MOSQUITOES, MARSH-ELDERS, AND MULTIMEDIA:

A PROTOTYPE FOR INTERACTIVE PLANT INTERPRETATION
AT ASSATEAGUE ISLAND NATIONAL SEASHORE

by

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The last pleasures of contact with the natural world are not reserved for scientists but are available to anyone who will place himself [sic] under the influence of earth, sea and sky and their amazing life.

-Rachael Carson

<u>The Sense of Wonder</u>

ACKOWLEDGMENTS

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GLOSSARY

The majority of the definitions are from <u>Welcome to Multimedia</u> by Linda Tway.

access time - amount of time it takes a CD-ROM or any disk drive to locate specified information; measured in milliseconds.

animation - refers to moving graphic images; usually involves the simulation of movement by sequentially displaying several frames showing a progression of movement.

arrow pointer - the arrow that indicates your position on the screen.

aspect ratio - the relationship between the height and width of the monitor screen; usually 3:4.

attract mode - a looped program that continually cyles through a series of images; the motion attracts visitors to the computer.

authoring software - specialized software used to develop computerized books and multimedia applications; uses interactive links to connect associated information.

bitmaps - images composed of sets of bits in the computer's memory that define the color and intensity of each pixel.

button - a screen object with a label indicating what action it activates.

byte - a unit of information for processing in certain kinds of electronic computers; equal to one character or eight bits.

CD-ROM drive - Compact Disk Read Only Memory; a high-capacity storage device that can store up to 600 MB of data; it does not allow user to save information, but only to read stored data; required by the MPC standard to have a transfer rate of at least 150 KB per second.

click - term for the rapid press and release of the mouse button.

clip - a file of sound, video, or animation that you can link or embed in other documents.

CPU - Central Processing Unit; the computer's electronic brain which controls the processing of the computer and allows it to perform instructions; sometimes called the microprocessor; the MPC standard requires at least a 386SX CPU.

database field - a "unit" of information of a database record that is stored in a datbase file.

database record - a collection of database fields.

flat-file database - simple database that is not associated with any other database.

graphical user interface (GUI) - the graphic environment used by some software such as Windows, and which displays easy to understand menus and symbols (or icons).

graphics - the display of images on a computer monitor; images may be still or full-motion video.

graphics board - hardward device that allows the computer to display graphic images; the type of graphics board (such as EGA, VGA, and Super VGA) determines the resolution of images; the MCA standard requires a Super VGA graphics board capable of displaying 640 x 480 pixels on a screen and 16 colors.

hot objects - any object that when clicked on initiates some action; examples are hypertext (or hotwords) and hypergraphics.

hotword - any word that has associated information that is accessible to the user; sometimes called "hypertext."

hypermedia - integration of text, graphics, animation, and sound into a multimedia program using interactive links.

icon - a small symbol displayed on the screen that, when clicked on with a mouse, carries out some action.

info bites - chunks of easily digestible data of any type - text, sound, video, and other media.

interactive links - connections that allow the user to jump from one topic to another in a non-linear way.

joystick - used to control movements, especially in games; required by the MPC standard.

kilobytes - 1024 bytes; written as K.

kiosk - a multimedia PC (or other multimedia playback system) that has been encased in a free-standing cabinet.

megabyte - one million bytes (1024^2 bytes); written as MB.

monitor - a device that displays computer output; must be compatible with the graphics board.

mouse - device used to point to and select screen options; required by MPC standards.

MPC Standard - Multimedia PC Standard; popular standard developed to ensure that a computer system has all the necessary capabilities to run ultimedia software; developed by Microsoft Corporation in cooperation with various hardware manufacturers, this refers specifically to PC's running under Windows with multimedia capabilities, and also ensures that any separately sold hardware or software carrying the MPC logo will be compatible.

multimedia - any form of communication that uses more than one medium to present information; computer program integrating text, graphics, animation, and sound. Also used to describe the hardware that enables users to access these capabilities.

navigation - a term that refers to the user's progress through a multimedia application.

pixel - short for "picture element," which is a unit of measurement across a computer screen.

prototype - a model or a mock-up of an actual program that often is used to illustrate sample screen displays.

