



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1998 Volume III: Art and Artifacts: the Cultural Meaning of Objects

Technological Change in a Coastal New England Village, 1790-1990 - - The Duck Creek Harbor Site, Wellfleet, Massachusetts

Curriculum Unit 98.03.03
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Introduction.

This curriculum unit has been developed through my participation in the seminar, “Art and Artifacts: The Cultural Meaning of Objects,” offered through the YaleNew Haven Teachers Institute and led by Professor Jules Prown. The unit takes an interdisciplinary approach to learning, bringing together information from material culture, historical archaeology, ecology, and environmental science. I identify strategies for the study of excavated objects from an archaeological site using the language and methodologies of material culture. The evidence gained from these studies is used to examine changing technologies and associated environmental problems in a coastal New England village, Wellfleet, Massachusetts, an Outer Cape Cod town. It is my intention that my students develop an understanding of the changing beliefs and values of a society and its evolving culture over the two hundred year period from the late 1700s to the late 1900s. The curriculum unit is intended for use in my Environmental Science course, an elective science course for high school juniors and seniors. It is based on an historical archaeology project I have been conducting in Wellfleet for the past 28 years.

Environmental Science.

Environmental science is defined as the study of “how we and other species interact with one another and with the nonliving environment[,] . . . a physical and social science that integrates knowledge from a wide variety of disciplines . . . [to understand] how the parts of nature and human societies operate and interact” (Miller, Jr. 1998.) An important component of environmental science is the examination of technology, that applied science which employs process or invention or engineering to provide a society with the material objects of its civilization. The specific technologies which I consider in this unit include energy use (lighting devices), food handling and preservation (kitchen items), waste disposal (trash piles, chamber pots, and a “throw it in the creek” mentality), methods of transportation (carriage, railroad, sailing ship, steam ship, automobile), and those technologies more broadly encompassed in trade or commerce. The larger environmental problems which I anticipate will be introduced by this study and be given more indepth treatment as a spinoff of the unit include: (1) the nearextinction of the baleen whales of the North Atlantic (fin whales, humpback whales, and northern right whales); (2) the decimation of the Atlantic fishery; (3) the

changing economic base of Cape Cod (its principal economies have been farming/agriculture, nearshore whaling, fishing and shellfishing, tourism, and the presentday development of a thriving art colony); (4) the changing size of Cape Cod's population over time and the present period of significant increase in the building of retirement or second homes, and; (5) the human impact on marine, estuarine, and freshwater wetlands and upland communities since colonial times, including a progressive degradation of groundwater supplies.

Material Culture.

Material culture is "the study through artifacts of the beliefs values, ideas, attitudes, and assumptions of a particular community or society at a given time" (Prown. 1982.) Prown states that "objects made or modified by man reflect, consciously or unconsciously, directly or indirectly, the beliefs of individuals who made, commissioned, purchased, or used them, and by extension the beliefs of the larger society to which they belonged." He has developed a functional classification of the objects of material culture, recognizing objects of art, diversions, adornment, modifications of the landscape, applied (decorative) arts, and devices. The artifacts and the physical landscape of the Duck Creek Harbor site which I use in this unit fall within the categories of diversions (although there is limited representation of these), modifications of the landscape (there is much opportunity for study here), decorative arts, and devices.

The Duck Creek Harbor artifacts which are objects of diversion include a bisque doll's head, some doll accessories, and a collection of clay marbles (see descriptions below.) Modifications of the landscape include the placement of Commercial Street (which runs next to Duck Creek Harbor) and its structures and dwelling places, the foot bridge spanning Duck Creek (see below), a series of wharves and oyster shacks, shops and stores, the railroad tracks and dike, and the disturbed hydrologic flow of salt water and the storm drains dumping into the creek. The decorative arts are represented by Sandwich glass and other pressed glass, semiporcelains, and souvenir items. The devices combine the utilitarian with decorative elements. The unit explores the following topics which were important to the seminar: using objects as historical events; seeking an explanation of how the world we live in came to be; identifying the makers and users of the objects; seeking their attitudes and values; defining their objects' stylistic characteristics and their society and culture. It is my intention that this unit, with its focus on applied (decorative) arts and technological devices, will enable my students to develop some experience in the study of humanmade objects (including description, deduction, and speculation). Student work is intended to shed light on who the users of the artifacts were, their ages, relative wealth, gender, places of residence, and professions.

Classroom activities are presented to help in the recognition of stylistic influences and sources and trade networks. Artifacts are studied in a taxonomic manner, but their cultural significance also is sought. Again, a principal goal of the unit is to gain an understanding of the nature of New England society in a rural community during the Nineteenth and early Twentieth Centuries. As an additional note, it is my hope that the techniques that I develop for teaching about these objects and their connection with their parent society and culture will have some application to the teaching about objects of nature, the subject matter of scientists. The processes of description, deduction, and speculation which are central to the examination of artifacts bear strong resemblance to observation of, experimentation with, and theorizing about the natural world the methodologies of science.

Unit Objectives and Strategies.

In this unit my students use a collection of objects found in an archaeological dig to study the beliefs, values, ideas, attitudes, and assumptions of the people living and working in a small New England village during the period 1790 to 1990. They develop their abilities for description, deduction, and speculation about the objects. In the descriptive portion of the examination, they record the dimensions, composition, and articulation of the object, its decorative patterns, and its threedimensional appearance. They then make deductions about the object as they perceive it physically and functionally. Finally, they develop hypotheses and theories as to the role of the object in the society in which it was created, and they begin some scholarly research in an attempt to confirm or alter their earlier perceptions of the object. This process will serve to acquaint my students with technological changes which have occurred over a 200 year period.

Historical Context for the Duck Creek Harbor Archaeological Site, Wellfleet..

The earliest Cape Cod towns to be settled following the one month visit by the Pilgrims in 1620 were Sandwich (1639), Barnstable (1639), and Yarmouth (1639). All three towns are located on the bay shore of Cape Cod in what is called the Upper Cape. The first Lower Cape or Outer Cape (Atlanticfacing) town to be settled was Eastham (1644, incorporated 1651), followed by Truro (1703). Wellfleet Village was a part of Eastham from the mid1600s until 1763, when the town of Wellfleet was incorporated separately. Prior to this date, it was called the north precinct of Eastham. The first settlers of Wellfleet lived in upland areas cleared in the pitch pine scrub oak or broad-leaved forests, or they were a part of a small community of houses, stores, school and lighthouse on the island of Billingsgate at the southern end of Wellfleet Harbor. Early maps of Wellfleet show that Billingsgate was at the southern end of a series of islands - Bound Brook, Griffin, Great, Great Beach Hill, and Little Beach Hill islands - connected at various times by salt marshes and sand bars, including Jeremy Point. The Billingsgate settlement was abandoned by the mid1800s as eroding waters of Cape Cod Bay and Wellfleet Harbor wore down its uplands and reduced it to a remnant sandbar, now visible only at low tide.

