SECTION 3: NATURAL & MARINE RESOURCES (Revised October 7, 2004)

PURPOSE

The purpose of this section is to present an analysis of selected components of Ogunquit's physical environment and natural resources to determine the nature and extent of any inherent opportunities or constraints on the future development of the town, and to provide part of the fact-basis for future growth management decisions.

SCOPE

This section examines the available information regarding the following components of Ogunquit's physical environment:

1. Climate and Sea-Level Rise
2. Bedrock Geology
3. Surficial Geology, Beaches and offshore sand deposits
4. Soils
5. Topography
6. Ground Water
7. Surface Water and Surface Water Drainage
8. Wetlands
9. Flood Hazard areas
10. Marine Environments
11. Vegetation
12. Wildlife Resources
13. Marine Resources
14. Critical Areas
15. Coastal Areas

APPROACH

Information regarding each of the above components was analyzed and synthesized, and is presented according to the following format:

1. A discussion of existing conditions and, where appropriate, discussion of the evolution of the current situation;

2. A discussion of inherent planning implications.

LIMITATIONS

The information contained in this section was gathered from the sources cited. Some of the sources were found to be more detailed and more recent than others. Where appropriate, future application of the information contained in this section should be preceded with a

check of the sources to see if additional or revised information is available. However, the majority of the information contained herein is considered current enough and of sufficient detail to support the conclusions and recommendations offered.

NATURAL RESOURCES MAPS

Large-scale resource maps were prepared for the 1991/93 Comprehensive Plan:

MAP 1:	CLIMATOLOGICAL INFLUENCES
MAP 2:	BEDROCK GEOLOGY
MAP 3:	SURFICIAL GEOLOGY & OFF-SHORE SAND DEPOSITS
MAP 4:	SOILS
MAP 5:	TOPOGRAPHIC RELIEF
MAP 6:	GROUND WATER
MAP 7:	SURFACE WATER AND SURFACE WATER DRAINAGE
MAP 8:	WETLANDS
MAP 9:	FLOOD HAZARD AREAS
MAP 10:	MARINE ENVIRONMENTS
MAP 11:	LAND COVER
MAP 12:	WILDLIFE RESOURCES
MAP 13:	MARINE RESOURCES
MAP 14:	CRITICAL AREAS

These maps are available for public and private planning purposes at the Town Offices.

CLIMATE

EXISTING SITUATION/CONDITIONS

Climatologically factors such as wind, precipitation, temperature ranges, etc. significantly influence the nature and extent of architectural style, engineering design, as well as the pattern of development. The climate of Ogunquit is strongly influenced by its proximity to the Atlantic Ocean and its latitude, which is approximately halfway between the equator and the North Pole.

Temperatures during the winter months average 24 degrees Fº and the average daily minimum is 13 degrees Fº. The lowest winter temperature of record for York County was recorded at Sanford, Maine at -28 degrees Fº, in 1957.

The average temperature in the summer is 67 degrees Fº and the average daily maximum temperature is 81 degrees Fº. To the extent that predicted global warming becomes real, a slight average warming may occur over the foreseeable future. One of the highest summer temperatures recorded to date for the area was in Sanford, Maine in 1975, when the temperature rose to 101 degrees Fº.

Precipitation averages 46 inches annually, with almost half falling between April and September. Average relative humidity is about 60 percent. Thunderstorms occur about 20 days each year, and most occur in the summer months.

The sun shines 65 percent of the possible time during the summer months and 55 percent of the possible time during the winter months.

Title 30-A, MRSA, Section 4405, allows municipalities to "prohibit, restrict or control development through subdivision regulations " for the...purposes of protecting and assuring access to direct sunlight for solar energy systems...."

The prevailing wind is from the south and the average wind speed is highest at 10 mph, in April. Winter storms move northeasterly along the coast bringing rain, thawing, and then snow and cold weather. Winter storms also bring high wind-driven tides.

In the summer, sea breezes moderate temperatures along the shore. Tropical storms (hurricanes) occur in late summer and pass within 60 miles of the Maine coast about once every five years. These storms are potentially dangerous because of their high winds and storm waves.

During the fall, Ogunquit and other Maine coastal towns enjoy a long mild autumn with daytime temperatures often into the 60s or 70s Fº until late October. This is due to the warmer ocean temperature keeping the near-shore land temperatures higher than the continental influenced temperatures farther inland (15+ miles).

The major climatological characteristics of Ogunquit are shown on the Climatological Influences Map available at the Town Offices.

Sea-Level Rise (added in 2003)

The WELLS BAY REGIONAL BEACH MANAGEMENT PLAN, Draft, pp. 52-57, February, 2002, Wells Beach Planning Committee, describes sea-level rise as follows. (This report is based on Maine Geological Survey and other data).

> **"What does 'sea-level rise' mean?"**
>
> The concept of sea-level rise refers to increased inundation of coastal areas due to rising oceans. Oceans rise because increased warming of the atmosphere causes ice at the planet's poles to melt, creating large volumes of water that must fit within the confines of ocean basins throughout the globe. Warming of the oceans also caused them to expand and thus raise sea level. In simple terms, there are two types of sea-level rise that need to be considered. Some predictions could cause catastrophic flooding of coastal areas in Maine while others would have a relatively minor impact on the state's beach communities.

The first consideration to understanding sea-level rise is the increase in ocean elevation that has been documented over the last fifty years for all municipalities in Wells Bay. Historic measurements of sea-level rise for Maine's coastal communities translate into about 8 inches / century or .08 inches / year (USEPA, 1995). Depending upon the category of coastline affected (e.g., sand, wetland, rock, etc.) some shore fronts are generally more resistant to rising tides and erosion than others.

The international scientific community that predicts accelerated sea-level rise bases the second, and much more controversial, sea-level rise predictions of studies. Accelerated sea-level rise predictions are based on global climate change associated with the so-called "greenhouse effect," which is a result of increased carbon dioxide levels from air pollution created via human activities (e.g., autos and power producing facilities). An estimate by the Intergovernmental Panel of Climate Change predicted an average rise in sea level of 26 inches by the year 2100 (USEPA, 1995). This estimate could conceivably add a considerable degree of urgency to sea-level planning strategies in Maine. [An earlier study, circa 1996, by the IPCC (Intergovernmental Panel on Climate Change) convened by the United Nations and the World Meteorological Organization, predicted a sea-level rise of 39 inches during the 21st Century].

"What effect will sea-level rise have on Wells Bay beaches?"

The Report titled Anticipatory Planning for Sea-Level Rise along the Coast of Maine identifies possible sea-level rise scenarios for salt marshes, bluffs and sand beaches (USEPA, 1995). These areas are the most vulnerable to the erosion from anticipated sea-level rise. In order to represent the difference of opinions accurately concerning the degree of rise, the EPA study has calculated projected shoreline erosion based on 1.5 feet, 3 feet and 6.5 feet scenarios. Table 3-1 illustrates the resultant amount of shoreline retreat for each category of land considering a 1.5 feet or 3 feet rise in sea level.

TABLE 3-1
SHORELINE RETREAT DUE TO SEA-LEVEL RISE
BY YEAR 2100

Sea-Level Rise	1.5 Feet	3 Feet	
Sale Marsh	10 – 115 feet	26 – 164 feet	= shoreline retreat
Bluff	49 – 148 feet	49 – 148 feet	= shoreline retreat
Beach	164 – 492 feet	328 – 984 feet	= shoreline retreat

Source: State Planning office, 1994

Possible Effects From Sea-Level Rise

Options for managing erosion / accretion in Wells Bay
The Wells Bay Planning Committee evaluated sand resources in Wells Bay and identified four possible courses of action based on the current set of circumstances.

Option 1: Dune Restoration

This option focuses on small-scale dune restoration projects as recommended by the Natural Resources Subcommittee. This includes beaches in Kennebunk that are candidates for beach nourishment due to their natural headland configurations, which assist with keeping sand within the beach system during storm events, as well as beaches in Wells. Barrier beaches in Wells, especially Wells Beach, consist of areas where the dune system has been damaged by removing sand or vegetation. Also, the presence of continuous seawalls creates a high-energy environment prone to sand scouring during storms. Therefore, locations with the greatest potential for sustainability should be targeted for small dune restoration projects. Such locations include pockets of sand that naturally accrete sand, areas where dune grass is established, or locations where seawalls are buried by sand. Adding sand, planting vegetation to stabilize the sand, and installing dune fences to assist with sand accretion and reduce foot traffic in these locations may allow future dune restoration in adjoining areas. This incremental approach to dune restoration was endorsed by MGS [Maine Geological Survey] during discussions with the subcommittee.

Option 2: Beach Nourishment

Large-scale nourishment, as was performed recently in Wells with the placement of dredge spoils from the harbor dredge on adjacent beaches, is another option for Wells Bay beaches. The benefits of placing large volumes of sand on the beach face within a short time frame are obvious. However, such endeavors are expensive and may result in catastrophic failure due to untimely storms. Another difficulty with large beach nourishment projects is the upfront costs of locating and transporting sand between the borrow site and the nourishment area.

Option 3: Jetty Modification

Jetty modification refers to altering existing coastal engineering structures in order to reduce channel and harbor infilling in Wells, as well as maintaining Wells Beach and Drakes Island Beaches. Based on previous studies (Corps, 1977 and 1994), it may help to narrow the harbor channel in Wells by installing a series of "spur" jetties on the inside waves and reduce the width of the channel. In theory, such narrowing of the channel would increase the tidal flow and hold sediments in suspension longer, keeping the channel deeper. However, additional structures within the channel would impede navigation to and from the harbor.

Another aspect of jetty modification is shortening the structures to allow increased flow of sand between Wells Beach and Drakes Island Beach. The 1977 Corps report refers to a northerly net littoral drift in the vicinity of Wells Beach and Drakes Island Beach. However, the 1994 Corps report results are less certain about northerly net littoral drift in the area.

Nonetheless, the objective of shortening the jetty, as suggested by some committee members, is to improve the flow of sand so that beach erosion is reduced. However, MGS (Maine Geological Survey) points out that 'shortening the jetties may result in faster shoaling in the harbor and a need for more frequent maintenance dredging. (Dickson, 2001).

Option 4: Retreat

This approach to managing coastal areas would require a policy of retreat in areas subject to considerable rates of erosion, since coastal flooding and erosion during storm events would continue. Under this scenario, all of Wells Bay would continue to erode. Dry beach areas fronting seawalls and other engineered structures will continue to vanish as sea level rises and coastal storms scour sand from the beach systems. Unfortified areas will continue to migrate landward, where possible, in response to environmental changes.

The Maine Department of Environmental Protection currently regulates sand dunes in an effort to reduce coastal hazard threats and reduce the impact of development on sand movement within coastal dune systems. These regulations adopt a policy of retreat for eroding areas by restricting development activities in coastal dune areas and preventing rebuilding of structures badly damaged by coastal erosion. Although only some committee members currently support additional retreat strategies, two voluntary options have been identified for eliminating or reducing the impact of erosion due to sea-level rise in the event that options 1 through 3 prove to be inadequate.

One option is to retreat from the area to a reasonable extent away from the rising waters. There are two possible approaches to retreat from coastal areas prone to flooding and damage due to storms and sea-level rise. The first policy focuses on the removal of structures currently threatened by coastal erosion. This approach could include the buyout of properties that are likely to be damaged or destroyed within the next 50 years, for instance, by coastal processes. The second method addresses the problem from a long-term approach by slowly acquiring properties that are damaged beyond a certain percentage of market value or that submit repetitive damage claims to FEMA under the Federal Flood Insurance Program. The acquired properties under both scenarios should be based on a willing buyer/willing seller program. That is, property sellers would have to agree to sell their property to a buyer offering a competitive market value. The potential exists for municipal, state and federal governments, or some combination thereof, to develop a cooperative program to purchase threatened properties.

Another option is to improve the flood control measures for existing properties in the flood and erosion hazard zones. One method of reducing the threats to properties already within the coastal flood zone is to redesign properties that are prone to damage using construction methods that reduce the chances of storm related damage from flood, wind and erosion hazards. While this does not fall under the definition of retreat, retrofitting current development does offer an opportunity to lessen the impact of development on the dune system. This includes raising structures above potential flood elevations and moving them inland where possible; breakaway basement walls; and reinforced walls, roofs and foundations that can withstand the impact of high winds and flooding waters. Elevating

buildings via pilings may produce a two-fold benefit. First, the most obvious benefit from elevating structures above storm surges is the reduction in damage from future storms. At the same time, however, sand will not be impeded from migrating under the raised structure. Such sand migration allows dunes to react to sea-level rise and storm events, thus conserving the natural dune system. Obviously, improving sand migration by way of elevating structures is effective only in areas where existing development permits sand to migrate inland. The presence of seawalls, roads, driveways and other anthropogenic influences hampers the ability of sand to migrate as necessary, however.

Sources of sand in Wells Bay

Unlike Saco Bay situated to the north where the littoral drift creates a "conveyor belt" effect transporting relatively large quantities of sand from south to north along the shore, Wells Bay has a very limited supply of sand and no dominant long shore drift. A major difference between Saco Bay and Wells Bay is the lack of river sediment entering Wells Bay. In Saco Bay the Saco River annually provides roughly 12,000 to 15,000 cubic yards of sand to the bay. Wells Bay, on the other hand, does not have a river source of sand nor an offshore supply that nourishes area beaches. Maine Geological Survey contends that the Webhannet River does not provide a significant amount of sediment to Wells Bay beaches (personal comment, Dickson, 2000).