RAM - Random Access Memory; the electronic storages of the computer which is temporary; information stored in the computer's memory is lost when the computer is turned off; the MPC standard requires a minimum of 2 MB of memory.

relational database - fields in a database are linked to or relate to one another.

resolution - the number of pixels across and down the monitor (usually 640 x 480); the higher the number the clearer the image; resolution is determined by the graphics board and monitor.

Sans Serif typeface - typeface without serifs.

seek time - also known as **access time**, speed at which the drive can get to the requested data.

Serif typeface - typeface with a fine line finishing off the main stroke as at the top and bottom of M or ending the cross stroke of T.

storage - refers to the means whereby information is saved when the computer is turned off; may mean magnetic disks (either floppy or hard) that allow you to add your own information to them, or optical disks (such as CD-ROM) that don't allow you to write files to them.

touch screen - device that allows the user to input information by touching the screen.

trackball - a trackball is similar to a mouse except the cursor is moved by rolling a ball with the fingers while the trackball case remains stationary.

transfer time - the rate at which the CD-ROM drive can transfer located information to the computer; measured as kilobytes per second; the MPC standard requires a transfer rate of at least 150 KB per second.

vector graphics - images stored as a series of geometric instructions.

ABSTRACT

The question: What do mosquitoes, Marsh-elders, and multimedia have to do with each other? The answer: All three will influence the visitor's experience of the National Seashore.   One-quarter of the Assateague Island's 800,000 visitors come to the current Visitor Center but only 2% of them attend ranger programs explaining the plant and animal life on the island.

During my thesis project I worked very closely with the interpretive staff at Assateague Island National Seashore to develop a preliminary prototype for interactive plant interpretation for the new Barrier Island Visitor Center at Assateague Island National Seashore in Berlin, Maryland. My project included: research and writing of content material, design of hierarchial branching structure for division of information, development of database format, and suggestions for features to be included in the overall multimedia program. This prototype will be used to create other phases of the program dealing with the Island's animals, birds, insects, and shellfish.

Exhibits explaining the life zones of Assateague Island will be an important part of the new Barrier Island Visitor Center. The prototye for a computer station with a multimedia information program will allow visitors to find out about plants from the different life zones either by habitat or by time of year through a series of simple questions.

Chapter 1

INTRODUCTION

Most visitors who come to Assateague Island see the

ponies or play on the beach, but miss the plants. It is not because the

plants are not important, but they do not have the media attention the

ponies or the beach do. The plants are important food sources for

resident animal life on the island, and supply refreshment for migratory

butterflies and birds. Plants provide nest building materials and protective

cover for birds and small mammals. Telling the plants' story is not easy

or quick. My research investigates and recommends a prototype for an

interactive multimedia computer program about plants which would be a

part of the habitat room in the proposed Barrier Island Visitor Center.

Computers are rapidly becoming a popular feature in public

areas such as shopping malls and museums. Two local institutions,

Winterthur Museum in Winterthur, Delaware and the Franklin Institute in

Philadelphia, Pennsylvania use multimedia programs as an integral part of

their museum. Winterthur has a **kiosk** with an interactive program which

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provides visitors with directions on what to see and do in the museum and garden, public events, history of the du Pont family, and other local attractions. The new gallery space has another kiosk focused on the collections with a short quiz and simple survey for visitors to answer. The Franklin Institute has forty-seven different programs in several stations for visitors to learn more about science-related topics. Visitors can interact on one of three levels depending on their age, and can also print out information to take home.

The technology for creating and using multimedia applications is constantly changing and much more has been published about creating multimedia programs within the last few months.