In the early 1830s, the main Wellfleet settlement shifted from Billingsgate to the mainland, Wellfleet Village. The Village centers on Commercial Street, which runs along Duck Creek and Wellfleet Harbor to Mayo Beach, and Main Street, where the center of social life is found today. Commercial Street has changed substantially over the past 160 years, but a few of its original structures remain, including Simeon Atwood's hardware store (now a gift shop), several other stores (now mostly art galleries), and homes (see maps of Wellfleet). Duck Creek is a small tidal creek to the north and east of Wellfleet Harbor, separated from it by Shirttail Point. Prior to 1870, the creek had a fairly wide opening to the harbor, and it flowed a circuitous path north through extensive marshland to surrounding uplands. In the 19th century, the construction of Route 6 through Wellfleet cut off the northernmost portions of the creek. The 1870 construction of a railroad trestle across the southern mouth of the creek narrowed this opening to Wellfleet Harbor substantially. As a result, the hydrology of Duck Creek was severely altered, and silts and sediments which previously had been washed out of the creek by twiceaday tidal action were deposited within the limits of the creek, a process which continues today.

Over the last 120 years the water depth inside Duck Creek has been reduced from the 1015 feet available to large sailing ships at high tide to today's maximum 712 feet at high tide. Mud deposits 23 feet thick have developed throughout the creek. As the 1870 trestle prevented ships from entering Duck Creek, requiring

them instead to discharge or pick up cargoes at Commercial and Mercantile Wharves in Wellfleet Harbor, the loss of water depth in Duck Creek was of little consequence. The mud which has accumulated in the creek serves to trap any humanmade objects which have been thrown or dropped into the water, locking them in place near where they were originally deposited. My archaeological work in the mudflats, begun in 1970, focuses on the recovery of any artifacts from late 18th and 19th century life in Wellfleet. Digging by hand in thick mud deposits, I slowly move through a chosen area and remove any glass, earthenwares, metal work, or leather that is exposed to view. The process is very labor intensive, but each day's work turns up an abundance of artifacts. I dig in the mud 1020 times a year, mostly during the summer, spending two to three hours at a time before running out of energy. Because the objects do go through some translocation in the mud from continual tidal action, there is little stratigraphic layering of objects at this site. The mud serves as a slowmoving soup which turns over objects and brings some of them to the surface from year to year. Other artifacts, trapped deeper in mud deposits, are found only by digging down to the sandy substrate which underlies all of Duck Creek.

A series of wharves used to jut in from the edges of Duck Creek in the 19th century, and artifacts are concentrated around the remnant pilings of these wharves. The richest deposits of artifacts, however, are found below Uncle Tim's Bridge, a foot bridge which has connected Commercial Street to Cannon Hill and Route 6 since at least 1844. The house once lived in by Tim Daniels (1807-1893) is located on Commercial Street just opposite the foot bridge which bears his name. Daniels used to operate a ship chandlery business at the head of the bridge. A few wooden pilings jut out of the sand and mud to mark the location of the two chandlery buildings that once stood here (see early photographs).

I believe that the material trapped in Duck Creek mudflats originated as the trash of homes located along Commercial Street, as well as from the commercial buildings on the street and from seagoing ships tied up at wharves in the creek. The artifacts thus reflect the domestic and commercial life of Wellfleet Village for a period of two hundred years. For this study I have identified a small number of decorative objects and devices which will form the material culture basis of the unit. One object, a brass box iron, has been used in the seminar for an in-depth examination of an object, using the methodology developed by Jules Prown. I suggest ways in which students can conduct similar studies of additional artifacts from the Duck Creek site, as they consider changing technologies and technological devices. These study objects include a pewter rat tail spoon, a redware milk pan, a brass candle holder, a brass harbor telescope, two Sandwich Glass whale oil lamps, a whaling harpoon and a blubber flensing tool, a wrought iron eel spear, a Staffordshire ironstone water pitcher, a collection of medicinal bottles, souvenir cups and plates, and children's play things (a bisque doll's head and doll chinaware).

Cape Cod Geology and Ecology.

Cape Cod's geology, ecology, and environmental issues are closely linked. The Cape was formed during the Pleistocene Epoch, beginning 21,000 to 16,000 years ago when the Wisconsin Glacier reached its maximum extent at what are now the south shores of Martha's Vineyard and Nantucket Island. By 16,000 years Before Present, three adjacent lobes of the glacier had taken form, the Buzzards Bay, Cape Cod Bay, and South Channel glacial lobes. These stalled over the centers of Martha's Vineyard and Nantucket, and in conveyor belt fashion they built up the land with glacially transported materials. A thousand years later, the lobes had retreated to positions centered on the Elizabeth Islands, the Sandwich moraine, and the Atlantic coastal plains

of Truro, the Truro Highlands, Wellfleet, Eastham, and Nauset, and they built up these lands. With glacial retreat completed approximately 14,500 years ago, Cape Cod had assumed its basic glacial identity.

Present day geological map units for the Cape's Pleistocene glacial deposits include the following: moraine deposits (sand and gravel, silt, clay, glacial till, and boulders - Sandwich, Buzzards Bay); pitted plain deposits (sand and gravel with some boulders - Mashpee, Wareham); outwash plain deposits (gravelly sand with some silt, clay, glacial till and boulders - Buzzards Bay, Harwich - occurring south of the moraines); ice-contact deposits (sand and gravel, till, and many scattered boulders - Dennis, Nantucket Sound - south of the moraine); coastal plain deposits (gravelly sand, silt, clay beds, and scattered boulders - Truro, Highlands, Wellfleet, Eastham, Nauset Heights, and Barnstable), and; lake deposits (gravelly sand with some silt, clay, and till - Cape Cod Bay). The coastal plain deposits of Wellfleet are significant to this unit, as they permit easy percolation of fresh water through gravelly sand, as well as easy percolation of contaminating toxic substances, pesticides, phosphate fertilizers, sewage, etc.

During the Holocene (10,000 BP to the present), the erosion of glacial deposits and the action of wind and waves gave further shape to Cape Cod. Geological map units of post-glacial deposits include: dune deposits (sand) on top of and along all cliffs of the Atlantic Ocean and Cape Cod Bay shore; beach deposits (sand, with some gravel and locally abundant boulders) formed by the action of wind and waves; sand and gravel deposits in kettleholes and valley floors; marsh and swamp deposits (decaying salt marsh plants mixed with sand, silt, and clay); artificial fill (human-deposited sand, gravel, and rip rap), and cranberry bogs (peat deposits topped by a layer of sand, often produced by the human conversion of white cedar swamps to agricultural land) (see Oldale and Barlow. 1986.) Beach deposits in Wellfleet include Jeremy Point, the north and south tips of Indian Neck, Mayo Beach, the northeastern tip of Lieutenant Island, and the northern tip of Wellfleet Bay Wildlife Sanctuary lands. Marsh and swamp deposits in Wellfleet include Duck Harbor marsh, the Herring River marshes, Great Island and Great Beach Hill Island marshes, Duck Creek, Indian Neck marsh, Lieutenant Island marsh, Blackfish Creek, and the Wellfleet Bay Wildlife Sanctuary marsh. Undifferentiated sand and gravel deposits of kettles and valleys include thin strips of land connecting Gull Pond (Wellfleet) and Slough Pond (Truro) to their adjacent marshes and swamps. Artificial fill in Wellfleet is limited to the town marina, although in earlier years there was a band of rip rap at The Gut, prior to its removal in the late 1970s by the National Seashore. A slide set described below focuses on the freshwater kettlehole, marsh and swamp deposits of Wellfleet and the artificial fill of the railroad dike over the mouth of Duck Creek.