In light of the finite supply of sand within the Wells Bay beach system, sand could be redistributed from one location to another or new sand could be added in an effort to manage beaches. The following list identifies possible sources of sand within the bay:

- Portions of the south and north fillets adjacent to the jetties protecting Wells Harbor (redistribution).
- Dredge spoils from Wells Harbor and the channel (redistribution).
- The dredge spoil pile placed on the marsh during the initial harbor dredge and located near the Wells town dock (re-adding sand originally part of system).
- The offshore sand deposit situated off the mouth of the Ogunquit River and Bald Head (adding new sand).
- Upland sources of sand moved by truck to the beach system (adding new sand).

While transporting sand from upland sources is possible, there are two primary concerns associated with such activities. First, transporting sand from an upland source is usually substantially more expensive than using nearby marine sediments.

A second concern is locating sand with similar physical characteristics as the recipient beach, such as grain size, shape and color. Matching the existing natural sand is important for ensuring a sustainable beach as the physical characteristics of sand greatly influence erosion rates. In general, smaller grains accumulate in the active dunes as a result of Aeolian

transport between the beach face and front and back dunes. Mixing smaller-sized grains of sand with larger-sized grains, for instance, may result in an unstable beach. Color is important for retaining the natural characteristics of the beach, which is integral to aesthetics and related recreational use. Dune vegetation is also impacted by the degree of compaction of the sand, with loosely packed sand providing opportunity for aeration and root growth.

PLANNING IMPLICATIONS FOR CLIMATOLOGICAL FACTORS

Detailed consideration of climatological factors should be made in the siting of major buildings and future development. Proper solar orientation should be encouraged and the possible negative impact of the shadow and wind patterns created by multi-story buildings on abutting property should be minimized.

Because of predictable higher energy costs and the number of heating degree days in the winter, structures should be constructed to minimize heat loss and to take advantage of solar radiation.

The frequency and intensity of the high winds, waves and flooding that accompanies seasonal storms should also be a consideration in design and location of future development, particularly along the shore.

Attention is needed to sea-level rise and to maintenance of the Ogunquit Beach dike (dunes).

BEDROCK GEOLOGY

EXISTING SITUATION/CONDITIONS

Bedrock refers to those rock types that underlie soils and which when exposed are commonly called ledges.

The bedrock underlying Ogunquit has a long and complex history. Early sediments of precipitates were deformed, folded and subjected to extreme pressure and temperatures during the mountain building period called the Acadian Revolution. Most of the features of the original rocks were destroyed in the recrystalization process known as metamorphism. During this period small bodies of igneous rocks were injected into the metamorphic material.

After a long period of inactivity igneous granites were again injected as a complex body near Mt. Agamenticus. These rocks have been subject to significant erosion during the 120 million years that followed and were subjected to at least four periods of glaciation, the last of which was the Wisconsin Stage.

The four bedrock types occurring in Ogunquit are as follows:

1. *Kittery Formation:* Early metamorphic rock (Merrimac Group) formed during the Precambrian to Silurian Period, occurring under most of the town east of the Maine Turnpike and extending into the Atlantic Ocean;

2. *Gray Biotite Granite:* Later igneous rock of the Webhannet Pluton, formed during the early Devonian Period, occurring under and west of the Maine Turnpike and extending into the Atlantic Ocean.

3. *Alkaline Quartz Syenite:* Later igneous rock of the Calc-Alkaline Plutons, formed during the early Triassic Period, occurring as a small inclusion along the York-Ogunquit Town line, east of the Maine Turnpike; and

4. *Alkaline Granite:* Later igneous rock of the White Mountain plutonic-volcanic series (Agamenticus complex), formed during the early Triassic Period, occurring as a small inclusion along the York-Ogunquit line, just west of the Maine Turnpike.

The Kittery formation overlies the Rye formation throughout the Town except where the igneous rock types are injected up through both formations.

The spatial distribution of the bedrock types within the Town, as mapped by the Maine Geological Survey, is shown on the Bedrock Geology Map available at the Town Offices. No major faults have been identified in the bedrock architecture. The contact lines between the bedrock types have not been accurately located, but considerable information is available regarding trend and slope angles of the bedrock layers.

The Maine Geological Survey has also mapped the yield, total depth and potentiometric surface of bedrock wells and the bedrock surface topography and thickness of overburden, for the Ogunquit area. The yield of bedrock wells is generally less than 10 gallons per minute and the depth of bedrock wells in the area range from 100 to 300 feet deep. The thickness of overburden is generally 10 feet throughout the town with thicknesses of less than 10 feet occurring on the tops of the higher elevations.

PLANNING IMPLICATIONS FROM BEDROCK GEOLOGY

The absence or presence of fault lines or contact boundaries indicates stable or unstable conditions for development due to possible rock movement. Soft bedrock or bedrock of low compressive strength is generally unsuitable for the foundations of large buildings. Bedrock near or at the surface may make trenching and excavating too costly. In addition, the type of bedrock and its depth affects the yield of drilled wells.

Due to the above factors, site specific geologic investigations should be conducted prior to any future large scale development to determine the suitability of the underlying bedrock and the possibility of groundwater contamination.

In terms of economic value, although some quarrying has taken place in the past, future quarrying of significance is not considered likely and there are no known deposits of metal, non-metal or fossil fuels of commercial importance within the town.

SURFICIAL GEOLOGY

EXISTING SITUATION/CONDITIONS

Surficial deposits are the unconsolidated materials which overlie bedrock. Most surficial deposits consist of sediments that were transported and put in place by wind, water and glacial ice.

Thirteen thousand years ago continental glaciers covered most of Maine, but were beginning to disappear from what is now the coast where the sea was in contact with the ice margin. As the glacier advanced, its massive weight ground up the bedrock and deposited the new material as a compact blanket of glacial till.

Twelve thousand eight hundred years ago, the glacier was receding rapidly and much of southern Maine was ice-free. The land was still depressed by the weight of the ice, allowing the sea to cover most of the coastal lowland. As the climate warmed, the glacier melted faster than it advanced, the sea level rose and deposited large quantities of clay and silt. As the glacier retreated, large quantities of meltwater carried and eventually deposited sand and gravel as kame terraces, kame fields, kames and eskers. Sand was also deposited as outwash plains and deltas.

Twelve thousand years ago, the glacier had disappeared from central and southern Maine and an uplift of the land had caused the sea to retreat. Not all material was transported by the meltwater; some remained as thin till covering the higher ridges and slopes.

As the land rebounded many of the lakes, ponds and marshes of today were formed. Some filled with lacustrine sediments or organic material and alluvial soils formed from the deposits along river and stream bottoms. Sulfihemist soils developed from saltwater marsh grasses in tidal marshes and Udipsamment soils formed from wind blown sands into stabilized dunes.

Ogunquit has four basic types of surficial deposits distributed as shown on the Surficial Geology Map available at the Town Offices. These deposits include:

1. *Glacial Till Deposits:* Heterogeneous mixture of sand, silt, clay and stones. Topography typically a blanket deposit that conforms to bedrock surface. Deposited directly by glacial ice. Glacial Till is a potential source of small quantities of water for dug wells. Drilled wells penetrating gravel beds in deposits of thick till may yield as much as 10 to 15 gallons per minute. The water found in glacial till is of good quality, but dug wells are likely to go dry during drier months.

2. *Glacial-Marine Deposits:* Silt, sand, and clay. Commonly a clayey silt but with sand very abundant at the surface in many places. Topography typically flat to gently sloping except where dissected by modern streams where it appears as a branching network of steep walled stream gullies. Glacial Marine Deposits may be saturated with water, but because of fine grain size, they yield water slowly and, therefore, are not considered as important aquifers.

3. *Swamps and Tidal Marsh Deposits:* Peat, silt, clay and sand. Topography typically flat. Formed by accumulation of sediments and organic material in depressions and other poorly drained areas. Inland swamps contain springs which are significant discharge areas for surrounding aquifers. Water direct from these sources, however, is likely to be acidic, colored, and high in nitrates. Water direct from tidal marshes tends to be of little significance due to its salt content.

4. *Beach and Dune Deposits:* Sand and gravel. High permeability. Materials are well drained, but water table is close to the surface. Topography typically low ridges and mounds, or sloping surface. Occurring along modern ocean and lake shores. Includes beach sediments formed by waves and current action, and wind blown sand derived from these. Although fresh water can be obtained from wells in Beach and Dune Deposits, salt water usually underlies the fresh water and it eventually contaminates drinking water supplies during heavy use particularly during summer peak demands.

5. *Off-shore Sand Deposits:* The WELLS BAY REGIONAL BEACH MANAGEMENT PLAN, Draft, pp. 47-49, February, 2002, Wells Beach Planning Committee, describes off-shore sand deposits as follows.

GEOLOGICAL PROCESSES IN WELLS BAY

How is Wells Bay defined?

Geologists at the Maine Survey (MGS) for the specific purpose of improving the management of sand beaches in southern Maine previously defined Wells Bay's regional parameters regarding geological delineation. The bay's natural rocky headlands. Bald Head in the south and Cape Arundel in the north, clearly define the orders of the system from a geological perspective. The sections of beach that lie between the south and north landform constraints mentioned above are located within three coastal municipalities bordering the bay. The municipalities, from south to north, are Ogunquit, Wells and Kennebunk.

What is the major source of sediment to Wells Bay?

A central issue of debate regarding the supply of sand to Wells Bay's beaches focuses on the origin and movement of sediment within the system. The following question is central to the debate: Is there an offshore source of sand that supplies the beaches in Wells Bay? MGS (Maine Geological Survey),

based on best available data, has concluded that the sand in Wells Bay is the result of glacial deposits that have been present for many thousands of years. Side scanning sonar of the bay has indicated that the volume of sand available offshore in the bay is minimal (MGS memorandum, 1989), despite the fact that an earlier report had indicated that significant offshore sand supplies the beaches (MGS memorandum, 1989). A recent finding by Miller (1998) indicates that a deposit of sand roughly 15 million cubic yards is located off of the mouth of the Ogunquit River and Bald Head.

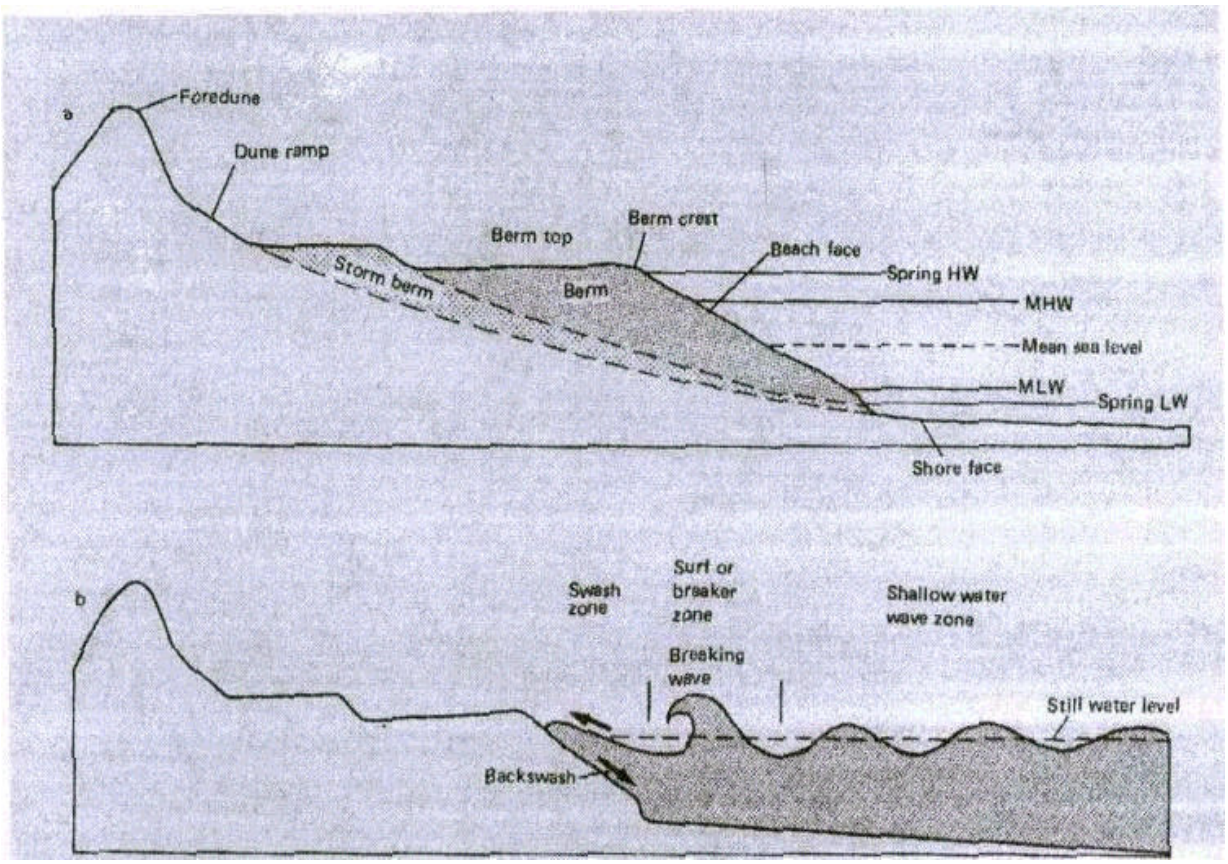
MGS estimates that the sand resources in Wells Bay are as follows (Dickson, 2000, Appendix Q):

- Frontal dunes — 4 million cubic yards
- Back Dune — 9 million cubic yards
- Submerged shoreface seaward of beaches — 132 million cubic yards
- Thin offshore sheet — 42 million cubic yards
- Offshore deposit off Ogunquit River — 15 million cubic yards
- Roughly 145 million cubic yards in the Wells Bay beach system
- Roughly 202 million cubic yards in the entire Wells Bay, including offshore sand
- Less than 10% of sand in the Wells Bay coastal sand dune system is located on land in the front and back dunes

How do beach systems function?

