Sanford, ME 04073	Tel: 324-2952
Washington County RPC, 63 Main Street, Machias, ME 04654	Tel: 255-8686

(Please note - There is not a regional agency for the southern mid-coast region; however, efforts are under way to establish one by 1988. In the meantime, local officials in the area should feel free to contact the Community Assistance Division of the Office of Community and Economic Development (289-3154)

2. **Cooperative Extension Service**. The Cooperative Extension Service is a part of the University of Maine at Orono. Its function is to help Maine People improve their economic and social conditions through its informal educational programs. This is done through technical field assistance and publishing a wide variety of educational materials.

There are offices of Cooperative Extension serving every county in Maine, with specialized staff based primarily at the University of Maine at Orono.

Androscoggin/Sagadahoc - 277 Minot Ave., Lewiston, Me. 04210	Tel. 786-0376
Aroostook - 23 Pleasant St., Fort Kent - 04743 (Northern)	Tel. 834-3905
Aroostook State Farm, Presque Isle - 04769 (Central)	Tel. 764-3361
Central Building, P.O. Box 8, Houlton - 04830 (Southern)	Tel. 532-6548
Cumberland - 96 Falmouth St., Portland - 04103	Tel. 780-4205
Franklin - 78 Main Street, Farmington - 04938	Tel. 778-4650
Hancock - RFD #5, Boggy Brook Road, Ellsworth - 04605	Tel. 667-8212
Kennebec - 125 State St., Augusta - 04330	Tel. 622-7546
Knox-Lincoln - 375 Main St., Rockland - 04841	Tel. 594-2104
Oxford - RFD #2, Box 1735, South Paris - 04281	Tel. 743-6329
Penobscot - Court House Annex, Bangor - 04401	Tel. 942-7396
Piscataquis - Court House Complex, Dover-Foxcroft - 04426	Tel. 564-3301
Somerset - P. O. Box 98, Skowhegan - 04976	Tel. 474-9622
Waldo - RFD #1, Box 83, Belfast - 04915	Tel. 338-1651
Washington - 5 Cooper St., Machias - 04654	Tel. 255-3345
York - Court House Annex, Alfred - 04002	Tel. 324-2814

3. See later subsections for discussions of Soil Conservation Service and Soil and Water Conservation District.

State Agencies

At the State level there are many agencies concerned with different aspects of the environment and natural resources.

1. **Department of Conservation**. State House Station 22, Augusta, Maine 04333 (Parks and Recreation is Station 19).

The following Bureaus are incorporated in this Department:

Bureau of Parks and Recreation (289-3821)
Bureau of Forestry (289-2791)
Bureau of Public Lands (289-3061)
Bureau of Geology (289-2801)
Land Use Regulation Commission (289-2631)

A) **Bureau of Parks and Recreation**. The Bureau administers monies under the Land and Water Conservation Fund and can supply information on this 50% reimbursement program, as well as copies of guidelines for the program. The Bureau also has information on State Parks and Recreation Areas.

B) Bureau of Forestry. The Bureau can supply information on woodlot management, tree farming, town forests, and shade tree insect and disease problems. The Bureau has also developed a "Forest Harvest Model Ordinance" for municipalities.

C) Bureau of Public Lands. The Bureau has charge of managing the State's public lots and the Coastal Islands Registry, among other things.

D) Bureau of Geology. The Bureau, through the Maine Geological Survey, does topographical maps and maps related to surficial and bedrock geology, aquifers and wetlands. U.S. Fish and Wildlife Service Wetlands Maps are also available through this Bureau.

E) Land Use Regulation Commission. The Land Use Regulation Commission (LURC) has responsibility for planning and zoning the unorganized territories of the State.

F) Special Programs. The Maine Conservation Corps is available to provide assistance on projects to improve public property (i.e. hiking trail construction, timber stand management, erosion control, park improvements, etc.) The Maine Rivers Fund Program provides grants to communities for river management and improvement projects. The Serve Maine Volunteers Program places volunteers and interns in public conservation projects throughout the State. These programs are managed through the Commissioner's Office of the Department (289-2211).