Cape Cod consists of sand and gravel, silt, clay, boulders, and peat deposits. Higher elevations are occupied by forests, grasslands, and heathlands, and lower elevations by wetlands and swamp forests. Salt marshes are found along the Atlantic and Cape Cod Bay coastlines, protected by barrier beaches, embayments, and mouths of rivers. These change to brackish and freshwater marshes as one moves inland away from the tidal waters. A remarkably wide variety of freshwater wetlands is found at inland sites. Cape Cod has in excess of 350 freshwater ponds in all stages of development, from deep bodies of open water to quaking bogs and sphagnum bogs to wet meadows. A brief review of those upland habitats and freshwater wetlands occurring on the Outer Cape is useful for a study of Cape Cod's critical environmental issues. I focus on the globally uncommon habitats identified in ecological studies of Cape Cod and mapped during the development of the Cape Cod Critical Habitats Atlas (VanLuven. 1990.)

The upland habitats of Cape Cod which are globally uncommon and globally significant are pitch pine/scrub oak barrens, critical woodland communities of hardwood trees uncommon or rare on Cape Cod, sandplain grasslands, heathlands, and grassy heaths. The Atlas defines sandplain grasslands as "grassy areas dominated by the tussock-forming bunch grasses little bluestem (*Schizachyrum scoparia*), and poverty grass

(*Danthonia spicata*).” These are found only in the Upper Cape towns of Bourne, Sandwich, Barnstable, and Falmouth. Heathlands are “open areas dominated by dense, prostrate mats of bearberry (*Arctostaphylos uva-ursi*), black huckleberry (*Gaylussacia baccata*), and either beach heath (*Hudsonia tomentosa*) or golden heather (*H. ericoides*). These are found only in the towns of Eastham and Wellfleet, at the Coast Guard Beach area and the Marconi Beach/Wildlife Management areas, respectively. Grassy heaths are “assemblages of sandplain grassland and heathland species in which neither association is dominant.” These are restricted to Corn Hill and an area near Pond Village, both along the bayside of Truro. I have studied and photographed the heathland communities of the Marconi site in Wellfleet (see slide set #2).

The pitch pine/scrub oak barrens are “dry, open [canopy] pitch pine (*Pinus rigida*) forests which typically have almost impenetrable understories of scrub oak (*Quercus ilicifolia*).” Open areas are covered by bearberry, sedges, reindeer moss and British Soldier lichens. Tree-sized Black Oak (*Q. velutina*) and White Oak (*Q. alba*) are not found in these pine barrens, although they are widespread in the far more abundant and more densely vegetated pitch pine/scrub oak forests of the Cape. The pine barrens are found in Mashpee on the Upper Cape and on Great Island in Wellfleet, as well as in other Wellfleet and Truro locations. My studies of pitch pine barrens have centered on the Great Island area.

The critical woodland communities of Cape Cod are late-successional, broad-leaved or hardwood forests which persist only in remnant stands in two Upper Cape towns (Barnstable and Mashpee) one Mid-Cape town (Brewster), and the Outer Cape towns of Wellfleet and Provincetown. Broad-leaved tree species which are rare on Cape Cod are American Beech (*Fagus grandifolia*), Coastal Basswood (*Tilia neglecta*), American Holly (*Ilex opaca*), Yellow Birch (*Betula alleghaniensis*), Black Birch (*B. lenta*), Post Oak (*Quercus stellata*), and Hickory (*Carya* spp.). Outer Cape stands of critical woodland tree species are found in Wellfleet at the Wellfleet Bay Wildlife Sanctuary (a Post Oak/Hickory stand on Try Island), west of Herring Pond (American Beech), and in Provincetown where a large stand of American Beech is found on the edge of the Provincelands. The National Seashore has an easily accessible trail running through this Beech Forest. I have photographed all three Outer Cape sites. One must travel to Sandy Neck and Marstons Mills Airport in Barnstable and the Mashpee and Santuit Rivers in Mashpee to see well-developed stands of American Holly and Coastal Basswood. Yellow Birch and Black Birch stands were unmapped at the time of the Atlas Project, but Yellow Birch can be expected to grow in cool, moist areas (in association with red maple and Atlantic White Cedar), and Black Birch grows on moist slopes and along forest edges.

Freshwater wetland critical habitats include significant coastal plain pond shore communities, quaking bogs, sphagnum bogs, vernal pools and amphibian breeding habitats, Atlantic White Cedar swamps, and anadromous fish runs. I give brief descriptions of these habitats here. Lengthier descriptions of the other freshwater wetlands may be found in my 1995 Teachers’ Institute curriculum unit, Freshwater Wetlands of Connecticut. Coastal plain pond shores are found around many kettle ponds of the Cape, and they develop their greatest abundance of plant and animal life when the ponds dry down in late summer, exposing five to ten feet of wet sandy substrate that marks the transition from highest water line to lowest water line. The Atlas defines these as “critical habitat for many state-listed rare plant and wildlife communities” and “globally rare habitat.” Common and rare pond shore plants include grasses, sedges, rushes, and wildflowers (see representative species in slide set #2). The damselflies and dragonflies are among the most interesting and diverse of pond shore invertebrates, with nearly 100 species found on Cape Cod. Their names suggest their color and beauty, grace in flight, and predatory behavior: Ebony Jewelwing, Amber-winged Spreadwing, Violet Dancer, Bog Bluet, Civil Bluet, Barrens Bluet, Sphagnum Sprite, Blue Darner, Common Green Darner, Sand Dragon, Calico Pennant, Blue Pirate, Damson Skimmer, Goldenwings, Tenspot, Whitetail, Corporal Skimmer, Band-winged Meadowfly, Red Saddlebags. The smaller, more shallow Wellfleet ponds are particularly good for

viewing damselflies and dragonflies: Turtle, Grass, Higgins, and Spectacle Ponds, and any associated vernal pools. Vertebrates of pond shores and surrounding uplands include Green Frog and Bullfrog, Painted Turtle, Snapping Turtle, and Eastern Box Turtle, and a number of birds, such as Great Blue Heron, Spotted Sandpiper, Least Sandpiper, Belted Kingfisher, Eastern Kingbird, swallow species, Gray Catbird, Cedar Waxwing, Pine Warbler, Common Yellowthroat, Red-winged Blackbird, Common Grackle, and American Goldfinch.

Quaking bogs are “floating mats of tangled roots and rhizomes which support thick accumulations of Sphagnum moss”, while sphagnum bogs are “perpetually saturated wetlands distinguished by unusually thick mats of Sphagnum moss and deep layers of peat.” Basically, quaking bogs have floating mats above open water, while sphagnum bogs are glacial kettles filled entirely with Sphagnum deposits. Truro has two classic quaking bogs, Featherbed Swamp and an unnamed bog just north of Round Pond in South Truro. I have taken core samples of the scattered, stunted pitch pine trees growing on the sphagnum beds and have determined that the trees, while only 6 to 15 feet high, have been growing for between 45 and 90 years at a rate of less than one inch trunk diameter per decade. Wellfleet’s only sphagnum bog is an extensive bog near Marconi Beach parking lot. This bog illustrates well the effects of nor’easters and hurricanes, as there are some sizeable pitch pine trees uprooted and fallen into the bog.