The project for Assateague Island evolved into developing a proposal for a flora information program which will serve as a model for similar programs about birds, animals, shellfish, insects, and history of the Island. The program will present background facts on fifty-four of the most common or visible plants on the Island. This research will aid the interpretive staff in determining what material will be of interest to visitors and will explain the relationship between plants, habitats, and other residents of the Island, and how to make the program easy to use.

In February 1993 an article was published in USA Today about government cutbacks including personnel in the National Park Service due

to budget constraints.[1] Our current economic climate is forcing all types of service industries to do more with less personnel. The technology of multimedia computers can assist national parks in handling the volume of visitor questions and concerns with fewer staff members.

ENDNOTES

[1]Kanamine, Linda, "Budget crisis poses threat to treasures," <u>USA Today</u>, February 3, 1993, p. 6A.

Chapter 2

ASSATEAGUE ISLAND

What Is a Barrier Island?

Barrier islands are long, thin land masses composed entirely of sand. They make up less than 10% of all global shorelines. In general, the average barrier island is from a few hundred feet to nearly a mile wide, and runs parallel to a sandy coastline separated by a bay of up to several miles in width. In North America they are more commonly found on the East and Gulf Coasts due to the 300-mile-wide submerged shelf along the Atlantic seaboard. The East Coast shelf was built up by fine sand carried down to the rivers' mouths after glacial melting.

There are three theories as to how barrier islands are formed, but current thinking is they were once high points on land which was many miles offshore from present locations. These high points were surrounded by water when the glaciers melted and the sea level rose separating them from the mainland and from each other.

Barrier islands have been described as restless and dynamic due to their ever changing nature and location. This is in keeping with their

migratory beginnings since some believe their sand composition is of geologic sediment from ancient Appalachian Mountains. The continual action of waves, along-shore current, and wind change the shape of the shoreline. Powerful storms can change the entire character of the island by causing it to "roll over" itself. This explains how what was once the bayside of the island can now be found on the oceanside.

Oddly enough this harsh and fragile environment, which wind and water continually reshape, forms the mainland's first line of defense from severe storms.

What Is Assateague Island?

Assateague Island is a 37-mile-long barrier island located approximately one mile off the Mid-Atlantic Coast. The northern end of the island is in Maryland and the southern portion in Virginia.

This island was originally part of a long peninsula connected to the mainland near Fenwick Island, Delaware, and which included Ocean City, Maryland.

In 1933 the Inlet Storm or Great '33 Hurricane cut through the peninsula at Ocean City, separating it from a newly formed Assateague Island. Man-made jetties were constructed on the ocean side to keep

sand from filling the inlet back in, which would have made the passage

unnavigable. (See Figure 2.1.)
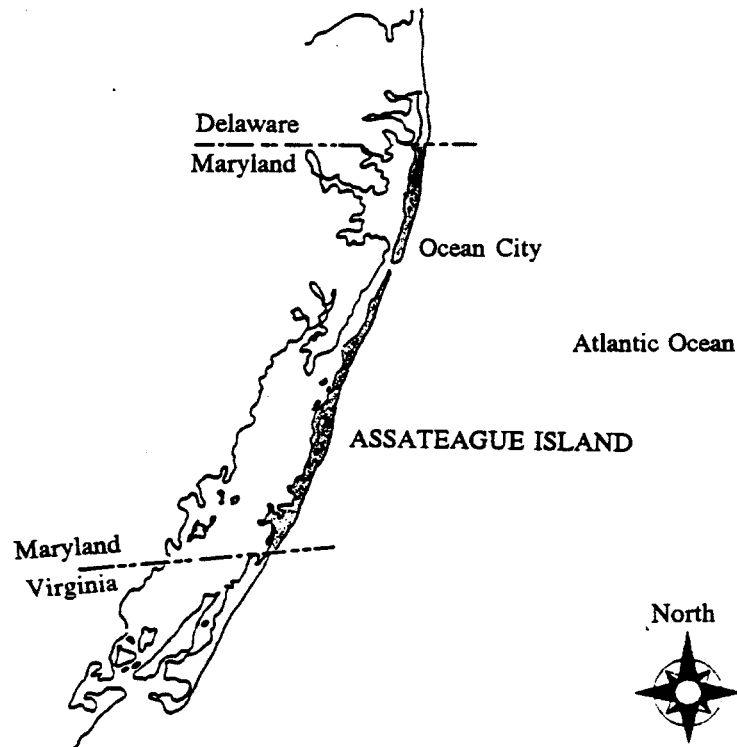
Figure 2.1   Assateague Island