2. Department of Environmental Protection. Address: State House Station 17, Augusta, Maine 04333 (Tel. 1-800-452-1942).

Bureau of Air Quality Control (Tel. 289-2437)
Bureau of Land Quality Control (Tel. 289-2111)
Bureau of Water Quality Control (Tel. 289-3355)
Bureau of Oil and Hazardous Materials Control (Tel. 289-2651)

These Bureaus are responsible for administration and enforcement of the Coastal Wetlands Act; Site Location Act; Great Ponds Act; Hazardous Waste, Septage, and Solid Waste Management Act; Protection of Waters Act; Protection of Air Act; Mandatory Shoreland Zoning Act; Stream Alteration Act; Sand Dunes Act; Great Ponds Act; and Oil Discharge Prevention and Pollution Control Act. Information explaining each of these laws are available from DEP's Augusta office.

The Lakes Division of the Water Quality Bureau has organized a program for monitoring the water quality of many lakes around the State through its Volunteer Monitoring Program.

The Water Bureau's geologists are available to assist towns in assessing the impacts of development on ground water resources.

The DEP also has a monthly periodical, ENVIRON-NEWS, which can be received at no cost, on request.

3. Department of Inland Fisheries and Wildlife. Address: State House Station 41, Augusta, Maine 04333 (Tel. 289-2871)

This Department has a network of wardens throughout the state who help enforce fish and game laws and water safety laws. A list of wardens is available from the Department. The Department's regional fish and wildlife biologists are extremely knowledgeable and generally are willing to provide natural resource information to towns. The addresses and phone numbers of the regional offices are available at the Department.

4. Department of Marine Resources. Address: State House Station 21, Augusta, Maine 04333 (Tel. 289-2291).

This Department enforces laws governing the coastal waters and the tidal wetlands of the state. There are wardens all along the coast who have power to summons violators of marine and marine fishing laws, as well as the Coastal Wetlands Law. A list of wardens is available from the Department. The Department also has area biologists who can provide information on marine resources. In addition, the Department oversees local shellfish conservation programs and is empowered to lease underwater areas for aquaculture.

5. Department of Agriculture, Food, and Rural Resources. Address: State House Station 28, Augusta, Maine 04333 (Tel. 289-3803).

A. Farmland Preservation. The Department has information about farmland preservation and soils best suited to agricultural use.

B. Soil and Water Conservation Commission. (Tel. 289-2666). The Soil and Water Conservation Commission (SWCC) and its executive director are under the Department of Agriculture. The SWCC is advisor to the County Soil and Water Conservation Districts (SWCD). The SWCC helps SWCDs with their programs, reviews and testifies on development plans, has information on flood plains, flood control practices, soils, erosion and sediment control. The SWCD is a regional unit of state government which establishes priorities for the County Soil Conservation Service (SCS) staff, located in the same office as the SWCD.

County Soil Survey Reports and other basic information regarding soil suitability and limitations can be obtained from the nearest SCS office, including technical plans, soils maps, standards information, and field assistance regarding soil, water and related natural resources management.

SCS and SWCD Offices

Androscoggin Valley SWCD
1 Great Falls Plaza
Auburn, Maine 04210
Tel. 783-9196 (Includes Androscoggin and Sagadahoc Counties)

Cumberland County SWCD
587 Spring Street
Westbrook, Maine 04092
Tel. 856-6108

Central Aroostook SWCD
Aroostook Ag Center Building
744 Main Street
Presque Isle, Maine 04769
Tel. 764-4153

Franklin County SWCD
2 Park Street
Farmington, Maine 04938
Tel. 778-4767

Hancock County SWCD
41 Main Street
Ellsworth, Maine 04605
Tel. 667-8663

Kennebec County SWCD
Federal Building, Room 408-C
Augusta, Maine 04330
Tel. 622-8250

Knox-Lincoln SWCD
RR 1 Box 15
Waldoboro, Maine 04572
Tel. 832-4292

Oxford County SWCD
1 Main Street
South Paris, Maine 04281
Tel. 743-7019

Penobscot County SWCD
89 Hillside Avenue
Bangor, Maine 04401
Tel. 97-6622

Piscataquis County SWCD
58 Union Square
Dover Foxcroft, ME 04426
Tel. 564-2321

St. John Valley SWCD
16 Market Street
Fort Kent, Maine 04743
Tel. 834-3311

Somerset County SWCD
7 High Street
Skowhegan, Maine 04976
Tel. 474-8324

Southern Aroostook SWCD
RR #3 Box 45
Houlton, Maine 04730
Tel. 532-2087

Waldo County SWCD
66 Anderson Street
Belfast, Maine 04915
Tel. 338-2320

Washington County SWCD
Federal Building
Machias, Maine 04654
Tel. 255-3995

York County SWCD
P.O. Box 392
Sanford, ME 04073
Tel. 324-7015

6. **State Planning Office.** Address: State House Station 38, Augusta, Maine 04333 (Tel. 289-3154 or 289-3261)

In addition to distributing a wide variety of planning and land use publications, the Office provides technical assistance relating to comprehensive planning, growth management, ground water, and flood hazard maps and ordinances. It also oversees the State Coastal Program and administers the State's Critical Areas Program.