Beaches, similar to numerous other natural systems, are constantly trying to attain a state of equilibrium. The sand within a beach system is very fluid, accreting and eroding on a relatively short time scale when compared to other geological processes. This natural system of sand movement is a seasonal phenomenon that generally creates a lower profile in winter and a higher profile with a berm in the summer, at least in New England. The reason for this seasonal variation is the occurrence of winter storms that remove sand from the beaches and the relatively fair weather in summer that allows the sand to be transported back up onto the beach face. Aeolian processes (wind influenced) also shape beaches by transporting sand between the dune and beach face on a seasonal basis. Figure 3-1 depicts the components of a typical beach profile.

FIGURE 3-1



Source: Cain and Boothroyd, 1983

PLANNING IMPLICATIONS FROM SURFICIAL GEOLOGY

Glacial Till Deposits are generally good sources of groundwater. However, since these deposits are so permeable, groundwater contamination is possible. Deeper Till areas are excellent sources of sand and gravel. Glacial Tills are suitable for most uses depending on soil cover, slope and depth to bedrock.

Marine Deposits have poor drainage characteristics and low bearing capacity, both limiting development.

Swamps and Tidal Marsh Deposits and Beach and Dune Deposits all have severe limitations on development.

From The WELLS BAY REGIONAL BEACH MANAGEMENT PLAN, Draft, February, 2002, Wells Beach Planning Committee, is the following on dune management.

In reaction to rising sea level (see section below) or increased storm activities, beaches will in fact migrate inland in order to maintain a constant state of equilibrium. But before

beaches begin to migrate, the dune system must be breached. The natural sand dunes accumulate inland of the shorefront and act as a natural seawall, taking the impact of waves that make their way over the face of the beach.

It is this dune system that is crucial to regional beach management planning activities in Wells Bay. Without adequate dunes to protect the land and man-made structures inland of the immediate beach area, there will always be issues of erosion and flooding in the back dunes directly behind the frontal dunes. Studies and observation indicate that man-made fortifications such as riprap and seawalls often increase a beach's rate of erosion (Kelley, 1989).

What are the beach management issues in each town?

Ogunquit (Appendix B-l)

The barrier beach in Ogunquit (Ogunquit Beach) is a continuation of Moody Beach in Wells. The fact that the beach is designated a Resource Protection District under Ogunquit's comprehensive plan is obvious from the differing development patterns between Moody Beach and Ogunquit Beach. Moody Beach is heavily developed with numerous residential structures on both the frontal and back dunes of the barrier spit that is separated from the mainland by salt marsh. Ogunquit Beach does not have any residential development and includes only a handful of structures, including the municipal sewerage treatment plant at the north end of the beach and a municipal parking lot and motel at the south end. The US Soil Conservation Service engineered the dunes in Ogunquit in 1975 to act as a "dike" against ocean storms and erosion. The dune ridge running from the sewerage treatment plant to the south end of the barrier beach consists of a gravel core with sand and dune grass plantings on the surface (Kelley, 1989).

SOILS

EXISTING SITUATION/CONDITIONS

Soil is the combination of organic and mineral material composing the first six feet of the earth's surface. Soil formation is the result of five factors: topography, climate, organisms, parent material (rock or other material from which soil is formed), and time. Soils with similar characteristics are classified together in soils series and further classified as a particular soils type based on color, thickness, depth, texture and drainage.

Soil is the resource on which all land use occurs. The various characteristics of soil are important factors in all land use decisions. Such characteristics include depth to water table, depth to bedrock, permeability, fertility, texture, and slope.

A medium intensity soils survey of Ogunquit's soils was completed by the Soil Conservation Service in 1976. This information is considered accurate to the nearest two acres and while

suitable for general community planning purposes, is not suitable for the planning and designing of specific developments.

For general community planning purposes the information provided by the Soil Conservation Service's medium intensity soils survey was analyzed to determine those soils which present the least constraints/limitations on future growth and development. To accomplish this analysis soils with severe limitations such as high water tables, shallow depths to bedrock, poor drainage, low strength, frequent flooding, and with slopes greater than 25 percent were collectively grouped as areas generally unsuitable for future growth and development. Those areas which are considered to have the most severe constraints on future growth and development are shown on the Soils With Severe Constraints Map available at the Town Offices. An overlay to the soils map reflects the Maine State Plumbing Code interpreted in Table 3-6, discussed below.

Tables 3-2 through 3-5, on the following pages, show the depth to bedrock, depth to water table, drainage, and flooding characteristics of the soils found in Ogunquit.

Table 3-6, following, shows the subsurface sewage disposal systems permitted on the various soils by the Maine State Plumbing Code assuming that an on-site investigation has been performed by a certified site evaluator and no major limitations are found.

These soils can be organized into three categories which reflect their suitability for on-site sewage disposal systems: Developable land, Poor soils, and Undetermined. The soils map overlay shows the locations of these soil categories. The map interpretation is based on "A Guide for Minimum Lot Size Determination for Single Family dwellings when on-site Waste Disposal is Required" from the Maine State Plumbing code. The Developable land category includes "good" and "fair" soils.

Tables 3-7 through 3-9 show the limitations posed by the local soils on the construction of dwellings, with and without basements, and small commercial buildings, individual subsurface sewage disposal systems, and on the construction of local roads and streets, according to the Soil Conservation Service. These tables are useful for general community planning but are not considered to be accurate enough for specific sites and specific projects.

PLANNING IMPLICATIONS FROM SOILS

In general, Ogunquit has few "poor" soils. They tend to be fairly evenly scattered throughout the Town. Some of the "fair" soils (lumped into the "Developable land" category on the overlay) may have pockets of "poor" quality. The beaches are all considered "poor", as are the coastal wetlands on the north end of Town.

Developable land" predominates in Ogunquit. A large pocket of "good" soils is found behind Ogunquit Beach on the mainland side of the Ogunquit River, south of the coastal wetlands. Israel's Head and the Perkins Cove area have "fair" soils. Most of the existing development does occur on "good" and "fair" soils.

The third category of soils on the overlay is "undetermined". This is composed of the "Urban land" soils identified by the Soil Conservation Service (SCS), which means that the land has been altered or paved so that over 30% of it is impervious surfaces. Essentially, its suitability for septic systems is unknown and is best determined on a site-by-site basis.

Steep slopes are identified on the soils map when the last letter of the soil code is "D" or "E": "D" signifies slopes of 15-25%, and "E" signifies slopes greater than 25%. Many of the Lyman-Rock Outcrop soils have steep slopes. This may decrease their suitability for septic disposal systems. Steep slopes are scattered throughout Ogunquit. (See "Topography" for policy recommendations regarding steep slopes.)

Because the available soils information is too broad for site-specific planning, detailed on-site soils investigations and analysis should be required. Such investigations and analyses should focus with relative specificity on depth to bedrock, depth to seasonal water table, frequency of flooding, erosion potential, and drainage characteristics.

TABLE 3-2
DEPTH T0 BEDROCK CHARACTERISTICS

Symbol	Soil Name	Depth to Bedrock
Ad	Adams loamy sand	+ 60 inches
Ag	Adams-Urban land complex	+ 60 inches
Bm	Biddeford mucky peat	+ 60 inches
Br	Brayton & Westbury fine sandy loan	+ 60 inches
Bs	Brayton & Westbury very stony fine sandy loam	+ 60 inches
Bu	Buxton silt loan	+ 60 Inches
Ch	Chocorua peat	+ 60 inches
Cr	Croghan loamy sand	+ 60 inches
Cr	Croghan-Urban land complex	+ 60 inches
Em	Elmwood fine sandy loam	+ 60 inches
Ln	*Lyman* fine sandy loam	10-20 inches
Ly	Lyman-Rock outcrop complex	10-20 inches
Na	Namburg sand	+ 60 inches
Ra	Raynham silt loam	+ 60 inches
Ru	Rumney loam	+ 60 inches
Sa	Saco mucky silt loam	+ 60 inches
Sc	Scantic silt loam	+ 60 inches
Se	Scio silt loam	+ 60 inches

TABLE 3-3
WATER TABLE CHARACTERISTICS

Symbol	Soil Name	High Water Table		
		Depth	Kind	Months
Ad	Adams loamy sand	+6 feet	-	-
Ag	Adams-Urban land complex	+ 6 feet	-	-
Bm	Biddeford mucky peat	+ 1-0.5 feet	Perched	Nov-Aug
Br	Brayton & Westbury fine sandy loam	0.5-1.5 feet	Perched	Nov-May
Bs	Brayton & Westbury very stony fine sandy loam	0.5-.5 feet	Perched	Nov-May
Bu	Buxton silt loan	1.0-3.0 feet	Perched	Nov-May
Ch	Chocorua peat	0-0.5 feet	Apparent	Jan-Dec
Cr	Croghan loamy sand	1.5-2.0 feet	Apparent	Nov-May
Cu	Croghan-Urban land complex	1.5-2.0 feet	Apparent	Nov-May
Em	Elmwood fine sandy loam	1.0-3.0 feet	Perched	Nov-May
Ln	Lyman fine sandy loam	+ 6 feet	—	—
Ly	Lyman - Rock outcrop complex	+6 feet	—	—
Na	Naumburg sand	0-l.5 feet	Apparent	Nov-May
Ra	Raynham silt loam	0.5-2.0 feet	Apparent	Nov-Jun
Ru	Rumney loam	0-1.5 feet	Apparent	Nov-Jun
Sa	Saco mucky silt loam	0-0.5 feet	Apparent	Sep-Jun
Sc	Scantic silt loam	0-1.0 feet	Perched	Oct-Jun
Se	Scio silt loam	1.5 – 2.0 feet	Apparent	Fbr-May

TABLE 3-4
DRAINAGE CHARACTERISTICS

Symbol	Soil Name	Drainage Classification
Ad	Adams Loamy sand	excessively drained
Ag	Adams-Urban land complex	excessively drained
Bm	Biddeford mucky peat	very poorly drained
Br	Brayton & Westbury fine sandy loam	moderately well drained
Bs	Brayton & Westbury very stony fine sandy loam	moderately well drained
Bu	Buxton silt loan	somewhat poorly drained
Ch	Chocorua peat	very poorly drained
Cr	Croqhan loamy sand	moderately well drained
Cu	Croghan-Urban land complex	moderately well drained
Em	EImwood fine sandy loam	moderately well drained
Lm	Lyman fine sandy Loam	somewhat excessively drained
Ly	Lyman-Rock outcrop complex	somewhat excessively drained
Na	Naumburg sand	somewhat poorly drained
Ra	Raynham silt loam	poorly drained
Ru	Rumney loam	poorly drained
Sa	Saco mucky silt loam	very poorly drained
Sc	Scantic silt loam	poorly drained
Se	Scio silt loam	moderately well drained

TABLE 3-5
FLOODING CHARACTERISTICS

Symbol	Soil Name	Flooding		
		Frequency	Duration	Months
Ad	Adams loamy sand	None		
Ag	Adams-urban land	None		
Bm	Biddeford mucky peat	None		
Br	Brayton & Westbury fine sandy loam	None		
Bs	Brayton & Westbury very stony fine sandy loam	None		
Bu	Buxton silt loam	None		
Ch	Chocorua peat	Common	very long	Nov-May
Cr	Croghan loamy sand	None		
Cu	Croghan-Urban land complex	None		
Em	Elmwood fine sandy loam	None		
Ln	Lyman fine sandy loan	None		
Ly	Lyman-Rock outcrop complex	None		
Na	Naumburg sand	None		
Ra	Raynham silt loam	None		
Ru	Rumney loam	Frequent	Brief	Mar-Jun
Sa	Saco mucky silt loam	Frequent	Brief	Nov-May
Sc	Scantic silt loan	None		
Se	Scio silt loan	None		

TABLE 3-6
MAINE STATE PLUMBING CODE:
SUBSURFACE SEWAGE SYSTEMS PERMITTED

Symbol	Soil Name	Plumbing Code Classification
Ad	Adams Loamy sand	Good – Developable
Ag	Adams-Urban land complex	Good – Developable
Bm	Biddeford mucky peat	Poor
Br	Brayton & Westbury fine sandy loam	Poor
Bs	Brayton & Westbury very stony fine sandy loam	Poor
Bu	Buxton silt loan	Good – Developable
Ch	Chocorua peat	Poor
Cr	Croqhan loamy sand	Fair – Developable
Cu	Croghan-Urban land complex	Fair – Developable
Em	Elmwood fine sandy loam	Good – Developable
Lm	Lyman fine sandy Loam	Fair – Developable
Ly	Lyman-Rock outcrop complex	Fair – Developable
Na	Naumburg sand	Poor
Ra	Raynham silt loam	Poor
Ru	Rumney loam	Poor
Sa	Saco mucky silt loam	Poor
Sc	Scantic silt loam	Poor
Se	Scio silt loam	Good – Developable