Vernal pools are temporary or ephemeral freshwater wetlands which typically fill up to a depth of 1-2 feet in February or March from snow melt and spring rains, exist as bodies of water for a few months, and dry up by late summer. They are breeding habitats for several amphibian species, including Marbled Salamander (*Ambystoma opacum*), Spotted Salamander (*A. maculatum*), Eastern Spadefoot (*Scaphiopus holbrooki*), and Wood Frog (*Rana sylvatica*), four species which will only breed in these fish-free habitats and thus are called obligate vernal pool species. A number of invertebrates are found in vernal pools, including the obligate species fairy shrimp (Order Anostraca). On June 14, 1998 during a Wilbur Cross High School field trip to Cape Cod, my students and I observed a breeding aggregation of spadefoots in a Wellfleet Village drainage ditch, a previously known site for this extremely hard to find species.

Atlantic White Cedar Swamps are critical habitats found in a narrow Atlantic coastal belt from southern Maine to North Carolina, with disjunct populations of white cedar (*Chamaecyparis thyoides*) to northern Florida and the Gulf Coast. On Cape Cod, they are found in Bourne, Barnstable, Yarmouth, Mashpee, Falmouth, Dennis, Harwich, Brewster, Orleans, Eastham, Wellfleet, and Provincetown. Atlas requirements for mapping cedar swamps included a minimum of 20 trees and a canopy cover of 50% or more. I have studied the cedar swamp at the Marconi site in Wellfleet, the type site for Cape cedar swamps. National Seashore literature indicates that this cedar swamp first developed 7000 years ago when a rising sea level intersected a dry kettle and created conditions necessary for the growth of sphagnum mosses and Atlantic White Cedar. Cedar swamps are dependent on periodic major disturbance for their long-term existence. Nor’easters and hurricane-induced blowdowns of trees, fires, or logging are required in order for these swamps to continue to exist. Without serious disturbance, white cedars eventually are outgrown and topped by hydric soil-loving red maples (*Acer rubrum*), which shade and kill the more light-dependent conifers. Severe competition between white cedars and red maples is very evident in the Marconi cedar swamp today, where red maple crowns fill every available gap in the canopy. The National Park Service underestimates of the age of the Marconi cedar trees at about 70-100 years old, a figure which is based on a limited number of trees cut from the swamp during the installation of a boardwalk or from tree cores. I have determined that some medium-sized white cedar trees are 130 years old and that others, twice as thick, are between 250 and 300 years old.

Cedar swamps are generally low in vertebrate species diversity, but one representative bird species of the Marconi cedar swamp is Whip-poor-will, a nightjar species which has been declining in its northeastern

populations for the past several decades. Chuck-will's-widow also occurs here annually, at least since the summer of 1996 (Broker, unpublished field notes), suggesting that breeding of this species on Cape Cod will occur and be documented before long.

Anadromous fish runs refer to small rivers and streams which connect freshwater bodies such as kettle ponds with estuarine and marine environments. Anadromous fishes are born in freshwater environments, migrate to the sea where they spend adulthood, and return to freshwater for breeding. The Cape's three species of anadromous fishes are Blueback Herring (*Alosa aestivalis*), Alewife (*A. pseudoharengus*), and White Perch (*Morone americana*). Nearly all Cape towns have one or more anadromous fish runs. I have studied and photographed the Herring River in Wellfleet, which connects Herring Pond with Herring Cove and Wellfleet Harbor. The Herring River has received much ecological study and management attention in recent years, and efforts have been made recently to restore it to its former free-flowing condition.

Cape Cod's Critical Environmental Issues.

Several environmental problems facing Cape Cod's communities can be addressed through a study of the artifacts I have found at the Duck Creek archaeological site. A brief review of them is given here.

(1) Direct human exploitation of wildlife, and endangered species. The best example of this issue is the near-extinction of the great or baleen whales. Wellfleet men participated in near-shore and ocean-going whaling for a period of 250 years. Whaling artifacts I have unearthed are a whale blubber cutting blade, a harpoon, and a harbor telescope.

(2) Habitat loss. The salt marshes, vernal pools, and critical woodland habitat of Cape Cod have been filled in and cut down as the Cape has developed and responded to a growing population. The best example of this in Duck Creek is the impact that humans have had on the creek's normal tidal flow, affected since the 1870 construction of the railroad dike and the filling in of the innermost portions of the creek to construct Route 6 through town. The drainage ditch in Wellfleet Village which is home to spadefoot toads is right on the edge of development.

(3) Water quality issues. Point source and non-point source pollution threaten the quality of Cape Cod's two aquifers and the drinking water they deliver to its residents. The spadefoot drainage ditch has a noticeable sewage smell which threatens the continued existence of this species at this site. Slide set #3 includes a photograph of Duck Creek which shows the town sign announcing that shellfishing is off limits within the creek, formerly the location of a thriving oyster industry.

(4) Solid waste disposal. The town dump is located not far from Duck Creek, on the other side of the Village. For years, trash and garbage were brought to the dump for land fill disposal. In recent years, however, recycling has played a major role in the disposal of trash, and all garbage is loaded into trucks for removal from the Cape. This major change in town policy is to be brought out in discussions of unit topics. The Duck Creek archaeological site is a rich one precisely because many people of the 17th, 18th, and 19th centuries were in the habit of disposing of their trash by pitching it into the creek. The best artifact to lead into a discussion of waste disposal is the ironstone chamber pot to be studied (but not used!) by the students.

(5) Changing land use practices and changing economies. Wellfleet has been a town of farmers, whalers, fishermen, shell fishermen, merchants, sea captains, those who depend on the tourism industry, artists, and retirees. Each of these professions has been at the heart of Wellfleet's and Cape Cod's economy at times in the past. By using the early maps and photographs of Wellfleet Village and some of the artifacts, my students will learn about the economic underpinnings of the town, and how the size of the population and the fortunes of the people have ebbed and flowed during the history of the town. For example, population data indicate that with the coming of the steam age (1840s and following), Cape Cod's wind-powered sailing ships were no longer efficient in moving fish and shellfish to ports around the world. Newly developed steam ships could move products from anywhere to anywhere with new speed and efficiency. The result was a collapse in the Cape's human population. Fully half the Cape residents moved off-Cape in the period 1850-1910 because they were unable to make a decent living with the advent of the steam age.

The Assemblages of Artifacts From Duck Creek Harbor.