7. **Department of Human Services.** Address: State House Station 11, Augusta, Maine 04333 (Tel. 289-3826)

The Division of Health Engineering in the Department's Bureau of Health is responsible for all aspects of the State Plumbing Code as well as health and safety programs, water programs, drinking water, and waste water. Its staff provides technical assistance by telephone and letter.

8. **Department of Transportation.** Address: State House Station 16, Augusta, Maine 04333 (Tel. 289-2551).

The Department oversees the State "Billboard Law" and works with towns and cities in the development of sign ordinances. It promulgates regulations regarding screening for junkyards. It also has information on its roadside spraying program.

The Department's Special Services Division publishes minor civil division maps and county general highway maps.

9. **Bureau of Taxation, Department of Finance and Administration.** Address: State House Station 78, Augusta, Maine 04333 (Tel. 289-2011).

The Bureau provides bulletins explaining many property tax laws, including the Farm and Open Space Tax Law and Tree Growth Tax Law.

10. **Maine Historic Preservation Commission.** Address: State House Station 65, Augusta, Maine 04333 (Tel. 289-2139).

The Commission assists groups to preserve the architectural, historic and environmental heritage of the people of Maine, and to promote the cultural, educational and economic benefits of these historic resources. Among other responsibilities, the Commission assists local groups with conducting surveys of community historic resources.

11. **Land and Water Resources Institute, University of Maine at Orono.** Address: University of Maine, Orono, Maine 04473. Tel. 581-1490

A wide range of environmental information is available from this office.

Federal Agencies

1. **Environmental Protection Agency (Region 1 Office).** Address: John F. Kennedy Federal Building, Boston, Massachusetts 02203.

This regional office of the federal agency covers the six New England states. It has responsibility for administering federal air and water pollution control laws, and is also involved in a number of other environmental areas such as hazardous waste and hazardous materials.

Towns can receive the monthly periodical of the Region 1 office at no cost. Write to Director, Public Affairs Office, US EPA Region 1, JFK Federal Building, Boston, MA 02203.

2. **Resource Conservation and Development Projects.** These federally funded regional projects offer low cost loans, technical assistance and, in certain instances, outright funding for local or regional projects.

Any community in York, Cumberland or Oxford counties can get more information by contacting "Threshold to Maine", RC&D Project, 587 Spring Street, Westbrook, Maine 04092 Tel. 856-6109

In the mid-coast area, including parts of Waldo, Knox, Lincoln and Sagadahoc counties contact the "Time and Tide" RC&D Project, Route #1, Waldoboro, Maine 04572 Tel. 832-5348

In Washington and Hancock counties, contact the "Downeast" RC&D Project, Tenaco Building, Route 182, Cherryfield, Maine 04622 Tel. 546-2368

In Northern Maine, contact the St. John-Aroostook RC&D Project, Ballard Building, Presque Isle, Maine 04769 Tel. 764-4126

3. Department of the Interior, Fish and Wildlife Service. Address: One Gateway Center, Suite 700, Newton Corner, Massachusetts 02158.

The Service acquires land for wildlife habitat to be included in National Wildlife Refuges. The Agency's refuges include: Petit Manan N.W.R.; Rachel Carson N.W.R.; Moosehorn N.W.R.; Pond Island N.W.R.; Franklin Island N.W.R.; Seal Island N.W.R.; and Carlton Pond Waterfowl Production Area.

4. Department of the Interior, Geological Survey Water Resources. Address: 26 Ganneston Drive, Augusta, Maine 04330. Tel. 622-8201.

The Survey collects surface water resources data on water quality and stream flows. They also conduct water quality investigations and modeling studies on sand and general aquifers.

5. Federal Emergency Management Agency. Address: Office of Federal Insurance and Hazard Mitigation, Boston, Massachusetts (Tel. 1-617-223-2617) or Washington, D.C. (Tel. 1-800-424-8872).

This Agency administers the federal flood insurance program. It assists local officials with the interpretation of local flood hazard ordinances, with the amendment of those ordinances, and with interpreting and changing boundaries on local flood hazard maps.

6. U.S. Army Corps of Engineers. Address: Regulatory Branch, New England Division, 424 Trapelo Road, Waltham, Massachusetts 02154 (Tel. 1-800-343-4789).