TABLE 3-7
SOIL LIMITATIONS FOR DWELLINGS AND SMALL COMMERCIAL BUILDINGS

Symbol	Soil Name	Rating	Limiting Factors
Ad	Adams Loamy sand	Slight	-
As	Adams-Urban land complex	Slight	-
Bm	Biddeford mucky peat	Severe	wetness/low strength
Br	Brayton & Westbury fine sandy loam	Severe	Wetness
Br	Brayton & Westbury very stony fine sandy loam	Severe	Wetness
Bu	Buxton silt loan	Severe	Wetness
Ch	Chocorua peat	Severe	Wetness
Cr	Croqhan loamy sand	Severe	Wetness
Cu	Croghan-Urban land complex	Severe	Wetness
Em	EImwood fine sandy loam	Severe	Wetness
Lv	Lyman fine sandy Loam	Severe	Depth to bedrock
Lv	Lyman-Rock outcrop complex	Severe	Depth to bedrock
Na	Naumburg sand	Severe	Wetness
Ra	Raynham silt loam	Severe	Wetness
Ro	Rock outcrop – Lyman complex	Severe	Depth to bedrock
Ru	Rumney loam	Severe	Flooding/wetness
Sa	Saco mucky silt loam	Severe	Flooding/wetness
Sc	Scantic silt loam	Severe	Wetness
Se	Scio silt loam	Severe	Wetness

TABLE 3-8
SOIL LIMITATIONS FOR INDIVIDUAL SUBSURFACE SEWAGE DISPOSAL SYSTEMS

Symbol	Soil Name	Rating	Limiting Factors
Ad	Adams loamy sand	Slight	-
Ag	Adams-Urban land complex	Sight	-
Bm	Biddeford mucky peat	Severe	Wetness
Br	Brayton & Westbury fine sandy loam	Severe	Wetness
Bs	Brayton & Westbury very stony fine sandy loam	Severe	Wetness
Bu	Buxton silt loam	Severe	Wetness
Ch	Chocorura peat	Severe	Wetness
Cr	Croghan loamy sand	Severe	Wetness
Cu	Croghan-Urban land complex	Severe	Wetness
Em	EImwood fine sandy loam	Severe	Wetness
Ln	Lyman fine sandy loam	Severe	Depth to bedrock
Ly	Lyman-Rock outcrop complex	Severe	Depth to bedrock
Na	Naumburg sand	Severe	Wetness
Ra	Raynhan silt loam	Severe	Wetness
Ro	Rock outcrop- Lyman complex	Severe	Depth to bedrock
Ru	Rumney loam	Severe	Flooding/wetness
Sa	Saco mucky silt loan	Severe	Flooding/wetness
Sc	Scan tic silt loam	Severe	Wetness
Se	Scio silt loan	Severe	Wetness

TABLE 3-9
SOIL LIMITATIONS FOR LOCAL ROADS AND STREETS

Symbol	Soil Name	Rating	Limiting Factors
Ad	Adams loamy sand	Slight	
Ag	Adams-Urban land complex	Slight	
Bm	Biddeford mucky peat	Severe	Wetness/low strength
Br	Brayton & Westbury fine sandy loam	Severe	Wetness/frost action
Bs	Brayton & Westbury very stony fine sandy loam	Severe	Wetness/frost action
Bu	Buxton silt loam	Severe	Frost action/strength
Ch	Chocorura peat	Severe	Wetness
Cr	Croghan loany sand	Moderate	Frost action
Cu	Croghan-Urban land complex	Moderate	Frost action
Em	Elmwood fine sandy loam	Severe	Frost action/strength
Ln	Lyman fine sandy loam	Severe	Depth to bedrock
Ly	Lyman-Rock outcrop complex	Severe	Depth to bedrock
Na	Naumburg sand	Severe	Wetness
Ra	Raynham silt loam	Severe	Wetness/frost action
Ro	Rock outcrop- Lyman complex	Severe	Depth to bedrock
Ru	Rumney loam	Severe	Flooding/wetness
Sa	Saco mucky silt loam	Severe	Flooding/wetness
Sc	Scantic silt loam	Severe	Wetness/low strength
Se	Scio silt loam	Severe	Frost action

TOPOGRAPHY

EXISTING SITUATION/CONDITIONS

Topography is the physical shape of the landscape and consists of three interrelated elements: land form, elevation above sea level, and slope.

Topography is a basic natural element influencing land use and the structural framework for community planning. Topography imposes a natural order on the landscape which in turn influences the pattern of development.

The most significant aspect of topography is slope. Slope is the angle of steepness, the rise in elevation commonly expressed as a percentage rise in 100 feet horizontal distance. Slope gradient or the steepness of the land influences the economic and physical feasibility of most land uses.

A community's landform is the product of particular geologic materials and processes including combinations of bedrock types, surficial deposits and their resistance to erosion.

Analysis of topographic features shows why existing patterns of land use evolved and suggests ways in which future patterns could evolve. Historically, lowlands along the coast and along river valleys were settled first because of easy access. Surrounding hills acted as walls whereas the valleys and coastal plain served as corridors.

The general topographical shape of Ogunquit is upland hills along the southern York-Ogunquit town line which slope down to the Ogunquit River to the north and the coastal plain to the east. Land elevations range from sea level at the coast to around 160 feet in the upland hills. Generally the transition from sea level to the hills is gradual, although the Ogunquit River corridor, which forms the northern border, generally remains below 80 feet.
The significant topographic features of Ogunquit are shown on Map 6 at Town Hall and consist of the following landscape units:

1. The Ogunquit River estuarine-dune complex at its confluence with the ocean,

2. The coastal lowlands running parallel to the ocean, traversed by U.S. Route 1 and on which most of the existing development pattern exists,

3. The upland hills along the York-Ogunquit Town line beginning west of U.S. Route 1 and bordered on the north by the Ogunquit River corridor; and

4. The valleys or corridors of the Ogunquit and Josias River and their tributaries.

5. The physiographic relief of the Town, as a series of 40-foot intervals of height above sea level, is shown on the topographic relief map available at the Town Offices.

In general, most land use activities encounter serious problems and significant additional construction and maintenance costs when located on slopes greater than 15 percent. Areas with slopes greater than 15 percent are generally considered as areas unsuitable for most future growth and development and have been included on Map 5 at Town Hall.

There are pockets of steep slopes (greater than 15%) in Ogunquit, according to the Soil Conservation Service (SCS) maps. Slopes are indicated by the last letter of the soil code: "D" signifies slopes of 15-25% and "E" signifies slopes greater than 25%.

PLANNING IMPLICATIONS FROM TOPOGRAPHY

Since slopes from eight to 25 percent are considered difficult and expensive to build on, future growth and development should be carefully regulated when proposed on these gradients, with careful attention given to accelerated surface water runoff and erosion.

Slopes greater than 25 percent are considered as unbuildable gradients and future growth and development of approaching and beyond this degree of slope should be prohibited, including any alteration of the natural vegetative cover.

As happened historically, future growth and development pressure will be greatest in areas close to the shore, above the elevations of flood hazard and back from the shore on slopes from zero to 15 percent.

GROUND WATER RESOURCES

EXISTING SITUATION/CONDITIONS

Ground water is defined as subsurface water found in the saturated soils and water bearing bedrock of the earth's surface. Its upper level, which rises and falls seasonally, is called the water table.

An aquifer is a soils deposit or porous rock formation which contains recoverable volumes of ground water. Precipitation and surface water infiltrate into the soil and depending on underground conditions, recoverable ground water supplies may be plentiful or scarce in any given location.

Ground water moves through this saturated zone by gravitational forces. It is recharged by precipitation and discharges as springs or into wetlands, lakes or ponds and eventually drains into the ocean in combination with surface water as the flowing waters of rivers and streams.

Stratified deposits of sand and gravel yield the greatest volumes but are also highly susceptible to contamination. The spatial distribution and size of the known deposits of surficial material which in all probability are capable of providing useful volumes of ground water in the Town of Ogunquit are shown on the Ground Water Resources Map available at the Town Offices.

These sites are considered favorable for developing sufficient water supplies for municipal, commercial and industrial uses. They also should be considered as the least favorable sites for the location of extensive development and particularly unfavorable for the location of solid waste disposal facilities, excessive numbers of septic tanks and for the storage of hazardous or toxic materials.

Once pollutants enter a ground water aquifer their movement can be extensive and they may remain in the ground water for indefinite periods of time.

Surface sources of contamination include septic tank effluents, land fill leachates, sewer line leakage, ruptured fuel storage tanks, and the application of agricultural fertilizers and pesticides. The productivity of aquifers can be adversely affected by extensive paving and building coverage and by the removal of the overlying sands and gravels.

Groundwater aquifers, because they are located in valleys and/or often occur as flat, well drained and easily excavated and developed areas, are in great demand for development.

PLANNING IMPLICATIONS FROM GROUNDWATER

There are no significant sand and gravel aquifers mapped in Ogunquit by the Maine Geological Survey (MGS). Most of Ogunquit obtains its water from the Kennebunk, Kennebunkport & Wells Water District (Chapter II, Section 4 "Public Water Supply" for a

discussion of drinking water supply). Those homes that do have wells are likely drawing from unmapped "bedrock aquifers" which are fractures in the bedrock containing water. Information about drilled wells is being collected by the Maine Geological Survey for their well inventory database. The database is useful to towns largely in determining where there are pockets of low yields at deep depths. This would indicate that there may not be sufficient groundwater for additional development in that area.

Threats to groundwater in Ogunquit potentially include isolated incidents such as a toxic spill on the Maine Turnpike. More likely, contamination would be a result of the high level of development on the coastal plain where leaking underground fuel tanks, salt leach ate from roads and salt/sand piles, or infiltration of herbicides, pesticides and pet wastes from domestic lawns could affect groundwater quality.

SURFACE WATER AND SURFACE WATER DRAINAGE

EXISTING SITUATION/ CONDITIONS

Atmospheric moisture in the form of rain, snow, fog, and dew is collectively called precipitation. Precipitation falls to the surface of the earth and is transported by gravitational forces either subsurface as ground water or on the surface as surface water from the land to the ocean.

The surface drainage pattern of an area is determined by topography. Surface water flows perpendicular to the contours of the land and collects in brooks and small streams which flow to lower elevations and collect in wetland, lakes, and ponds which in turn drain into larger rivers and streams which return to the ocean.

The surface water drainage pattern of the Town of Ogunquit consists of the Ogunquit and Josias River watersheds and numerous smaller watersheds which drain into them. The nature and extent of the surface water drainage pattern of Ogunquit is shown on the Surface Water Drainage Map available at the Town Offices.

The Ogunquit River watershed originates in the Town of South Berwick and flows easterly, forming the boundary between Wells and Ogunquit, before entering the Atlantic Ocean behind Ogunquit Beach. It is the largest drainage area in the Town of Ogunquit, draining more than eighty percent of the Town's land area. Its water quality is classified as "Class B", by the Maine Department of Environmental Protection, which is satisfactory for fishing and swimming but not for use as potable water supply without adequate treatment. Proof of water quality was the reopening in 1997 of the Ogunquit Estuary clam flats to harvesting – closed in 1988 – on the basis of 36 consecutive months of satisfactory water quality testing.

The Josias River watershed originates in the Town of York and flows northerly and then easterly before emptying into the Atlantic Ocean at Perkins Cove. It is the smallest of Ogunquit's drainage areas, draining most of the southeastern part of town. Its water quality is also classified by default as "Class B" as no reference was found to it in DEP classification statutes (October, 2002). Surface water, as it travels across the surface of the earth in

increasing volumes as velocity picks up, it transports soil particles and debris from exposed mineral soils. As the mineral soil is washed away erosion occurs and when the silted surface water enters water bodies such as lakes, ponds, rivers and larger streams, the velocity of flow is reduced, and suspended soil particles drop to the bottom as sedimentation or siltation.

PLANNING IMPLICATIONS FROM SURFACE WATER

There is a direct relationship between land use and surface water quality because of the way precipitation flows into the drainage network. This relationship is most critical at the shoreland interface between land and water.

Shoreland vegetative cover provides an important filter for surface water runoff, critical habitat for riparian wildlife species, excellent outdoor recreational opportunities and important visual buffers. Shoreland areas should be designated as preferred open space. In addition to protecting the critical land and water interface, this designation has the potential of creating a linear open space network forming a natural framework for future growth.

Soil erosion is accelerated on steeper slopes which have had their vegetative cover removed or disturbed. The sedimentation or siltation of water bodies is a form of water pollution which has an adverse impact on both the quality and quantity of water supplies, on plant and wildlife habitat, and on recreation opportunities. Erosion and sedimentation can be controlled and significantly reduced through accepted construction and land management practices.