Coarse Earthenwares. I have recovered from the Duck Creek mudflats numerous fragments of coarse earthenwares or ceramics. These jugs, jars, crocks, bottles, and bowls are made of coarse or fine clays, and they reflect several technologies used in the making of ceramics. The main earthenwares are redware, yellowware, and saltglazed stoneware pottery. Redware is defined as European or early American pottery generally of the utilitarian type made from clay containing iron mineral compounds which are fired to a reddish hue in the kiln (McConnell, 1988.) Redware pieces include milk cooling basins and bowls and milk jars which are glazed on the inside and unglazed on the outside. The milkcontaining vessel first is soaked in water, then dried inside and filled with fresh milk. The unglazed outer surface of the vessel loses its water to the air, thereby cooling the clay and keeping the milk cool. This is a predecessor to the modernday refrigerator. Redwares are particularly difficult to date, as they were in use through much of the American colonial period. They were popular containers until late in the 19th century, when less expensive potteries were introduced. Yellowwares account for a far greater share of the ceramic assemblage from Duck Creek Harbor. Yellowwares were manufactured by a number of American potteries from the 1830s through the 19th century and well into the 20th century. Yellowware continues to be used today in the making of kitchen mixing bowls. Pieces from Duck Creek include a number of bowls, cups, and plates, some plain, some fairly elaborately embossed, and some with decorative glazes. Finally, there is a large assemblage of saltglazed earthenware or stoneware from Duck Creek. This includes jugs, jars, bean pots, crocks, and wine bottles. Some containers are plain, and some

have cobalt blue glazes, including one crock identifying a pottery manufacturing company, “_____ & Casey,” with an address at Kneeland Street, Boston.

Staffordshireware, or Ironstone China. By far the most abundant type of material to be recovered from the Duck Creek site is ironstone china, a fairly inexpensive, highly utilitarian china manufactured in the Staffordshire region of England, including the towns of Burslem, Cobridge, Tunstall, and Hanley. There are large and small fragments of plates of all sizes, bowls, cups, pitchers, basins, and chamberpots. These are among the most datable objects from the archaeological site, as many of the pieces have trade-marks transferprinted or stamped on the bottom of the container which identify the manufacturers of the products. The marks are readily identifiable in encyclopedias of British pottery and porcelain marks. Such manufacturers as Elsmore and Forster, Anthony Shaw, John Alcock, J. & G. Meakin, and J. Wedgwood are represented in pieces found. Although the McKinley Tariff Act of 1891 required that all ceramics imported into the United States show the place of manufacture, Staffordshire potteries were using makers marks as early as 1815. These marks allow the dating of pieces to a range of years for example, Elsmore & Forster ironstone china, with trade-marks often showing the British Royal Arms (lion & unicorn), were manufactured between 1853 and 1871. Anthony Shaw pieces made in Tunstall date to the period c1851-1856, while those made in the Staffordshire town of Burslem were manufactured between c1860 and c1900. Those pieces which have impressed registry marks record the actual day of manufacture through an encoded system, or at least the earliest date that the piece could have been manufactured. The Staffordshire ironstone china provides an important method for crossdating other objects in the entire collection of Duck Creek artifacts. Flow blue Staffordshire and feather edge patterning on plate edges are two of the more decorative forms of ironstone china recovered from the mud.

Pressed Glass. Several hundred fragments of pressed glass dishes, bowls, cups, pitchers, and other forms have been found. Pressed glass items were manufactured in a number of American glass companies throughout New England and eastern states. Among the most famous of these companies were the Boston and Sandwich Glass Works (Sandwich, Cape Cod), and the New England Glass Works (Boston). Pressed glass is highly collectable, and the patterns which were impressed on the glass are quite readily identifiable as to manufacturer and time of production. Two pressed glass pieces of particular interest to this study are Sandwich Glass whale oil lamps, the first manufactured in the early Sandwich Glass period of 1828-1835, and the second during 1840-1850.

The use of whale oil to provide a source of light in homes and on shipboard preceded the use of kerosene in 19th century America.

Glass Bottles. Approximately 1000 whole glass bottles and top and bottom fragments of another 1000 bottles have been found in the mud of Duck Creek. These bottles include containers for alcoholic beverages (beer, wine, liquors), medicinal bottles, bitters bottles, soda bottles, perfume bottles, and a variety of other glass containers. They are divided into those bottles which are embossed (e.g., Morse’s Celebrated Syrup; The Cuticura System of Curing Constitutional Humors; Mulford’s Predigested Beef; Kickapoo Indian Cough Cure; Dr. Kilmer’s Swamp Root, Kidney, Liver, and Bladder Cure; Dr. Hough’s Antiscrofula Syrup; Dr. Langley’s Root & Herb Bitters; Cape Cod Pilgrim Mineral Spring Company), and unembossed bottles, which may have geometric or inset panels, gothic arches, swirls, or a variety of other surface features, or they may be plain. Place of origin is shown on a number of the embossed bottles, and trade routes can be established for Wellfleet and other Cape Cod towns. The bottles can be used to establish changing methods of health care (bitters bottles contained medicines which were 12-15% alcohol) and changing domestic culture (stove polish, foods, etc.). Bottles are dated by the height of the bottle seam extending up the neck of the bottle, and by the presence or

absence of pontil marks, bubbles in the glass, irregularities, and other means.

Metalwares. A number of metal objects have been recovered from Duck Creek, including brass, iron, and pewter. Brass objects include kerosene lamp parts, a harbor telescope, a box iron, and a variety of brass fittings believed to have been used in the home and onboard ship. Ironwares include an eel spear, a harpoon, and a whale blubber flensing blade. These objects are datable by their method of manufacture, and occasionally by embossing on parts, such as the wick adjusting knobs of kerosene lamp parts.

Leather. A small assemblage of leather items has come out of the mud, particularly women's leather shoes, portions of which are in an excellent state of preservation due to having been buried in anaerobic muds for a hundred years or more. Several button shoes and lace shoes have been found, and they reflect styles of dress for the time periods involved.

Faunal Remains. Approximately 2000 animal bones have been found, primarily cow bones, but including deer, sheep, and dolphin and whale bones. These faunal remains can be studied for 19th century butchering techniques as well as for the socioeconomic levels of the people who were consuming the cuts of meat. Large leg bones, for example, reflect expensive cuts of meat such as roasts and steaks, and ribs reflect far less expensive cuts. While it is difficult to determine whether these bones originated in the garbage of the domestic homes along Commercial Street in Wellfleet or were dumped overboard from ships tied up at wharves in Duck Creek Harbor, one can speculate that the high percentage of ribs in the bone assemblage reflect cuts of meat that were used on shipboard, perhaps heavily salted for oceangoing voyages. One interesting rib fragment bears the patterned ink stains of a person presumably practicing the making of scrimshaw, most likely undertaken during a free moment at sea.

Study Objects From the Duck Creek Harbor Site.

The following list of artifacts from the Duck Creek Harbor site identifies those objects which I feel have the maximum potential for a student study of material culture and environmental issues. I plan to have these objects in the classroom during the teaching of the unit, as well as having a slide set (#3) available for student use.

(1) A pewter rattail spoon, c1770-1780. Length, 7 3/8", Width, 1 1/2". This is the oldest known object I have excavated from the Duck Creek mud flats. It was a common kitchen utensil in use during the latter portion of the 18th century.

(2) A brass box iron, c1790. Length, 6 3/4", Width, 3 1/2", Depth of body, 1 5/8", overall Height, 5 3/4". This artifact, found in the mid-1970s, was the study object I selected for the seminar. My description, deduction, and speculation about the box iron are available from the Teachers Institute collection of classroom materials. Box irons were used for a period of decades in the 18th and early 19th centuries, then were replaced by solid irons (made of iron). The electric versions of today preserve the shape and size of those irons used 250 years earlier. This is a good example of changing technology.