The Corps administers the Clean Water Act of 1977, Section 404 (33 USC section 1344) which requires a permit for most activities involving the discharge of dredge or fill material into certain tidal and non-tidal waters and adjacent wetlands. Augusta Office, Federal Building, 40 Western Avenue, Augusta, Maine 04330 (Tel. 622-8246)

Private Environmental Organizations

There are many private environmental organizations in the State. Some work at the state level, some at the regional level, and some at the local level. Certain statewide and regional organizations are listed below. In addition, the Land and Water Resources Institute at Orono (581-1490) publishes a "Directory of Natural Resources Organizations".

1. Maine Association of Conservation Commissions.

MACC is a non-profit corporation dedicated to helping municipalities establish strong, active conservation commissions and to providing a technical support system for commissions.

2. Maine Coast Heritage Trust. Address: Box 120, U.S. Route 1, Falmouth, Maine 04105 (Tel. 781-3157); Summit Road, Northeast Harbor, ME 04662.

This is the primary organization dealing with the conservation easement as a tool for the protection of land. It also assists in the creation of local land trusts.

3. Congress of Lake Association. Address: 15 High Street, Winthrop, Maine 04364. (Tel. 377-2234)

COLA is principally concerned with the protection of Maine's lakes and ponds through lake associations, legislative action and agency cooperation.

4. Natural Resources Council of Maine. Address: 271 State Street, Augusta, Maine 04330 (Tel. 622-3101).

NRCM is a statewide membership organization which deals in major statewide and regional issues through legislative activity, testimony at State agency proceedings, public education, and lawsuits.

5. Maine Audubon Society. Address: Gilsland Farm Road, Falmouth, Maine 04105 (Tel. 781-2330).

Audubon is the oldest statewide environmental organization with interests in wildlife, wetlands, and energy conservation, among others.

6. The Nature Conservancy, Maine Chapter. Address: 20 Federal Street, Brunswick, Maine 04011 (Tel. 729-5181)

This is a state chapter of a national organization dedicated to the preservation of land for future generations.

7. Maine Municipal Association. Address: Community Drive, Augusta, Maine 04330. (Tel. 623-8428 or 1-800-452-8786).

MMA is a service organization for the municipalities of Maine. It offers a wide variety of services, including legal assistance, budgetary advice, ordinance review, and a monthly magazine called "The Maine Townsman". It represents municipalities during the legislative session and publishes a "Legislative Bulletin". Any town, city or plantation which pays membership dues can contact the MMA for advice and assistance.

8. Watershed Organizations. Watershed or river organizations have formed to protect most of the major rivers in Maine. There are active groups on the Salmon Falls, the Mousam, the Saco, the Kennebec, the Sheepscot, the Damariscotta, the Penobscot, and the Royal.

9. Land Trusts. Land conservation trusts are private, non-profit corporations formed at the local level. They can acquire and manage environmentally sensitive or unique parcels of land which otherwise might be developed. Maine Coast Heritage Trust has a list of these trusts.

10. Solid Waste. Maine Solid Waste Management and Recovery Association. Address: Maine Municipal Association, Community Drive, Augusta, Maine 04330. (Tel. 623-8428 or 1-800-452-8786).

This is a private organization formed as a means of sharing information on solid waste management and recovery techniques.

11. Miscellaneous. There are other statewide organizations, such as the Sierra Club (basically an outing group in Maine), the Maine Lung Association (air pollution - a specialty), the Conservation Education Foundation (runs the conservation school at Bryant Pond) and Maine Organic Farmers and Gardeners (promotes organic farming practices in Maine).

Registry of Deeds

Information on property ownership and boundaries of individual lots and information on land included on a subdivision plan should be available at the county Registry of Deeds, if the owner or developer has recorded that information. The staff at the Registry offices are usually very willing to answer questions.

Maine Legislature and State House

Law and Legislative Reference Library State House Station 43, Augusta, ME 04333	289-2648
Legislative Assistants Office State House Station 13, Augusta, ME 04333	289-2486
Legislative Finance Office State House Station 5, Augusta, ME 04333	289-2491
Legislative Research Office State House Station 7, Augusta, ME 04333	289-2101
Legislative Information	289-3021

Appendix 2

Annotated Bibliography

NOTE: To obtain copies of most publications see Appendix 1 for addresses and phone numbers.

FARMLAND

Agricultural Land Evaluation and Site Assessment System. U.S. Soil Conservation Service; (no date).