Acceptable erosion and sedimentation control practices and measures are described in the Environmental Quality Handbook, Erosion and Sedimentation Control for Developing Areas in Maine, published by the Maine Soil and Water Conservation Commission, Maine Department of Agriculture.

WETLANDS

EXISTING SITUATION/CONDITIONS

Wetlands are defined as lands on which water stands at or near the surface most of the year. Wetland soils are typically water logged and poorly to very poorly drained.
Wetlands is the collective designation for areas commonly referred to as fresh water swamps, bogs, marshes, heaths, etc. as well as coastal marshes, flats, beaches, and other contiguous areas subject to tidal action and normal storm flowage.

Wetlands are important to the public health, safety and welfare because they:

1. Act as a filter by slowing water flow and absorbing nutrients and thus enhance water quality;

2. Absorb excess water during high flows and reduce peak period flows thus reducing the dangers of flooding;

3. Often are aquifer discharge areas releasing stored waters during periods of low flow thus maintaining ground water levels and stream flow;

4. Provide critical breeding, nesting and feeding areas for a wide range of fish and wildlife, including commercially important marine species; and

5. Provide important open space and passive outdoor recreation opportunities.

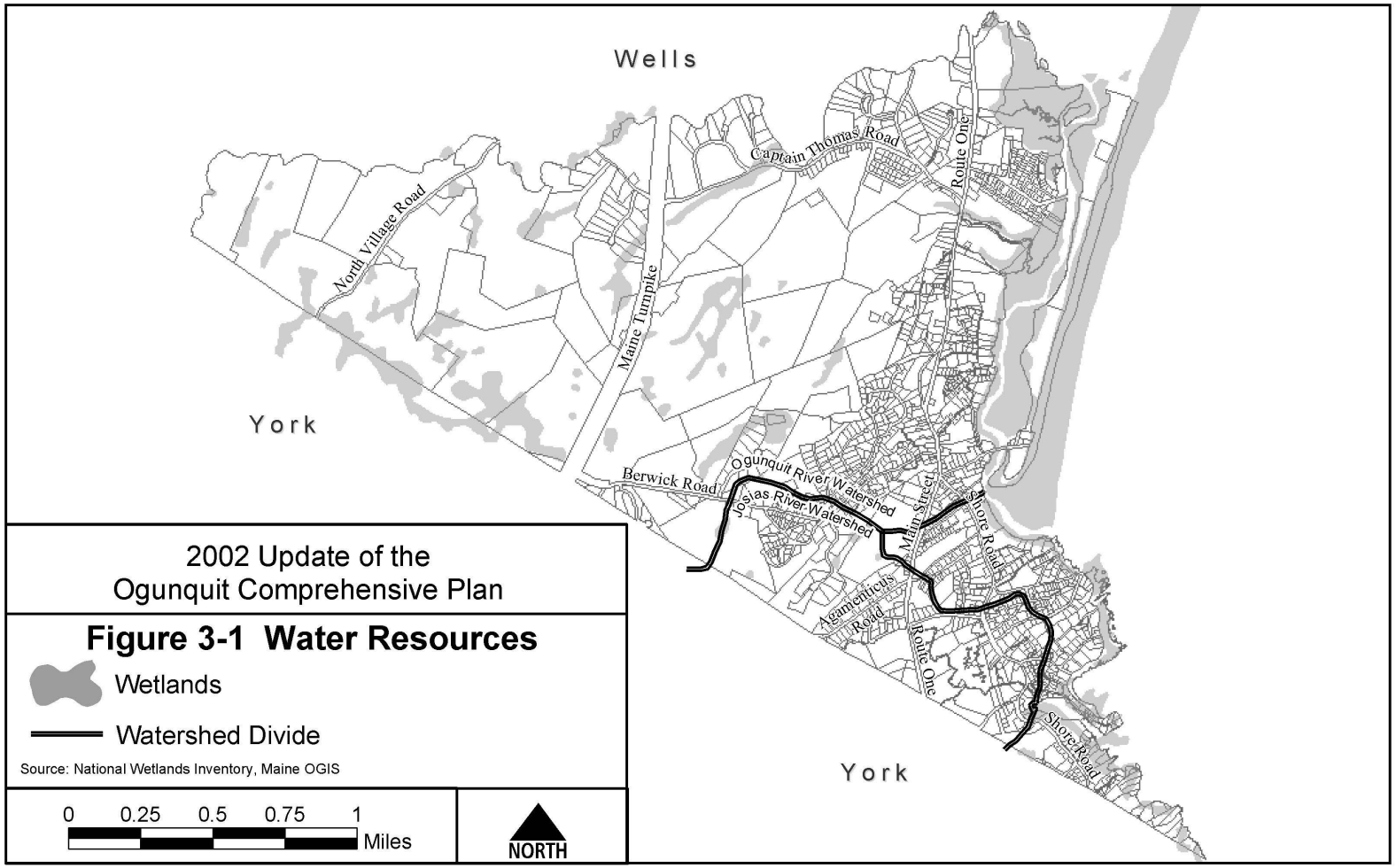
The Wetlands map for Ogunquit is based on the medium intensity soils survey conducted by U.S. Department of Agriculture, Soils Conservation Service, by inventories conducted by the Maine Department of Inland Fisheries and Wildlife, and most recently by the Maine Department of Environmental Protection.

The Maine Geological Survey (MGS) has mapped freshwater wetlands of ten acres or more (not including forested wetlands which are now protected under the NRPA). NRPA = Natural Resources Protection Act of Maine. There are no MGS freshwater wetlands mapped in Ogunquit. The other source is the National Wetlands Inventory (NWI), a series of maps produced by the U.S. Fish and Wildlife Service. The NWI wetlands include Marine, Estuarine, Lacustrine, Riverine, and Palustrine wetlands of all sizes. It should be noted that the NWI maps were prepared using aerial photographic interpretation methods, which largely have not been ground truthed. There are numerous NWI wetlands in Ogunquit, which are shown on the wetlands map overlay.

The most valuable of Ogunquit's wetlands according to the DEP are the class I coastal wetlands. Both marine and estuarine wetlands fall into this category, identified on the wetlands map overlay by a code beginning with "M" or "E". (The actual NWI maps have a key for the code which further identifies the type of wetland.) Practically the entire Ogunquit coast is made up of these wetlands. Class II wetlands include those found along the Ogunquit River identified as riverine wetlands by an "R" code. There may be other Class II wetlands. There are no Lacustrine wetlands as there are no lakes in Ogunquit.

The Department of Inland Fisheries and Wildlife has rated the Ogunquit River estuary behind Ogunquit Beach as a High value wetland. Some wetlands in Ogunquit, unfortunately have already been altered or built upon.

Maine's Natural Resources Protection Act (NRPA), administered by the Department of Environmental Protection (DEP), includes the protection of coastal and freshwater wetlands. Generally the DEP regulates wetlands of ten acres or greater, though there are exceptions. The U.S. Army Corps of Engineers regulates all wetlands regardless of size or quality. Because of the development pressures in southern Maine, the Army Corps has been active in reviewing projects involving wetlands of any size.


Wells
York
York
North Village Road
Maine Turnpike
Captain Thomas Road
Route One
Berwick Road
Ogunquit River Watershed
Josias River Watershed
Main Street
Shore Road
Agamenticus Road
Route One
Shore Road
2002 Update of the
Ogunquit Comprehensive Plan
Figure 3-1 Water Resources
Wetlands
Watershed Divide
Source: National Wetlands Inventory, Maine OGIS
0 0.25 0.5 0.75 1
Miles
NORTH

PLANNING IMPLICATIONS FROM WETLANDS

Because of their public importance, wetlands should be preserved and protected by public acquisition and regulation from adverse impact. Given the positive influence of wetlands, on both water quality and quantity, on the prevention of flooding, their critical role in the natural cycle of important fish and wildlife species, and the important open space and passive recreation opportunities they provide; land use activities which have the potential of diminishing or destroying these important public values should be avoided.

FLOOD PLAIN AREAS

EXISTING SITUATION/CONDITIONS

Floodplains are defined as areas adjacent to a river, stream, lake, pond or saltwater body which can reasonably be expected to be covered at some time by floodwater.

Flood prone areas occur along the coast and are subject to flooding as a result of the high tides, strong winds and large waves which often accompany seasonal storms. Floods are generally classified as either Intermediate Regional Floods or Standard Project Floods. Intermediate Regional Floods are floods which occur once every 100 years on average, while Standard Project Floods are major floods caused by a combination of severe meteorological and hydrologic conditions and are the most severe floods likely to occur.

The primary function of floodplains is their ability to accommodate large volumes of water from nearby overflowing channels and to dissipate the force of flow by reducing the rate of flow through a widening of the channel.

Since flooding only occurs periodically, flood prone areas have high value as open space and for outdoor recreation involving minimal development. Many flood prone areas have highly fertile soils and thus can be used for productive agriculture without interfering with their emergency overflow capacity.

Intensive urban development on floodplains and flood prone areas can increase the severity of floods and cause flooding of previously unaffected areas. The major consequence of intensive development in floodplains and flood prone areas is the widespread property damage and loss of life which results from severe flooding. Other significant consequences include high public costs associated with cleanup and rebuilding, increased insurance costs, and water pollution or contamination resulting from toxic and hazardous materials.

The enormous public costs involved in flood damage and flood control nationwide resulted in the establishment of a National Flood Insurance Program which helps the victims of floods to rebuild their homes and businesses and reduce the future risk of flood losses. The Town of Ogunquit has voted to participate in the Flood Insurance Program and landowners in identified "Flood Hazard Areas" within the Town are eligible to purchase special flood insurance.

The "Flood Hazard Areas" identified under the National Flood Insurance Program are shown in the Flood Hazard area Map available at the Town Offices. As can be seen from this map, floodplains and flood prone areas overlap fresh water and coastal wetlands to a large extent.

PLANNING IMPLICATIONS FROM FLOODPLAINS

Because of the potential for serious loss of life and property during floods, the enormous costs involved in cleanup and rebuilding after floods, the enormous costs involved with the construction of flood control projects and their ultimate ineffectiveness, further development in flood plains, flood prone areas, and "special flood hazard areas" should be avoided and only compatible, non-intensive uses permitted.

Existing development and incompatible land use activities should not be allowed to expand and should be amortized for their eventual elimination, to the maximum extent feasible.

MARINE ENVIRONMENTS

EXISTING SITUATION/CONDITIONS

Marine geologic maps of the Maine coast have been prepared by the Maine Geologic Survey. These maps identify the geologic environments of Ogunquit's coastal land in the supratidal, intertidal, and subtidal areas. Copies of the Marine Environments Map are available at the Town Office.

Descriptions of various marine environments identified in Ogunquit are as follows:

Supratidal Zone

Environments just above the highest high water datum, but under the partial influence of marine processes and forces.

The supratidal environments found in Ogunquit and their location are as follows:

1. DUNES AND VEGETATED BEACH RIDGES
   Description: Remnants of the old Ogunquit Beach dune system occur linearly behind the Beach, parallel to the river. These dunes have been designated as significant natural areas by the Maine Critical Areas Program.

   Location: Most of the original Ogunquit Beach dunes were covered by sand brought from inland to erect a “dike” by the US Department of Agriculture to hold back storm surges. The imported sand, courser than the native beach sand, does not hold and nurture the dune grasses as well.

2. FRESH-BRACKISH MARSH
   Description: Water-saturated, organic-rich sediments characterized by broad-leafed vegetation tolerant of constant submergence in fresh water. Salinity of waters is less than 5 ppt (parts per thousand).

   Location: Fresh-Brackish marshes are located north and east of the end of Bayview Avenue and at the end of Riverbank Road.

3. MAN-MADE LAND
   Description: Structures or fill emplaced by man in the nearshore environment. This activity is now strictly regulated by state and federal law and in most instances is prohibited.

   Location: The shoreland below the Route 1 Bridge along the Ogunquit River, the Upper Beach Parking Lot and the shoreland parallel to Beach Plum Lane, the shoreland along River Road, the shoreland at the end of Wharf Lane, the parking area and roadway at Perkins Cove, the Lower Beach Parking Lot and the high ridge running the length of the Ogunquit Beach are all examples of Man-Made Land.

Intertidal Zone

Environments between the highest high water datum and the lowest low water datum subject to twice daily tidal flooding and all other marine forces.

The intertidal environments found in Ogunquit and their location are as follows:

Marsh Environments

Vegetated environments or isolated depressions within vegetated environments located above mean high tide level in protected coastal areas.

1. HIGH SALT MARSHES
   Location: High Salt Marshes occur on both sides of the Ogunquit River from the Route 1 Bridge to the Lower Beach Parking Lot Bridge.

2. SALTPANNES AND SALTPONDS
   Description: Salt-water filled, non-vegetated depressions on High Salt Marsh surfaces (Salt Pannes) or salt-water filled depressions anywhere in the intertidal zone such as tidal pools. Salt Pannes may be dry and covered with algae during late summer months.

   Location: Salt Pannes and Salt Ponds occur in the High Salt Marsh at the end of Seaview Avenue.

Beach Environments

Deposits of unconsolidated sediment which extend shoreward from the lowest tide line to the upland or vegetated dune field or beach ridge. Dominated by wave processes.

1. SAND BEACHES
   Description: Beaches consisting of sand-size sediments which are subject to high or moderate wave energy.