(3) A brass harbor telescope, c18201825, inscribed "J. J. Messer, London/Day Or Night." English. Length, 18 3/4", Maximum Width, 2 1/2". The telescope was used for near-shore purposes, such as catching sight of pods of Long-finned Pilot Whales, the primary source of whale oil for the residents of Wellfleet. This object raises issues of navigation, commerce, and the endangerment of marine mammals.

(4) An eel spear, made of handwrought iron, c18001850. Length, 12 1/2", Width, 5". Eel spears of today have the same fundamental structure and appearance of this artifact. The method of manufacture has changed, however, with casting and mass production replacing the hand-wrought process. I use this object to help focus on one of the Cape's most important industries, fishing.

(5) A wrought iron harpoon, c18001850. Length, 20 1/4", Maximum Width, 2". This 19th century whaling harpoon has no modern counterpart on Cape Cod, as U. S. whaling is completely banned by the Marine Mammal Protection Act of 1972. Near-shore and ocean-going whaling offered popular and important livelihoods for some of the residents of Wellfleet from colonial times to well into the 19th century. Interestingly, the brass telescope mentioned above provided a visual link between user and whale, while the harpoon represents a highly physical link.

(6) A whale blubber flensing blade, made of wrought iron over a remnant wooden handle. The flensing blade is another physical link between user and whale, although when put into use the whale is already dead. Again, I use this object to represent a former method of commerce in Wellfleet and to lead to more expanded study of endangered species.

(7) A Flow Blue Staffordshire ironstone china sugar bowl, c18301840. This piece is one of the finer examples of the most abundant artifacts of the archaeological site, the fragments of ironstone china plates, bowls, and containers. It is best used to develop some student thinking on trade networks, including international ones.

(8) A series of embossed medicinal bottles, including: (a) The Cuticura System of Curing Constitutional Humors, Weeks and Potter, New York; (b) Dr. Hough's Antiscrofula Syrup; (c). Dr. Langley's Root & Herb Bitters; (d) Dr. Seth Arnold's Cough Killer; (e) Dr. Cummings' Vegetine; (f) Atwood's Jaundice Bitters/Moses Atwood/Georgetown/Mass.; (g) Congreve's/Elixer/For Cough's/Hooping Cough/& Asthma; (h) Healy & Bigelow's/Kickapoo/Indian Cough Cure; (i) Mrs. Winslow's/Soothing Syrup/Curtis & Perkins/Proprietors; (j) Household Panacea/Curtis & Brown/New York; (k) Liquid/Opodildoc. These "medicine doctor" elixirs and cure-alls pre-date the Federal

Food and Drug Administration, although it can be argued that we have a wide assortment of phony drugs and medicines on the market today. These medicines, especially the bitters, were very high in alcohol content. Students can get a kick out of the variety of names on the bottles, and they can draw some inferences about health and illness today and in the past. A consideration of environmental health issues can follow.

(9) Several souvenir plates and cups, black transferprinted and multi-colored, showing Main Street, Wellfleet and the Congregational Church, also Uncle Tims Bridge and Duck Creek, ca. 1895-1910. One of these, a souvenir slipper, is stamped "Made in Germany/for/Mrs. E.B. Ryder/Wellfleet, Mass." Wellfleet cemetery records show that Mrs. Eunice B. Ryder lived from 1849 to 1930. These are best used to represent the change of Wellfleet's principal economy from one of fishing and shellfishing to the tourism industry. Tourism began to develop in a serious way in the late 1880s and 1890s when the Chequessett Inn was constructed and run by Lorenzo Dow Baker on Mayo Beach.

(10) An ironstone chamberpot, with blue transfer print, showing an oriental scene with pagodas, castles, and peacocks. This essential object predates the advent of indoor plumbing and sewage systems. It is a lively and personal example of changing technology and changing magnitude of waste disposal. There are numerous possibilities for consideration of environmental issues in examining the chamberpot and the cultural insights it offers.

(11) Two Sandwich Glass whale oil lamps, dated to the periods 1825-1835 and 1840-1850. These are among the most interesting and useful artifacts to come out of the Duck Creek mud. Student study of them can lead to a consideration of lighting technologies, whaling and species endangerment, regional industry, non-sustainable harvest, and renewable versus non-renewable energy sources.

(12) An ironstone china pitcher, with purple transfer print and the text, "White Squall/C. N. & Co./1864/Liverpool." This object is one of the clearest and most persuasive artifacts indicating that the material culture trapped in Duck Creek mud flats came in part from a seafaring or maritime industry. It undoubtedly fell or was pitched into the waters of Duck Creek from a sailing ship tied up at the wharf near Uncle Tim's Bridge, perhaps because it had become cracked. Students can speculate about how the pitcher got into the mud, after they develop a good understanding of what it was used for. Those who are familiar with antiques and decorative objects know that pitchers and basins were the essential pieces of china used at home (and onboard ship) to wash hands and wash foods.

(13) A redware milk cooling basin and a redware milk cooling bowl or preserve jar , each with lead glazed interior, early to middle 1800s. These were early forms of refrigerators, as they were very effective in keeping milk cool and unspoiled through evaporation of water from the unglazed outer surfaces of the vessels. Study of them leads to a consideration of changing technology and energy use.

(14) A collection of faunal remains, including one rib fragment with a pattern dyed unto the surface. The rib is an example of practice scrimshaw, and it is good evidence that many of the faunal remains (ribs, leg bones, shoulder blades, vertebrae, etc.) were thrown into the mud from sailing ships tied up in Duck Creek. Faunal remains are used by anthropologists for studies of socioeconomic levels of the populations producing these bone fragments. They are tangible evidence of what was being eaten by the social group. Upper level socioeconomic groups would have a greater percentage of roasts than ribs and less expensive cuts of meat in their diets, for example. These artifacts can be used for a greater understanding of the daily lives of the people who lived and worked around Duck Creek. The bones are fun to play with, in the process!

(15) The 1858 Henry F. Walling Atlas of the Counties of Barnstable, Dukes and Nantucket, Massachusetts, map of Wellfleet Village; the 1884 George H. Walker Atlas of Barnstable County, Village of Wellfleet; the 1907 Walker Atlas of Barnstable County, Village of Wellfleet. These three maps show in great detail the Duck Creek Harbor section of Wellfleet Village, including the names of home owners and shop keepers and the types of shops found along Commercial Street. By comparing information among the three maps, which span a period of a half-century in the town, one can learn a great deal about changing land use practices, commerce, and distribution of wealth. For example, Lorenzo Dow Baker, the founder of the United Fruit Company who brought us bananas from the Caribbean, was a major land holder in Wellfleet in the late 1800s and early 1900s.

(16) A collection of children's playthings, including a bisque doll's head (made in Germany), bisque doll arm and leg, dolls' ironstone miniature pitchers and basket, a clear glass candy container shaped like a pistol, and 18clay marbles. Few artifacts clearly associated with children and play have emerged from the Duck Creek mud flats. These several examples of play things can lead students into consideration of recreation and play, use of leisure time, and domestic life in the town of Wellfleet, including the various forms of child's play.