A locally customized planning methodology that can be used to determine the quality of land for agriculture based on soils, surrounding land uses, and other characteristics. The Soil Conservation Service staff can assist in conducting the evaluation and assessment.

FORESTS

A Handbook for Town Forests. Maine Association of Conservation Commissions; 1983.

An informative guide to the establishment and management of town forest properties.

The Forests of Maine, The Land and Water Resources Center, University of Maine at Orono, 1987.

A 12-page informational brochure that provides an overview of the general characteristics of Maine's forests.

Model Timber Harvesting Ordinance. Maine Forest Service, Department of Conservation; 1986.

Model municipal regulations designed to manage and control timber harvesting. This ordinance should be modified and adapted to fit circumstances in individual towns.

GROUND WATER

Ground Water Handbook for the State of Maine. Maine Geological Survey; 1978.

Provides an extensive amount of information on ground water and its characteristics in Maine.

Ground Water: Maine's Hidden Resource. Maine Association of Conservation Commissions; 1986.

An easy to read primer about ground water and its importance. Includes 2 "sample" ground water protection ordinance provisions.

Ground Water Quality: A Handbook for Community Action. Maine Association of Conservation Commissions; 1985

Provides a methodology for inventorying potential threats to ground water resources. Includes an extensive listing of land uses that may potentially threaten ground water quality.

Play it Safe With Ground Water, Maine's Ground Water, Private Wells, and Radon in Water and Air. Land and Water Resources Center, University of Maine at Orono; 1986, 1985, 1985, 1983 respectively.

Informative 8 to 12 page booklets. Maine's Ground Water provides an overview of the situation statewide. Private Wells, Play it Safe With Ground Water, and Radon in Water and Air provide more detailed information. (The publications are also available through County Extension Offices).

The Planning Process for Local Ground Water Protection (draft). Maine State Planning Office; 1986.

Sets forth a methodology for inventorying ground water and ground water threats, and outlines an approach for implementing ground water protection measures.

Model Aquifer Protection Ordinance. Southern Maine Regional Planning Commission; 1987.

Model ordinance that contains purpose, definitions, Permitted and Prohibited Uses, performance and dimensional standard and plan review submissions. This ordinance should be modified and adapted to fit circumstances in individual towns.

Suggested Amendments to Subdivision Review Standards to Protect Ground Water Resources. Southern Maine Regional Planning Commission; 1987.

Contains specific amendments that can be inserted into the Commission's model subdivision review standards.

Model Ordinances for Ground Water Protection. Rural New England, Inc (P.O. Box 786, Waldoboro, Maine 04572, tel: 207-832-6825); 1986.

Includes ground water protection strategy, hazardous material ordinance, zoning amendments, subdivision amendments and other regulations.

Underground Petroleum Storage Tanks: Local Regulation of a Ground Water Hazard. Conservation Law Foundation of New England, Inc. (3 Joy Street, Boston, MA 02108-1497); 1984.

Provides information on the scope of the problem, managing the risks, and on regulating underground petroleum storage tanks.

LAND USE PLANNING

Comprehensive Planning Guide for Local Planning Boards. Penobscot Valley Regional Planning Commission; 1976.

Provides a step-by-step process for developing a comprehensive plan. It's a useful guide for lay planners.

Growth Management Handbook. Greater Portland Council of Governments; 1987.

Contains information on the basic tools for growth management, innovative zoning techniques, non-regulatory methods, historic preservation and design review methods and moratoria.

Maine's Coastal Program: Core Laws and Their Administration. Maine State Planning Office; 1986.

Explains the state laws that govern coastal areas.

Maine Planning and Land Use Laws. Maine State Planning Office; 1986.

Contains excerpts from Maine statutes that are of particular concern to municipal planners. All planning boards and conservation commissions should have copies.

Model Subdivision Regulations for Maine Planning Boards. Southern Maine Regional Planning Commission; 1986.

Municipal Comprehensive Plan Document. Androscoggin Valley Council of Governments; 1986.

Outlines the comprehensive planning process; identifying goals, collecting and interpreting data, developing policy and adopting and implementing the plan.

MAPPING

Elements of Cartography. A.H. Robinson, R. Sali, and J. Morrison; Wiley, 1978.

A standard text on map making and design used extensively by students and teachers of cartography.

Planning Soft Ware Survey. Robert J. Lima; American Planning Association Planning Advisory Service; (Report Number 388, 1313 E. 60th Street, Chicago, IL 60637); July 1985.