   Location: Ogunquit Beach.

2. MIXED SAND AND GRAVEL BEACHES
   Description: Beaches consisting of sand and gravel-size sediment which are subject to high or moderate wave energy.

   Location: The Beach at Oarweed Cove is a Mixed Sand and Gravel Beach.

3. GRAVEL BEACHES
   Description: Beaches consisting of gravel-size sediments which are subject to high or moderate wave energy.

   Location: Gravel beaches occur at the beginning of the Marginal Way and south to the end of Juniper Lane, i.e. Narrow Cove.

4. BOULDER BEACHES
   Description: Beaches consisting of boulder-size sediment which are subject to high or moderate wave energy.

   Location: Boulder beaches occur at several locations along the Marginal Way and north of the end of Juniper Lane.

5. BOULDER RAMPS
   Description: Surfaces sloping to the lower intertidal zone veneered by large boulders. This environment is seaward of gravel or boulder beaches on high wave energy shorelines. Boulders are remnant lag deposits of eroded glacial tills. Boulder movement is limited to periods of intense storm wave activity.

   Location: Boulder Ramps occur seaward of the mixed sand and gravel beach at Oarweed Cove and seaward of the gravel beach at the beginning of the Marginal Way.

6. WASHOVER FANS
   Description: Fan-shaped deposits of gravel located behind gravel beach ridges and covering portions of marshes. Few washovers have been recognized as mappable units on sand beaches. Washover fans are deposited by storm waves. Fan sediment is derived from the beach itself.

Location: A washover fan occurs landward of the sand dunes north of the lower Beach Parking Lot.

Flat Environments

Gently sloping or level environments composed primarily of fine sand, silt and clay accumulated in relatively quiet water. Flats are depositional areas controlled primarily by tidal currents and sediment settling from the water column. Flat environments may be eroded temporarily by storm waves.

1. MUD FLATS
   Description: Flats consisting of sediments finer than sand.

   Location: Mud flats occur seaward of the gravel beach in the cove south of Juniper Lane and along the landward side of the Ogunquit River estuary from River Road northerly.

Miscellaneous Environments

1. LEDGE
   Description: Subaerially or subaqueously exposed bedrock.

   Location: Bedrock outcrops occur along the shore from the Beachmere Point southerly to the York-Ogunquit town line.

2. POINT OR LATERAL BARS
   Description: Accumulations of sediment adjacent to intertidal channel margins at channel bends (Point Bars) or along straight segments (lateral bars).

   Location: Point or Lateral Bars occur along the Ogunquit River channel behind Ogunquit Beach.

3. FLOOD-TIDAL DELTAS
   Description: Lobate bars of sediment which accumulate landward of an inlet separating a back-barrier estuary or lagoon from open-ocean water.

   Location: Flood-tidal deltas occur just north and south of the Lower Beach Parking Lot and seaward of the Ogunquit River's entrance to the open ocean.

4. EBB-TIDAL DELTAS
   Description: Lobate bars of sediment which accumulate seaward of an inlet separating a back-barrier estuary or lagoon from open-ocean water.

   Location: An ebb-tidal delta occurs seaward east of the beach in front of the Norseman Inn.

Subtidal Zone

Environments existing below lowest low water and subject to tidal current forces and wave-generated current forces.

The subtidal environments found in Ogunquit and their location are as follows:

Flat Environments

Submerged, gently sloping, or level environments composed primarily of fine sand, silt and clay. Includes subaqueous exposures of coarse-grained, pleistocene glacial sediments.

1. MUD FLATS
   Description: Fine-grained subtidal flats.

   Location: Subtidal mud flats occur just off the cove south of the end of Juniper Lane.

2. SEAWEED COMMUNITY
   Description: Coarse-grained subtidal flats and bedrock ledges which support seaweed growth.

   Location: Seaweed Communities occur offshore from the beginning of the Marginal Way and continue southerly to the Ogunquit-York town line.

3. UPPER SHORE FACE
   Description: The inner subtidal slope which extends seaward from large exposed sand beaches where sediments are actively transported by bottom currents generated by storm waves. The upper shoreface is a sandy environment of constant wave shoaling under normal wave conditions.

   Location: Offshore from Ogunquit Beach from the Norseman Inn northerly to the Wells-Ogunquit town line.

Channel Environments

Linear, intertidal and subtidal depressions carrying tidal-current water.

1. MEDIUM-VELOCITY TIDAL CHANNEL
   Description: Tidal channels where maximum flow velocities probably attain values between 1 and 2 mps.

   Location: The Ogunquit River from the Ogunquit-Wells town line southerly to the open ocean and the outlet of Perkins Cove from just below the Footbridge to the open ocean are examples of Medium-Velocity Tidal Channels.

2. ESTUARINE CHANNEL
   Description: Tidal channels where ocean and river waters mix. Estuarine water salinity ranges between 0.5 ppt and 30 ppt.

   Location: An Estuarine Channel runs from just below the Route 1 Bridge easterly toward the Sewage Treatment Plant.

3. INLET CHANNEL
   Description: High-current velocity channels cut through barrier beaches and connecting back barrier estuaries or lagoons with the open ocean.

   Location: An inlet channel is found just south of the Lower Beach Bridge.

4. DREDGED CHANNEL
   Description: Man-made artificially-deepened or widened tidal channels.

   Location: An example of a dredged channel is the dredged pool at Perkins Cove.

PLANNING IMPLICATIONS FROM MARINE ENVIRONMENTS

Marine environments, particularly marshes and estuaries, are among the most biologically productive areas per acre in our part of the world. Marshes are crucial habitats for most commercial fish and shellfish species.

Nearly three-quarters of Maine's fishery resources, some 60 species of commercial fish and shellfish, depend directly or indirectly on marsh environments for nutrients or nursery grounds.

Marine environments are sensitive to man-made changes and impact from inappropriate upland activities. Dredging, draining, filling or altering these environments should be discouraged. In addition, pesticides, other chemicals and sewage wastes have significant adverse impact on the marine organism inhabiting these areas.

Marsh environments are particularly susceptible to disturbance from the wakes of motorized boats.

In addition to providing habitat for commercial Fisheries, many marine environments provide critical habitat for many wildlife species. Marine environments, such as beaches, also offer significant recreational opportunities.

VEGETATION

EXISTING SITUATION/CONDITIONS

Ogunquit's original forest vegetation began to be cleared following settlement in the late 1700's. By the 1850's, as much as two thirds of southern Maine was cleared for pasture and farmland.

The abandonment of fields and pastures which began at the end of the Nineteenth Century accelerated through the early decades of the Twentieth Century. Land that had been cleared reverted quickly to second growth forest.

A variety of plant associations can be found within the Town of Ogunquit, all typical of the White Pine- Hemlock-Hardwood forest type. These associations range from hemlock ravines on steep moist hillsides, streamside associations of willow, maple and elm, to second growth pine stands, often of pure white pine.

The White Pine-Hemlock-Hardwood forest type is one in which either white pine or hemlock predominate. Significant trees and shrubs found in Ogunquit are noted on the next page. The distribution of areas with forest cover in Ogunquit is shown on the Land Cover Map available at the Town Offices.

Typical white pine sites are those with dry, sandy, infertile soils. On these sites white pine often form a climax association with oaks. White pine is also found in areas that have been burned over in the past, but are reforested with other successional species without repeated burns to kill the climax Northern Hardwoods. Other white pine sites include old fields, barrens and dunes where, in the early stages of succession, they compete successfully and associate with pitch, jack, and red pine.

Hemlock is adapted to a wide variety of conditions. It is often found in scattered groves along ravines and in less well-drained areas but rarely along the immediate coast. Hemlock is normally associated with the Beech-Birch-Maple forest type.

The Beech-Birch-Maple forest type, also known as Northern Hardwood type, is characterized by American beech, yellow birch, and sugar maple. Other common associating species include: basswood, red maple, red oak, white ash, eastern white pine, balsam fir, cherry, paper birch, gray birch, American elm, slippery elm, hophornbeam, red and white spruce, and hemlock. Northern Hardwoods are normally found in areas with deep, moist, well-drained soils.

The State Planning Office has identified the pitch pine stand near the Sewage Treatment Facility as a significant natural area containing an outstanding example of the Pitch Pine-Sand Dune plant association.

PLANNING IMPLICATIONS FROM VEGETATION

When existing vegetative cover is carelessly removed, erosion and sedimentation are likely to occur. With the natural cover left as undisturbed as possible, root systems stabilize the soil and help prevent erosion and sedimentation. Removal of more than 45 percent of the existing vegetative cover for road, parking and building construction and removal of existing natural cover on slopes greater than 15 percent should be avoided to the maximum extent possible. Roads, parking and buildings should be located where it is necessary to cut only a minimum number of existing trees.

Natural vegetative cover is a critical component to wildlife habitat. Stream-side vegetation shades the adjoining waters and keeps water temperatures lower. Lower water temperatures are critical to several fish species. Removal of existing natural vegetative cover in shoreland areas and in identified significant and vulnerable fish and wildlife habitats should be carefully regulated.

Retaining natural vegetative cover, or, at most, carefully pruning lower branches and thinning overgrown stands, helps retain the natural character of an area and make it more enjoyable to look at and live in. The retention of adequate buffers can provide privacy and reduce noise. Retaining adequate natural vegetation also provides protection from excessive winds, snowdrifts, and too much summer sun. Adequate vegetative buffers of native plant material should be required, particularly along public roads and property lines and between incompatible uses.

Timber harvesting should be regulated to prevent erosion and sedimentation, destruction of significant fish and wildlife habitat and rare, unique and exemplary plant communities; as well as to prevent adverse visual impact along public roads and shoreland areas and other highly visible areas. Areas of identified rare, unique or exemplary plant communities should be protected from the adverse impact of timber harvesting and development.

WILDLIFE RESOURCES

EXISTING SITUATION/CONDITIONS

The Maine Department of Inland Fisheries and Wildlife completed in 1986 an evaluation of important wildlife areas in southern Maine and Ogunquit. The following types of habitat were identified:

1. FISHERIES HABITAT: permanent streams and ponds;
2. RIPARIAN HABITAT: areas adjacent to water;
3. WETLAND HABITAT: significant wetland waterfowl areas;
4. WATERFOWL WINTERING AREAS: usually coastal marshes;
5. DEER WINTERING AREAS: traditional winter use areas; and
6. NON-GAME HABITAT: a diverse group of habitats critical for non-game species.

TABLE 3-10

Type Habitat/Location	Classification			
	High	**Medium**	**Low**	**Indeterminate**
FISHERIES HABITAT				
Streams				
Ogunquit River (inland)	X			
Josias River		X		
Sea Run Trout Streams				
Ogunquit River (lower)				X
RIPARIAN HABITAT				
Ogunquit River (whole)	X			
WETLAND HABITAT				
None				
WATERFOWL WINTERING AREAS				
Ogunquit River (lower)			X	
DEER WINTERING AREAS				
None				
NON-GAME HABITAT				
Ogunquit Beach (Piping Plovers)		X		

Source: Important Wildlife Areas in Southern Maine, Jody Jones, Department of Inland Fisheries and Wildlife, June 1986

Ogunquit contains only 4.5 square miles of land area, adjacent to the Atlantic Ocean, and while marine resources are abundant, the town includes very few freshwater resources and no significant ponds. Moody Pond is approximately 1 acre in size and is used for an annual trout fishing tournament. Public access to Moody Pond is available from Main Street. The Ogunquit River and Josias River each contain a small freshwater trout fishery, occasionally enjoyed by local fly fishermen. Public access to the Ogunquit River is available at the North Village Road bridge. Public access to the Josias River is available from the Main Street bridge. Traditionally, access to these rivers from private lands is granted by the landowners, upon request. Overall, there are limited opportunities for freshwater angling, compared to those available in other, larger Towns in the region.

A list of the significant fishes and mammals found to occur in the Ogunquit area is given on the next page. A map of the significant wildlife habitats in Ogunquit is available at the Town Offices.

TABLE 3-11
SIGNIFICANT FISHES AND MAMMALS
FOUND IN THE OGUNQUIT AREA

Common Name	Scientific Name
FISHES	
Landlocked Salmon	Salmo salar
Brook Trout	Salelinue fontinalis
Brown Trout	Salmo trutta
Smallmouth Bass	Micropterus dolomieui
Largemouth Bass	Micropterus salmoides
Chain Pickerel	Esox nigar
White Perch	Roccus americanus
Yellow Perch	Perca flavescens
Brown Bullhead (hornpout)	Ictalurus nebulosus
American Eel	Anguilla rostrata
White Sucker	Catostomus commersoni
Burbot (Cusk)	Lota lota
MAMMALS	
Black Bear	Ursus americanus
Raccoon	Procyon lotor
Fisher	Martes pennati
N. Logtailed Weasel	Mustela frenata
Mink	Mustela vison
River Otter	Lutra Canadensis
Striped Skunk	Mephitis mephitis
Red Fox	Vulpes fulva
Gray Fox	Urocyon cinereoargenteus
Bobcat	Lynx rufus
Lynx	Lynx Canadensis
Woodchuck	Marmota monax
E. Chipmunk	Tamias striatus
Red Squirrel	Tamiasciurus hudsonicus
Gray Squirrel	Sciurus carolininsis
N. Flying Squirrel	Glaucomys sobrinus
Beaver	Castor Canadensis
Muskrat	Ondatra zibethica
Porcupine	Erethizon dorsatum
Snowshoe Hare	Lepus americanus
Whitetailed Deer	Odocoileus virginianus
Moose	Alces americanus

The Wildlife Resources map indicates the presence of striped bass in the coastal waters, American eels in the Ogunquit River, tidal flats important to waterfowl in the Ogunquit River flowage between Ogunquit Beach and the mainland, and marks the Ogunquit River (inland) as a freshwater recreational fishery. The Wildlife Resources map overlay contains the following information:

- The 1989 "Significant Fish and Wildlife Resources of Coastal York County, Maine" report prepared by the Department of Inland Fisheries and Wildlife (IFW) identifies one wetland habitat. It is a coastal wetland on the Ogunquit River behind Ogunquit Beach, and has been given a "High" value rating.