Sample Lesson Plans and Specific Activities of the Unit.

(1) Maps and photographs of Wellfleet Village and Duck Creek Harbor. Students compare and contrast 19th century and modern photographs, maps, and engravings of the Duck Creek region of Wellfleet, and they make note of changing land use practices. The early maps of this region often show the names of home owners and commercial establishments along Duck Creek. More recent maps contain less information about ownership but are more complete in representing topographic features of the land. The maps to use are: the 1858 Atlas of the Counties of Barnstable, Dukes and Nantucket, Massachusetts, Village of Wellfleet, by Henry F. Walling; the 1884 Atlas of Barnstable County, Village of Wellfleet, by George H. Walker; the 1907 Atlas of Barnstable County, Village of Wellfleet, by Walker Lithographic & Publishing Company, and the 1972 U. S. Geological Survey Topographic map of Wellfleet. Students should ask questions of the following types: What are the natural features on the map? How was the system of roads developed? Who were the land holders? What stores, shops, and other commercial buildings are noted on the map? What type of activity took place at each store? What is the relation between the natural features on the map and the human modification of the environment? How did movement of people and goods take place in each section of the map? What forms of negative environmental impact were occurring in the vicinity of Duck Creek? The Wellfleet Historical Society/Rich Family Association publication, "Wellfleet, Truro, & Cape Cod Cemetery Inscriptions," contains vital statistics for virtually everyone listed as a property owner on the selected maps. I would have students look up data on Commercial Street property owners, for 1858, 1884, and 1907, to determine their ages at the times the maps were made.

(2) Study of an artifact. Select an object from the study collection, and prepare an analysis of the object, including description, deduction, and speculation. A list of objects in the study collection is provided in the Study Objects section above. For this activity, I would have students select one object from the collection of artifacts and study it in some depth. The students should develop a detailed description of the object, including its size, shape, two-dimensional and three-dimensional features and geometric forms, articulations, materials of construction (brass, iron, clay, porcelain, glass), and iconography or ornamentation. They should develop some deductions about why the object has its present appearance, whether there are missing parts, how the object was manipulated when in use, what it was used for, where it was put to use, and any other deductions which emerge from the description of the object. Finally, students should speculate about the object, considering how it wound up in the mud flats of Duck Creek, who made it, the methods of manufacture, where it was made, who bought it and owned it, the value that it had to the owner, and any metaphors that can be applied to the object which help shed light on the culture that produced and used the object and the relation between that earlier culture and the culture and society of today. In developing this unit, I tested this methodology of study of an object - a Winslow Homer painting - with several of my students, and I found that they had wonderful interest in describing and ability to deduce and speculate about the painting.

(3) Technological change. Research the changing technologies of the type of object selected, including changing methods of lighting (whale oil lamp, kerosene lamp, electric lamp); changing health care practices (home remedies, medicine doctor formulas, bitters, curealls, and present day drugs); kitchen processes such as refrigeration and the presentation of food. This activity involves a comparison of related objects from the Duck Creek collection of artifacts. It leads to an understanding of the technological advances that are made over time, and the social and environmental consequences of these advances. It is here that students begin to consider environmental problems such as species endangerment, habitat loss, solid waste disposal, water quality, recycling and reusing, energy consumption, environmental health, and the relationships among

ecology, economics, and ethics. The lighting devices are a particularly good collection of objects to illustrate this aspect of the study, as they represent a number of ways of solving the problem of providing a source of light for indoor activities. The brass lamps for candles, the glass candlestick, the whale oil lamps, the kerosene lamps, and modern day electric lighting each has its source of renewable or nonrenewable energy, its energy efficiency, and its environmental consequences. These are the directions in which we spin off from this unit to a more in-depth study of environmental issues.

(4) The Slide Sets. The following three sets of color slides are to be used in class to introduce students to the early New England village which is the focus of their study of material culture and environmental issues. Set #1 provides an overview of Cape Cod, Massachusetts and the Outer Cape town of Wellfleet, presenting some historical information and a flavor of life in this summer resort town. Set #2 deals with the freshwater habitats which have been listed as critical habitats for Massachusetts and which are in some instances globally significant habitats. Set #3 focuses on the Duck Creek Harbor region and on the archaeological work that I have conducted there since 1970, including the artifacts which I have recovered from this tidal creek area. I am developing a set of study questions for each slide set, so that my students assimilate content and concepts as they learn about Cape Cod, its ecology, and its history.

Slide Set #1. Introduction to Cape Cod. 1. Cape Cod, Massachusetts (map in National Aquarium, Baltimore). 2. aerial view of the Outer Cape. 3-4. The Great Outer Beach. 5. aerial view of glacial kettle ponds, Wellfleet and South Truro. 6. 3500 year old Native American archaeological site, East Orleans. 7. grave of reinterred Wompanoag Indian woman, Sunset Hill, Wellfleet. 8. Norse ship post hole, Bass River, Dennis. 9. Norse carved stone seat, Jarvie house, Long Pond, Wellfleet. 10. plaque, the first landing place of the Pilgrims, Provincetown. 11. plaque, First Encounter Beach, Eastham. 12. early English map of Cape Cod and New England. 13. Provincetown Harbor and the Outer Cape from Pilgrim Monument. 14. the Dorothy Rawson gravestone, 1683. Lothrop Hill Burying Ground, Barnstable. 15. the Hoxie house, Sandwich. 16. the Captain Hendricks house, Chatham. 17. oldest house in Provincetown, West Commercial Street. 18. the Atwood house, Chatham. 19. the Samuel Ryder house, Newcomb Hollow Road, Wellfleet. 20. the Fred Dill house (c1750), Long Pond Road, Wellfleet. 21. the figurehead house, Commercial Street, Provincetown. 22. the Captain Penniman house, Fort Hill, Eastham. 23. Mayo Beach Lighthouse, Wellfleet. 24. Congregational Church, Wellfleet. 25. gingerbread house, Holbrook Avenue, Wellfleet.

26. Morning Glory house (former windmill), Holbrook Avenue, Wellfleet. 27. East Orleans windmill. 28. Eastham windmill. 29. Highland Lighthouse (Cape Cod Light), highlands of North Truro. 30. aerial view of Highland Lighthouse, North Truro. 31. Nauset Lighthouse, Eastham. 32. one of the twin lighthouses, Nauset, Eastham. 33. shipwreck off South Nauset Beach, Orleans. 34. Humane hut/halfway house from Wellfleet Outer Beach, now at Mystic Seaport. 35. gravestone commemorating the loss of 60 lives in mid-nineteenth century nor'easter, South Truro. 36. Thomas O. Broker on U. S. Coast Guard Station life saving tower, Cahoon Hollow, Wellfleet. 37. Humpback Whale flipper slapping off Nauset Beach, Eastham. 38. Humpback Whale calf, Dolphin Fleet whale watch, Provincetown. 39. Beached Fin Whale, Sunken Meadow Beach, Eastham. 40. Stranded Atlantic White-sided Dolphin, Great Island, Wellfleet. 41. Stranded Ocean Sunfish, Mayo Beach, Wellfleet. 42. baleen whale jaw bone and Eastham Historical Society. 43. aerial view of Great Island, Wellfleet (site of Smith Tavern). 44. fishermen unloading catch of the day, Chatham. 45. dumping salt into fish crates, Provincetown. 46. Hatche's Fish Market, Wellfleet Center. 47. Wellfleet fishing fleet, town marina. 48. the last oyster shack, Duck Creek, Wellfleet. 49. clamming at Egg Island, Wellfleet Harbor. 50. Aerial view of cranberry bog, Orleans. 51. derelicts at Duck Creek, Wellfleet. 52. the Outermost House (Henry Beston lodgings), North Nauset Beach, Eastham. 53. "Welcome to Wellfleet" dory, Main Street and Commercial Street, Wellfleet. 54. Sandwich Glass Museum, Sandwich. 55. Fourth of July parade, Wellfleet. 56. Wellfleet art galleries. 57. Cape Cod Canal,

Bourne.