This report provides detailed descriptions of microcomputer software designed specifically for inventory and planning purposes.

Standard Classification System for Land Use Coding in Maine. and Standard Classification System for Land Cover in Maine. Maine State Planning Office; 1978.

These two publications present and explain land use and land cover classific-

ation systems. By using common classification systems, groups and agencies can share and apply information.

NATURAL RESOURCES

GENERAL

All Land Is Not Created Equal, A Handbook for the Protection of Environmentally Sensitive Lands. Greater Portland Council of Governments; 1976.

Discusses the characteristics of sensitive lands and explains the various protection techniques.

Design With Nature. Ian L. McHarg; the American Museum of Natural History Press (Garden City, New York); 1971

A thought provoking discussion on how man can live and prosper without destroying the natural environment.

Performance Controls for Sensitive Lands. Thurow, Charles and Others; American Society of Planning Officials (1313 East Sixtieth Street, Chicago, IL 60637 Report Nos. 307, 308); 1977.

A practical guide for local administrators. Contains discussions on the importance of sensitive areas as well as ordinance provisions.

NATURAL RESOURCE INVENTORIES

An Ecological Characterization of Coastal Maine. U.S. Department of the Interior, Fish and Wildlife Service; 1980.

A coastal inventory of areas north and east of Cape Elizabeth. Includes: wetlands, land cover, geology, land use and fish and wildlife. The maps are at a scale of 1:24,000 or about 1 inch = 2 1/2 miles (available at Maine Association of Conservation Commissions' library).

The Land book. Office of Comprehensive Planning State of New Hampshire; (no date).

Provides a methodology for conducting a natural resources inventory and land use analysis.

OPEN SPACE

Open Space: What It Is, What It Can do, and How to Protect it. Strafford Regional Planning Commission, 1977. (Available at the libraries of the Southern Maine RPC and the Maine Association of Conservation Commissions.)

Identifies areas that should be maintained as open space and explains the various techniques for preserving them.

"Public and Private Options for Preserving Open Space." Maine Association of Conservation Commissions; 1987.

An informative brochure on the various municipal and landowner techniques for preserving open spaces.

SOIL

Environmental Quality Handbook: Erosion and Sedimentation Control. Soil and Water Conservation Commission, Department of Agriculture; (no date). (Also available from U.S. Soil and Water Conservation Service County Offices.)

Provides methods and techniques to control non-agricultural erosion and sedimentation that will be helpful to town officials, planners and developers.

SCENIC RESOURCES

Assessing the Impact of Development on Scenic Resources of the Hudson River. Carol Sondheimer and Paul Gobster; Scenic Hudson, Inc. (9 Vassar Street, Poughkeepsie, New York 12601, Tel: 914-473-4440); 1986.

Provides helpful information on how to deal with problems and issues affecting visual and scenic resources in a community.

The Cumulative Impact of Development: A Scenic Landscape Assessment of the Mousan River Watershed. Mary F. Droegge; Maine State Planning Office; 1987.

Sets forth a methodology for inventorying and analyzing scenic resources.

Scenic Lakes Character Evaluation in Maine's Unorganized Towns. Jody J. Jones; State Planning Office; 1986.

Provides a methodology and standards for evaluating and preserving the scenic character of lakes.

SURFACE WATER RESOURCES

Freshwater Wetlands of Maine. Maine Audubon Society; 1979.

An educational primer on the characteristics and importance of wetlands.

Guide to the Designation of Prime Wetlands in New Hampshire. New Hampshire Association of Conservation Commissions and Others; June 1983.

Provides a detailed methodology for mapping and regulating wetlands.

Protecting Your Coastal Wetlands: A Citizen's Guide to the Coastal Wetlands Act. Maine Department of Environmental Protection, 1983.

Explains the importance of coastal wetlands and contains the text of the Coastal Wetlands Act.

Protecting Your Lakes, A Citizen's Guide to the Great Ponds Act. Maine Department of Environmental Protection; 1981.

Explains the lake environment, lake sensitivity to various land uses, and the Great Ponds Act.

Wetland Plants of the State of Maine. U.S. Fish and Wildlife Service, Department of Interior; 1986.

A manual on identifying wetland plants that is helpful for delineating wetland areas.

VOLUNTARY LAND PROTECTION

The Landowner's Options: A Guide to the Voluntary Protection of Land in Maine. Milne, Janet E., State Planning Office, The Nature Conservancy, Maine Coast Heritage Trust; 1985.

An excellent booklet on the many methods that a land owner can use to protect his land. Also discusses land trusts.