- There are four Coastal Wildlife Concentration Areas. Two are rated Class A: Ogunquit/Moody Beaches and Ogunquit River.

- The other two are rated Class B: Perkins Cove and Bald Head. The Wildlife Resources Map overlay shows their location.

- According to the 1989 report, there are none of the following: colonial-nesting seabird islands, bald eagle nest sites, wading bird rookeries, seal haul-outs, shorebird roosts, or other areas of special concern.

PLANNING IMPLICATIONS FROM WILDLIFE

Wildlife resources in any community are among the most sensitive biological elements to changing land use practices.

Wildlife habitats tend to be clumped around ecosystems that are particularly rich and diverse and often in close proximity to water. These same ecosystems, adjacent to water, are in high demand for development.

The persistence of a particular wildlife species depends upon the sustained quality and quantity of habitats the species encounters.

Fisheries habitat is best protected by protecting the surrounding riparian habitat. The significance of rivers and streams that support cold water fisheries should not be underestimated given their relative scarcity and the heavy fishing pressure in southern Maine.

Riparian areas are significant and highly vulnerable habitat for a diverse population of game and non-game species. An undisturbed riparian zone is critical to the maintenance of cold water fisheries and to the maintenance of wildlife diversity, particularly for birds and small mammals. In addition, many small mammals, furbearers and birds use the riparian zone as travel corridors.

Water quality in rivers, streams, ponds, and wetlands is adversely affected by disturbance within the riparian zone; i.e., changes in ground water temperature, stream flow, and rate of sedimentation. Development threatens to divide habitats into fragments or "islands", thereby

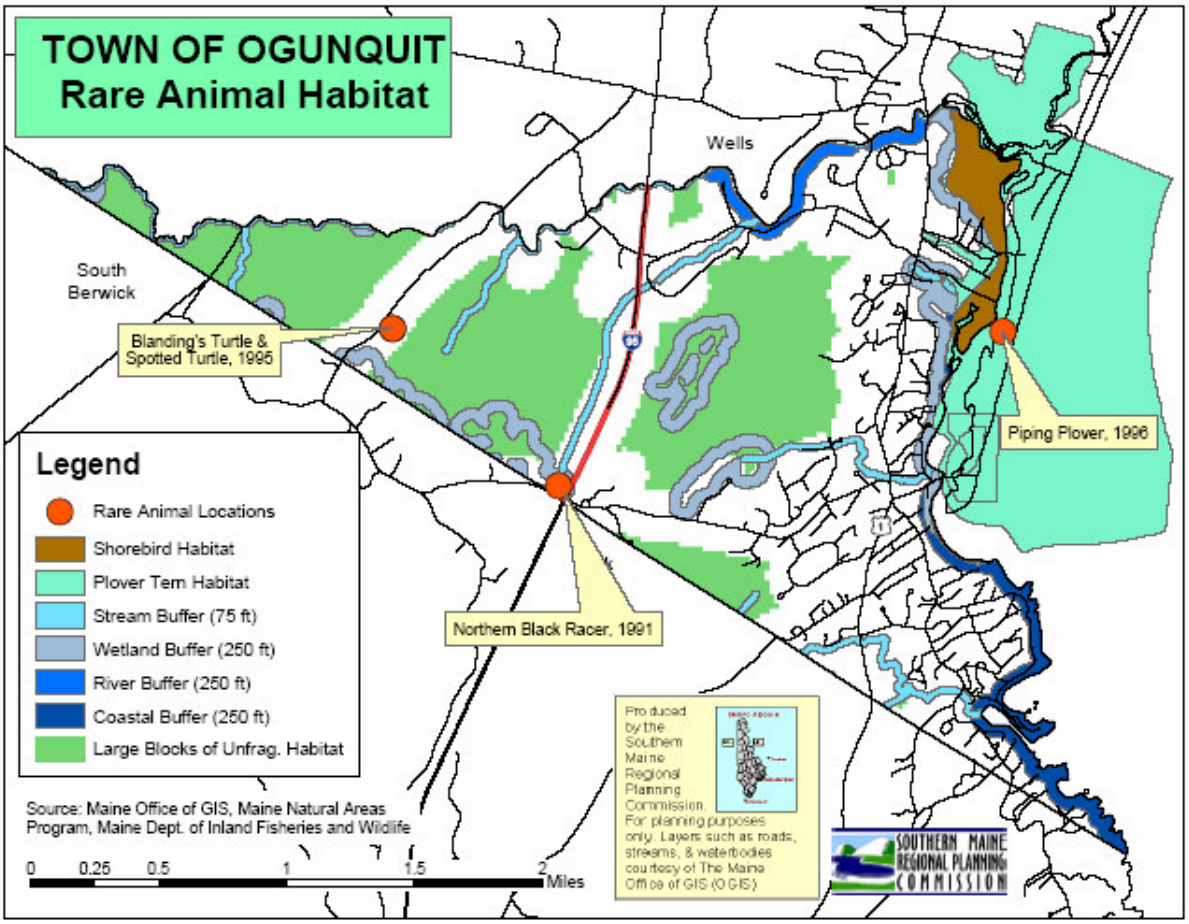
confining within them species which do not travel far from cover. Such fragments may cut off the animals from winter and summer ranges particularly if travel corridors are not maintained.

Buffer strips of continuous, undisturbed riparian vegetation are important to the maintenance of fisheries, riparian, deer wintering, and non-game habitats.

MARINE RESOURCES

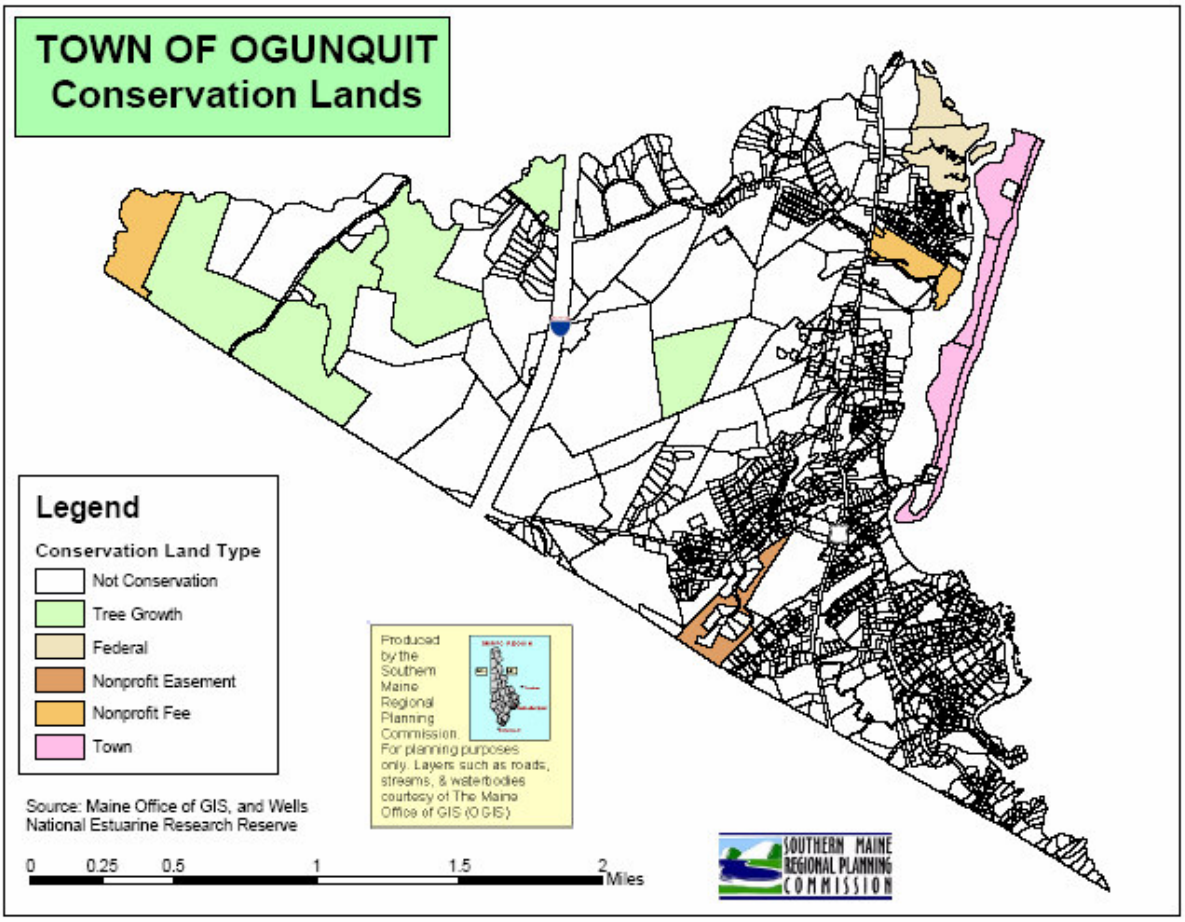
BEGINNING WITH HABITAT PROJECT DATA

The following map shows data for Ogunquit from the 2001 "Beginning with Habitat" project, a joint program of the Maine Department of Inland Fisheries and Wildlife, the Maine Natural Areas Program, the Maine State Planning Office, the Wells National Estuarine Research Reserve, the Maine Audubon Society, SMRPC, and the US Fish & Wildlife Service. The project collected all of the data on wildlife from each of the partner agencies and put it on one map, in order to promote good land use planning based on the specific locations of critical resources.



INVENTORY OF LANDS IN CONSERVATION USE

Since 1996, the Wells National Estuarine Research Reserve, in cooperation with the Southern Maine Regional Planning Commission, has been inventorying land in conservation use, in order to promote better land use plan. The following Map indicates land owned in fee by the federal government (Rachel Carson National Wildlife Refuge), as well as the Town of Ogunquit (Ogunquit Beach). Land with Conservation Easements owned by Great Works Land Trust are also shown. Several parcels are also indicated as participating in the State Tree Growth current use taxation program. However, properties in Tree Growth are not considered to be in permanent conservation use, since they can be easily developed after payment of a penalty.



EXISTING SITUATION/CONDITIONS

During the early 1960s, Wells and Ogunquit were among the more progressive communities along the Maine coast, regarding shellfish conservation. At a time when very little money was being spent on shellfish management in the state, a green crab infestation study and control effort was successfully being implemented in the area.

Shellfish landings were close to 3000 bushels during the mid-sixties, reflecting an economic value of as much as $70,000 per year.

The Ogunquit Sewer District received the necessary permits (1992) for an ocean outfall pipe which would shift the discharge from the sewage treatment plant from the Ogunquit River to the ocean side of the beach. The results of this were two-fold: the estuary benefited from the absence of the discharge, which includes chlorine, and experienced a return of many of its resources including fin-fish such as coho salmon, sea run brown trout and flounder, but conversely there may have to be closure of the clam beds (surf clams and ocean quahogs) around the ocean outfall pipe.

A continuing factor affecting pollution levels in the Ogunquit River estuary is contamination of feeder streams by stormwater runoff. This is a pervasive form of non-point source pollution which is just as harmful as point sources such as the discharge pipe, but more difficult to address. Furthermore, the area of the clam flats has been reduced from historic levels due to the influx of sand into the river.

Clam growth and quality are dependent upon the interaction of many variables and are particularly sensitive to water quality fluctuations. Out of a total of approximately 100 intertidal acres for shellfish in Ogunquit, 85 acres are permanently closed (Perkins Cove and Oarweed Cove), but 15 acres have been re-opened in 1997 and are classified by the Maine Department of Marine Resources (DMR) as conditional (Ogunquit River area).

A conditional class means that, based on periodic water quality samples that are taken by the Department of Marine Resources, limited harvesting can be allowed to take place during some portion of the year. Typically, this has meant that the area is open in the winter and early spring (November - March) for recreational harvesting of shellfish when water quality samples indicate a low coliform count.

Although the lobster resource of the Maine Coast is the State's most valuable fishery and a highly significant source of income for other communities, lobster fishing has only a moderate and declining impact on the Ogunquit economy. Increasingly, the economics of lobster fishing require large capital investments for boat and gear. Although the value of the catch has been fluctuating, careful practices in preserving brood stock females has stabilized, even increased, the numbers of lobsters. Part of this increase may reflect the depleted number of cod and other ground fish, which feed on lobster larvae. Dock and mooring space are at a premium in the Ogunquit area often making it difficult for new fishermen to operate effectively from the area. Ogunquit is home port to 16 commercial fishing vessels which harvest a variety of ocean fish resources, ranging from lobsters to mackerel and tuna, to bait fish for the lobster fishing industry.