Slide Set #2. Ecology of the Outer Cape: Critical Freshwater Habitats. A. Coastal Plain Pond Shores: 1. aerial view of Wellfleet kettle ponds (Duck, Dyer, Great, and Long Ponds) 2. aerial view of Long Pond 3. Long Pond 4. Great Pond 5. Dyer Pond 6. aerial view of Gull, Higgins, Williams, and Herring Ponds, Wellfleet 7. Williams Pond 8. Spectacle Pond, Wellfleet 9. Turtle Pond, Wellfleet 10. Grass Pond, Wellfleet. 11. Leatherleaf (*Chamaedaphne calyculata*) on pond edge 12. Highbush Blueberry (*Vaccinium corymbosum*) 13. Swamp Loosestrife or Water Willow (*Decodon verticillatus*) 14. American Cranberry (*Vaccinium macrocarpon*) 15. Bladderwort (*Utricularia purpurea*) 16. Fragrant Water-lily (*Nymphaea odorata*) 17. Pickerelweed (*Pontederia cordata*) 18. Military Rush (*Juncus militaris*) 19. Water Lobelia (*Lobelia dortmanna*) 20. Common Pipewort (*Eriocaulon septangulare*) 21. Pond shore community at Long Pond 22. Virginia Meadow-Beauty, Grass Pond 23. Cross-leaved Milkwort, Long Pond 24. Rose Coreopsis, Spectacle Pond #2 25. Round-leaved Sundew (*Drosera rotundifolia*)

26. Thread-leaved Sundew (*D. filiformis*) 27. Freshwater clam (*Anodonta* sp.) 28. Civil Bluet Damselfly (*Enallagma civile*) 29. Ruby Meadowfly dragonfly (*Sympetrum rubicundulum*) 30. Elisa Skimmer or Calico Pennant (*Celithemis elisa*) 31. Damson Skimmer (*Libellula incesta*) 32. Wandering Globetrotter (*Pantala flavescens*) 33. Bullfrog (*Rana catesbeiana*) resorbing tail 34. Eastern Box Turtle (*Terrapene carolina*) at Spectacle Pond #2 35. Least Sandpiper (*Calidris minutilla*) Quaking Bogs: 36. aerial view of quaking bog near Round Pond, South Truro 37. Featherbed Swamp, South Truro 38. Dwarf Pitch Pines at Featherbed Swamp 39. Open water at Featherbed Swamp 40. Quaking bog at Round Pond, South Truro 41. Round Pond quaking bog Sphagnum Bogs: 42. Marconi sphagnum bog, Wellfleet 43. Marconi sphagnum bog with blowdown trees Vernal Pools: 44. Vernal pool north of Round Pond, South Truro 45. Vernal pool, Round Pond 46. Spectacle Pond vernal pool with turtle tracks 47. Vernal pool near Long Pond 48. Eastern Spadefoot (*Scaphiopus holbrookii*) 49. Spotted Salamander (*Ambystoma maculatum*) Atlantic White Cedar Swamps: 50. aerial view of Marconi Station Atlantic White Cedar Swamp, South Wellfleet 51. Marconi cedar swamp trailhead 52. boardwalk in Marconi cedar swamp 53. Atlantic White Cedar (*Chamaecyparis thyoides*) trees 54. Sphagnum moss 55. Competition between white cedars and red maples 56. Inkberry (*Ilex glabra*) 57. Paine Hollow white cedar swamp Anadromous Fish Runs: 58. aerial view of Herring River, Wellfleet 59. Herring River, Wellfleet 60. vegetation of Herring River 61. White Perch (*Morone americana*) from Higgins Pond, Wellfleet

Slide Set #3. The Duck Creek Harbor Site and Duck Creek Artifacts. 1-4. aerial views of Duck Creek and Wellfleet Harbors. 5. late 19th-early 20th century view of Duck Creek and Uncle Tim's Bridge, high tide. 6. same view, present day. 7-9. late 19th-early 20th century views of Duck Creek, low tide. 10-12. same views, present day. 13-20. contemporary views of Duck Creek and Commercial Street buildings. 21-22. Uncle Tim's bridge. 23. Timothy Daniels' house. 24. The Golden Cod galleries. 25. Simeon Atwood's hardware store.

26. The Bradford apartments. 27. the Masonic Lodge. 28. Cape Cod Railroad bridge and dike. 29. the last oyster shack in Wellfleet. 30. "This area is closed to the taking of all shellfish." 31. derelict boats. 32-33. Duck Creek mud flats. 33. Stephen Broker digging in Uncle Tim's Bridge mud flats. 34. 18th century pewter rattail spoon. 35-37. Late 18th century brass box iron. 38-39. 1820s brass telescope, "J. J. Messer, London". 40. iron whaling harpoon. 41. iron whale blubber flensing blade. 42. wrought iron eel spear. 43. brass candle holder. 44-45. brass kerosene/oil lamps. 46. redware pieplate. 47. redware milk cooling pan/basin. 48. redware milk storage crock. 49. coarse earthenware storage jar. 50. salt-glazed earthenware fragments.

51. yellowware fragments. 52. ironstone pitcher, "White Squall/C.N.&Co./1864/Liverpool" 53-54. ironstone blue transfer print chamberpot. 55. ironstone mulberry transfer print teapot. 56. small creamer from Chequessett

Inn table service. 57. "Jules Huel saponaceous shaving compound, container cover. 58-68. ironstoneware manufacturers' marks: Elsmore & Forster; W.M. Co.; William Adams; J. Wedgwood; Jones, McDuffie & Stratton; Anthony Shaw. 69. registration number on pink transfer print plate, English pearl. 70. early period Sandwich Glass whale oil lamp. 71. middle period Sandwich Glass whale oil lamp. 72. glass peg lamp. 73. pressed glass containers. 74. glass obelisk-shaped thermometer holder. 75. glass gauze jar lid, amber. 76-80. glass bottles: medicinal, beverage, household, ink, etc. 81. faunal remains. 82. scrimshaw dyed rib bone. 83. carved ivory thread bobbin. 84. souvenir porcelain slipper, "Uncle Tim's Bridge" 85. souvenir cup, "Congregational Church, Wellfleet" 86. souvenir dish, "Wellfleet Village, Mass" 87. souvenir cups. 88. China trade salt shaker.

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