WILDLIFE

The Cumulative Impacts of Development: Important Wildlife Areas in Southern Maine. Jody Jones; State Planning Office; 1986

Contains helpful information on protecting important wildlife habitat including the identification of the sensitivity of critical wildlife to disturbance and recommended land use practices to protect habitats.

The Penobscot Bay Conservation Plan. Susan Woodward, Alan Hutchinson and Mark McCullough, Endangered and Nongame Wildlife Project, Maine Department of Inland Fisheries and Wildlife; December 1986

Identifies and maps 230 coastal wildlife concentration areas within the Penobscot Bay Area. The areas are classified into Class A, B and C habitats and include specific management guidelines. IF & W is continuing the work for other coastal areas. Available through IF&W and SPO.

Appendix 3

Municipal Ordinances with Natural Resource Provisions

This table lists municipal ordinances with provisions to protect natural resources. It is often helpful to review ordinances from other towns when drafting a new ordinance. Copies of these ordinances and others can be obtained from regional planning commissions, councils of government, the Maine Municipal Association, Maine State Planning Office or the towns, themselves.

Assistance in preparing ordinances can be obtained from all of the organizations listed above as well as private consultants.

Resource	Municipality	Ordinance	Section	Provisions
Aquifers	Freeport	Zoning	Rural Residential III	Permitted, Conditional and Prohibited Uses; Space Standards
Aquifers	Gray	Zoning	Aquifer Protection District Sec. 402.25	Permitted and Conditional Uses, Prohibited Activities and Space Standards
			Village Aquifer Protection District	" "
Aquifers	Kennebunk	Zoning	Branch Brook Aquifer Protection District Sec. 3.13 & 5.14	Definitions; Permitted, Prohibited and Permitted as Exception Uses; Performance Standards; Administration and Enforcement; Submissions and Non-conformities
Aquifers	Lisbon	Zoning	Ground Water Protection Overlay Zone Sec. 15-409	Delineation of Zones; Permitted, Conditional and Prohibited Uses; Dimensional Requirements
Farmland/ Open Space	Auburn	Zoning	Agriculture & Resource Protection District Sec. 3.31	Permitted Uses, Special Exceptions, Dimensional Requirements

Resource	Municipality	Ordinance	Section	Provisions
Farmland/ Open Space	Gorham	Zoning	Building Permit System - Sec. III Rural District Sec. VIII	Permitted Uses, Special Exceptions, Space Standards, Rural and Land Management System (based on land suitability for septic systems)
Open Space	Cape Elizabeth	Zoning	Transferable Development Rights Sec. 19-3-11, Cluster Sec. 19-3-12 and 19-3-13	Transfer Zone Maps, Easement Reservation Provisions, Cluster Provisions, Subsidized Housing Density Bonus
Open Space	Hampden	Zoning	Cluster Housing Sec. 4.6	Minimum Standards, Density Bonus, Rules Governing Home Owners Associations or Open Space Trusts
Open Space	Kennebunk	Zoning	Cluster Zoning Amendments (6/23/87 draft Sec. 4.1, Secs 5.1, 5.2, 5.3, 6.14	Definitions (includes wetland zones), Performance Standards, Design Standards, Approval Process
Open Space	South Berwick	Zoning	Cluster Article 4	Performance Standards Based on Soils
Open Space	Wells	Zoning	Transferable Development Rights Chapter 138 (1987 Draft)	Eligibility, Easements, Dimensional Standards, Permitted Uses, Design Review and Maintenance
Resource Protection (Shoreland, Wildlife, Flood Hazard, Wetlands)	Brunswick	Zoning	Natural Resource Protection Zone Sec. 403	Permitted and Special Exception Uses, Performance Standards, Special Shoreland Requirements
Watershed	China	Zoning	Control of Phosphorus in Stormwater Runoff Guidelines and Procedures Sec. 11.E	Phosphorus Treatment, Required Controls, Treatment System Guidelines