There were 18 commercial licenses issued for lobster and crab harvesting in 2001 in Ogunquit, which correlates well to the 26 commercial fishing boats (2002) moored in Perkins Cove, and 2 non-commercial licenses. Undoubtedly, some recreational lobstering is also being done in Ogunquit waters by non-commercial lobster/crabbing license-holders from Wells (13±) and York (34±). For the 2001/2002 season (November 1 – March 31), Ogunquit

issued 120 non-commercial clamming licenses to resident and non-resident recreational clammers in the Ogunquit River Estuary clam flats. The Town also issued 260 one-day clamming licenses.

Two species of crabs have commercial significance in Maine - the red rock crab and the Jonah crab. The vast majority of these crabs are "by-catch" of lobster fishermen, that is, they are caught incidentally in lobster traps.

PLANNING IMPLICATIONS FROM MARINE RESOURCES

Although the commercial harvesting of shellfish and lobsters may no longer be the significant part of the Ogunquit economy that it is elsewhere on the Maine coast, marine resources are still important to the remaining fisherman and to those who harvest for personal use or recreation.

The quality and quantity of marine resources in the waters of Ogunquit also serve as biological indicators of other environmental problems. Pollution from chemicals and sewage adversely impact marine resources as does the inappropriate dredging, draining, and filling of marine related environments.

Further development in or near any productive marine resource areas should be regulated to assure that such areas are not adversely impacted.

CRITICAL AREAS

EXISTING SITUATION/CONDITIONS

The Maine Critical Areas Program (Title 5, MRSA, Chapter 12) was created by the 106th Legislature in 1974. Critical areas are defined as naturally occurring phenomenon of statewide significance which because of their uniqueness, rarity or other critical factors are deemed important enough to warrant special planning and management consideration. These areas include those places where changes in use would jeopardize resources of natural, educational, historic, archaeological, scientific, recreational, or scenic significance.

To meet the requirements of this program, areas must be identified, catalogued and submitted to the Critical Areas Advisory Board and thoroughly reviewed. Landowners of affected land have an opportunity to respond to the registration. The status of the proposed area is then decided based on the following criteria:

1. The provisions of the statute;
2. Values and qualities represented by the area;
3. Probable effects of uncontrolled use;
4. Present and probable future use;
5. Level of significance; and
6. Probable effects of registration both positive and negative.

Five critical areas have been identified and registered in Ogunquit. The first four are on The Critical Areas map, and the fifth is on the Critical Areas map overlay. The following is a brief description of those areas:

The Marginal Way

This critical area includes the entire shoreline of the Marginal Way from the beginning of the walkway at Oarweed Cove running northward to and including Israels Head. The area is further bounded by the low water line and the seaward extent of private property lines and includes approximately 13.9 acres.

The ledges along the Marginal Way are particularly significant because they afford superb exposures of the Kittery Formation and a profusion of basaltic dikes. Several early recumbent folds in the metamorphosed sedimentary rocks of the Kittery Formation are well displayed. These folds have been subsequently deformed by overturned folds which have well developed axial plane cleavage. The numerous basaltic dikes offer excellent illustration of features of dike emplacement such as chill margins, rock dilation and intrusion sequence. In addition, numerous minor faults cut across the rocks; these faults postdate the basaltic dikes.

Ogunquit Beach-Beach Face

This critical area extends from the seaward end of the first boardwalk near the Norseman Hotel to a point near the Sewage Treatment Plant and includes the beachface from low water to the fence in front of the dike and consists of approximately 48 acres.

This portion of Ogunquit Beach retains significant natural features in the beachface, dunes and vegetation. The most active zone of Ogunquit's dunes have been stabilized by the dike construction, planting, fertilizing and fencing. But because the vegetation, geomorphology and source of the material for the dike are artificial, the dike has been excluded from the area.

The Ogunquit beachface provides excellent examples of geomorphic features associated with beach face processes. It is a classic example of summer vs. winter beachface profiles which are the result of onshore and offshore accretion and erosion. The difference in the summer and winter profiles are a reflection of the increased wave activity of winter storms. The unusual width of the beach, one of the largest in Maine, may be due to a large submerged sand source. The abundance of fine-grained, nearly pure quartz sand suggests winnowing and transportation of submerged glacial outwash and the dominance of low energy waves which select and transport the fine-grained sand particles.

Ogunquit Beach-Back Dune Area

This area, in back of the dike, extends from the Norseman Hotel to the Sewage Treatment Plant and includes the area between the boardwalk and the sand dune/marsh or sand dune/tidal river interface. It is approximately 27 acres in size.

This section of the Ogunquit Beach retains some of the natural dune features which were lost with the construction of the artificial dike. Of particular interest in this area is the backdune vegetation. In this sandy berm-like habitat, which is flooded only during spring tides, near the high water line are found the berm plants: Seaside Burdock, Saltwort, Sea Blite, and Seabeach Orach, all of which depend on flotsam for nutrients. In the windblown sand above spring high water grows Dusty Miller and Seaside Goldenrod.

Only three beaches on the Maine Coast remain with large undisturbed dune fields (Popham, Reid and Seawall). Consequently, all undisturbed coastal sand dune and berm habitats are significant simply because of their limited extent.

Ogunquit Beach - Pitch Pine Stand

This critical area is located between the Moody Beach parking lot and the Sewage Treatment Plant and is bounded by the road and the back edge of the dike. This area includes approximately 0.89 acres.

The site includes the small pitch pine stand located at the northern end of Ogunquit Beach. The Pitch Pine stand is considered significant because it is the edaphic (soil) climax stand in Ogunquit. A few small patches of Beach Heather have been identified in the area, but severe foot traffic on most of the open dunes greatly limits their growth. Heather is an uncommon, fragile dune plant, covering less than 10 acres in Maine.

Sea Cave at Jack's Cove

An unusual geomorphic feature, this Critical Area is one of only two significant caves known to occur along the York County shoreline. The cave, eroded at mean sea level, measures approximately two meters in diameter and four meters in length. It occurs in rocks of the Kittery formation which is composed of metamorphosed sedimentary rocks.

A discussion of Critical Areas usually includes the threatened and endangered plants, animals and natural communities recorded at the Maine Natural Heritage Program (MNHP). Frequently, the Maine Natural Heritage Program and Critical Areas Program (CAP) data overlap.

The Maine Natural Heritage Program only lists one rare animal and no plants or natural communities in Ogunquit, except for the registered Critical Areas. The animal is the Piping Plover (Charadrius melodious), a very rare sandpiper that nests on coastal sandy beaches and is found on only a few south coastal beaches in Maine. The Piping Plover is listed by both federal and state agencies as endangered.

PLANNING IMPLICATIONS FROM CRITICAL AREAS

Critical areas maintain biological diversity by providing necessary habitat for a wide range of plant and animal species. They provide undisturbed natural systems for research, educational

opportunities for teaching natural systems, and provide benchmarks in the changing environments modified by man.

Because of the fragile nature of the beach and dune systems and the vegetational compartments associated with them, it is important that these areas be monitored and management plans developed. The attractiveness of beach and dune environments for potentially damaging recreational and development uses could result in their eventual destruction. The maintenance and conservation of these areas and significant portions of the rocky coastline is especially important since they display a variety of values including: scenic, zoological, geological, botanical, educational, and scientific. Proper management of these exemplary areas is necessary in order that they be preserved for future use.

COASTAL ENVIRONMENT

EXISTING CONDITIONS

Ogunquit has one of the finest sand beaches, not only in the eastern United States, but in the world. A variety of national and international publications have recognized it as an exquisite natural resource.

The Town of Ogunquit provides public access to at least 85 percent of its shoreline. The public has access to a greater extent than many coastal communities. For example, the submerged land in the basin at Perkins Cove may be unique in Maine by virtue of being owned by the people of the Town, rather than by the state government. The Town also owns and maintains a number of public access points to its shoreline, including Ogunquit Beach, Footbridge Beach, Moody Beach, Perkins Cove, Marginal Way and various overlooks.

The following is a selected list of the publications researched in the preparation of this Section:

CLIMATE Fefer, Stewart I., and Schettig, Patricia A., An Ecological Characterization of Coastal Maine. Volumes 1, 2 and 3, U.S. Fish and Wildlife, Department of the Interior, Washington, D.C., 1980.

Wells Beach Planning Committee The Wells Bay Regional Beach Management Plan, Draft, February, 2002,

BEDROCK GEOLOGY
Hussey, Arthur M., The Bedrock of Southern York County. Maine. Department of Economic Development, Augusta, Maine, 1962.

Hussey, Arthur M., The Bedrock Geology of the Bath and Portland 2 degree Map Sheets. Maine. Maine Geological Survey, Department of Conservation, Augusta, Maine, 1985

SURFICIAL GEOLOGY
Thompson, Woodrow B., Surficial Geology Handbook for Coastal Maine. Maine Geological Survey, Augusta, Maine, 1978

Maine Geological Survey, Surficial Geologic Maps. Kennebunk and York Quadrangles. Department of Conservation, Augusta, Maine, 198

SOILS
Division of Health Engineering, Maine State Plumbing Code. Department of Human Services, Augusta, Maine, 1984.

Maine Cooperative Extension Service, Maine Soil and Water Conservation, and Soil Conservation Service, U.S. Department of Agriculture, Soil Suitability Guide for Land Use Planning in Maine. University of Maine, Orono, Maine, 1975.

Soil Conservation Service, Soil Survey of York County. U.S. Department of Agriculture. Alfred. Maine, 1982.

TOPOGRAPHY
Maine Soil and Water Conservation Commission, Environmental Quality Handbook: Maine. Erosion and Sediment Control for Developing Areas of Maine. Department of Agriculture, Augusta, Maine, 1986.

GROUNDWATER
Caswell, W. Bradford, and Lanctot, E. Melanie, Ground Water Resource Maps of York County. Maine Geological Survey, Augusta, Maine, 1975.

Lanctot, E., Melanie and Tolman, Andrews L., Hydrogeologic Data for Significant Sand and Gravel Aquifers in part of York County. Maine. MAP 2. Maine Geological Survey, Augusta, Maine, 1985.

Caswell, W. Bradford, Ground-Water Handbook for the State of Maine. Maine Geological Survey, Department of Conservation, Augusta, Maine. 1978.

WETLANDS

Adamus, Paul R., The Cumulative Impacts of Development in Southern Maine: Wetlands: Their Locations. Functions, and Values. Maine State Planning Office, Augusta, Maine, 1986.

Cowardin, Lewis M., Carter, Virginia S., Golet, Francis C., and Laroc, Edward T., Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C., 1979.

Mullen, Michael K., and Tolman, Andrews L., Fresh-Water Wetlands Map 2. Maine Geological Survey, Augusta, Maine, 1983.

FLOOD HAZARD AREAS

Federal Emergency Management Agency, Flood Insurance Rate Map. Village of Ogunquit. Maine. Panels: 1. 2 and 3. Washington, D.C., 1983.

MARINE ENVIRONMENTS

State Planning Office, The Geology of Maine's Coastline. A Handbook for Resource Planners. Developers and Managers. Augusta, Maine, 1983.

Maine Geological Survey, Coastal Marine Geologic Environments Maps. Kennebunk and York Quadrangles. Department of Conservation, Augusta, Maine. 1976

FORESTRY RESOURCES

Society of American Foresters, Forest Cover Types of North America. Washington, D.C., 1967

Fowells, H.A., Silvics of Forest Trees of the United States. U.S. Department of Agriculture, Forest Service, Agriculture Handbook ^271, Washington. D.C., 1965.

WILDLIFE RESOURCES

Jones, Jody, Important Wildlife Areas in Southern Maine. Department of Inland Fisheries and Wildlife. Augusta, Maine, 1986.

MARINE RESOURCES

Maine/New Hampshire Sea Grant Program, Increasing Clam Harvests in Maine. University of Maine, Orono, Maine. 1983.

Reports of the Clam Warden, Ogunquit Town Reports, 1981-1986.

CRITICAL AREAS

Nelson, Bruce W., and Fink, L. Kenneth, Geological and Botanical Features of Sand Beach Systems in Maine. Department of Oceanography, Ira C. Darling Center, Walpole, Maine, 1980.

Tyler, Hank, Personal communications, Critical Areas Program, Maine State Planning Office, Augusta, Maine, 1986.

MISCELLANEOUS

Office of Comprehensive Planning, State of New Hampshire, The Land Book. Concord, New Hampshire, 1980.

Eyerman, Mark J., All Land Is Not Created Equal. Greater Portland Council of Governments, Portland, Maine, 1976.

Dominie, Holly and Droege, M., Gaston, B., and Gobstcr, P., Coastal Scenic Landscape Assessment Final Report. Maine State Planning Office, Augusta, Maine, 1986.

Smyer, Carol A., Nature's Design. Rodale Press, Emanus, Pennsylvania, 1982.

E.C. Jordan Co., Inc., Ogunquit Village Corporation Comprehensive Plan: Land Use. Growth and Development Policies. 1975.

Ogunquit Planning Board and Moulton, Bradley S., Town of Ogunquit Comprehensive Plan Update. 1980.