Resource	Municipality	Ordinance	Section	Provisions
Watershed	York	Zoning	Watershed Protection Overlay District	Permitted and Prohibited Uses, Performance Standards, Required Submissions
Wetlands	Cape Elizabeth	Zoning	Regulation of Wetlands Alterations	Wetland Zones including Buffer Zones; Interpretation of Boundaries, Permitted, Prohibited and Special Permit Uses; Submissions; Standards; Conditions Attached to Special Permits
Wetlands	Kennebunk	Zoning	Inland Wetland Resource Protection District (overlay district) Sec.3.12 (district def.) Sec. 5.12	Permitted and Prohibited Uses, Setback and Dimensional Requirements, Performance Standards, Wetland Permit Board
Wetlands	Lebanon	Wetlands Conservation Ordinance	Not applicable	Determination of Wetlands, Permitted and Prohibited Uses, Performance Standards, Permit Procedure and Review Standards
Wildlife	York	Zoning	Shoreland Zoning District - overlay zone (1987 draft revisions)	Extent of Zone (330 ft corridor), Subdistricts - Permitted and Prohibited Uses, Land Use Standards, Conservation Commission Review

Appendix 4

Legal Brief on Application Fees

Application Fees

Question: Our Town only charges \$2.00 for a permit fee under our zoning ordinance and \$10 per lot for a subdivision application under our subdivision ordinance. The planning board often feels the need for clerical assistance and an opportunity to consult with experts, such as an engineer, hydrogeologist, or land use planner, in reviewing applications under these ordinances because of the paperwork involved and the technical decisions that they must make. However, the town does not appropriate money for the planning board to pay for these services. Can these costs be passed along to the applicant?

Answer: Yes, within reason. The Maine Supreme Court has held that: "generally the amount of a fee imposed by a municipality in the exercise of its police powers for the purpose of regulation must be reasonably related to the necessary or probable expenses of issuing a (permit) and of conducting such inspection, regulation, and supervision as may be lawful and necessary. (emphasis added). State v. Brown, 135 Me. 36, 188 A.713 (1937). Where the purpose of the fee is to regulate and control an activity rather than to raise revenue, the amount exacted constitutes a fee rather than a tax, even though the fee is in excess of the town's actual administrative costs. However, if the fee is greatly in excess of the probable amount of administrative costs associated with the permit, the amount collected is deemed to be a tax. Corpus Juris Secundum, "Licenses", § 3. Since a municipality may collect taxes only where specifically authorized by the Legislature, such a tax would be improper. Cf. Opinion of the Justices, 141 Me. 442, 42 A.2d 47 (1945)."

Consequently, if the town needs to hire a secretary for the board or experts to assist the planning board with its review of zoning or subdivision application, the town may recover those costs from the applicant through a permit fee system established by local ordinance or regulation. Generally the fee is adopted by the legislative body of the town (i.e. the town meeting, in the absence of a charter provision to the contrary). However, fees in connection with subdivision review may be established through a regulation adopted by the planning board pursuant to 30 M.R.S.A., subsection 4956(2) (B), provided the legislative body has not already adopted a subdivision ordinance.

A number of communities are requiring applicants to pay both a basic application fee to cover administrative and clerical costs and an additional amount to hire expert assistance. The following are examples from the Town of Falmouth's Subdivision Ordinance and from the Model Subdivision Regulations prepared by Southern Maine Regional Planning Commission:

1. Falmouth Subdivision Ordinance

SECTION 5. Application Fee

The following fee(s) shall be paid prior to the submission of any preliminary plan:

- a) Publishing and notice fee, \$25.00
- b) Review fee, \$20.00 per lot, or living unit for multiplex development.
- c) Review escrow account, \$100 per lot (or living unit for multiplex developments) deposited in an escrow account established by the town, which monies may be used by the Board to pay for professional reviews and advice related to the developers application as it deems necessary. The Board shall provide the applicant with notice of its intent to spend any portion of this account which notice shall specify the purpose for the proposed expenditures. Those monies deposited by the developer and not spent by the

Planning Board in the course of its review shall be returned to the developer within thirty days after the Board renders its final decision on the application.

2. SBRAC Model Regulations

7.1 Procedure.

- B. All applications for Preliminary Plan approved for a Major Subdivision shall be accompanied by an application fee of \$15 per lot or dwelling unit, payable by check to the municipality. In addition, the applicant shall pay a fee of \$25 per lot or dwelling unit to be deposited in a special account designated for that subdivision application, to be used by the Planning Board for hiring independent consulting services to review the application. If the balance in this special account shall be drawn down by 75%, the Board shall notify the applicant, and require that an additional \$10 per lot or dwelling unit be deposited as necessary whenever the balance of the account is drawn down by 75% of the original deposit. Any balance in the account remaining after a final decision on the subdivision application by the Board shall be returned to the applicant. If a public hearing is deemed necessary by the Board, an additional fee shall be required to cover the costs of advertising and postal notification.

(By R.W.S.) Source: "Maine Townsman", Maine Municipal Association, December 1986.

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