In theory the island is probably at least 6000 years old, but in

practice it has shifted, migrated, overwashed and even rolled over itself

many times making the actual age hard to pinpoint. What we see today

is entirely different from the original spit of land. What we see tomorrow

will have changed again. This transitory nature also makes the island's

cultural and natural history difficult to document.

Human Intervention

In 1524 the Italian navigator, Giovanni da Verrazzano, was the first European reported to set foot on the island. King Francis I, then King of France, supposedly commissioned him to explore the shores of America.[1] The Verrazzano bridge from the mainland to the island is named for him.

Little is known of the early Algonkian-speaking Native Americans that inhabited this area. The name of the island, Assateague, came from their language and is thought to mean "marshy or muddy place across." Researchers are reasonably certain they did not attempt to live on the island, but rather visited it during the better weather months to fish and hunt.

In the 17th century colonists brought their horses, cows, goats and sheep to barrier islands to graze either to avoid taxes and fencing requirements, or to prevent livestock-caused crop damage near their homes. Barrier islands were considered natural pens for livestock.

A few hardy settlers attempted to live year around on Assateague Island. Between the 1870s and 1913 there was a hotel for visitors called Scott's Ocean House. A ferry brought people to the island where they fished or hunted for oysters, clams, wildfowl and diamond backed terrapins. Ducks and geese were shot for sale to restaurants,

herons and egrets killed for feathers for ladies' hats, and wild bird eggs were collected. These popular pastimes lead to a decrease in the wildfowl population - the very abundance of which had attracted visitors.

During the 1950s and early 1960s Assateague Island was on its way to becoming another Ocean City. The middle portion of the island was divided into 9000 lots for vacation homes and resort businesses complete with a 13-mile paved road and utility lines. About 5000 lots were sold to 3000 people in the new resort community called Ocean Beach.

Realizing that this many people could not be effectively served by the ferry, the largest developer, Mr. Leon Ackerman, tried to raise money to build a bridge to the island. This venture was not successful, so he instead donated 540 acres near the northern end of the island to the State of Maryland for a park in 1956. He intended for the state, with taxpayer's money, to construct a bridge to access the new state park. The developer assumed, probably correctly, that purchasers of his real estate would have perpetual access through land he had donated.

Nature intervened and in March 1962 a large extratropical cyclone (or Northeaster) coupled with the highest tides of the year, and ocean surges swept over the island destroying or damaging structures which had been built and portions of the road. Many Maryland citizens

finally convinced Congress that the island was not conducive to development. Money was appropriated in 1965 which allowed the National Park Service to purchase, to preserve and to protect the island against future development. At that time it was the largest private land deal put together by the National Park Service. Currently all of the island, with the exception of a few properties which were granted exclusive-use rights until near the turn of the century, is part of the Assateague Island National Seashore.

Today the island is divided into the 680-acre Assateague State Park, the 9003-acre Assateague Island National Seashore managed by the National Park Service on the Maryland end, and the 9300-acre Chincoteague National Wildlife Refuge (established in 1943 to protect wintering migratory waterfowl) on the Virginia end. (See Figure 2.2.)

The National Park Service maintains the present Barrier Island Visitor Center in Maryland and works with the United States Fish and Wildlife Service to manage recreational use and provide services at the Tom's Cove area in Virginia.
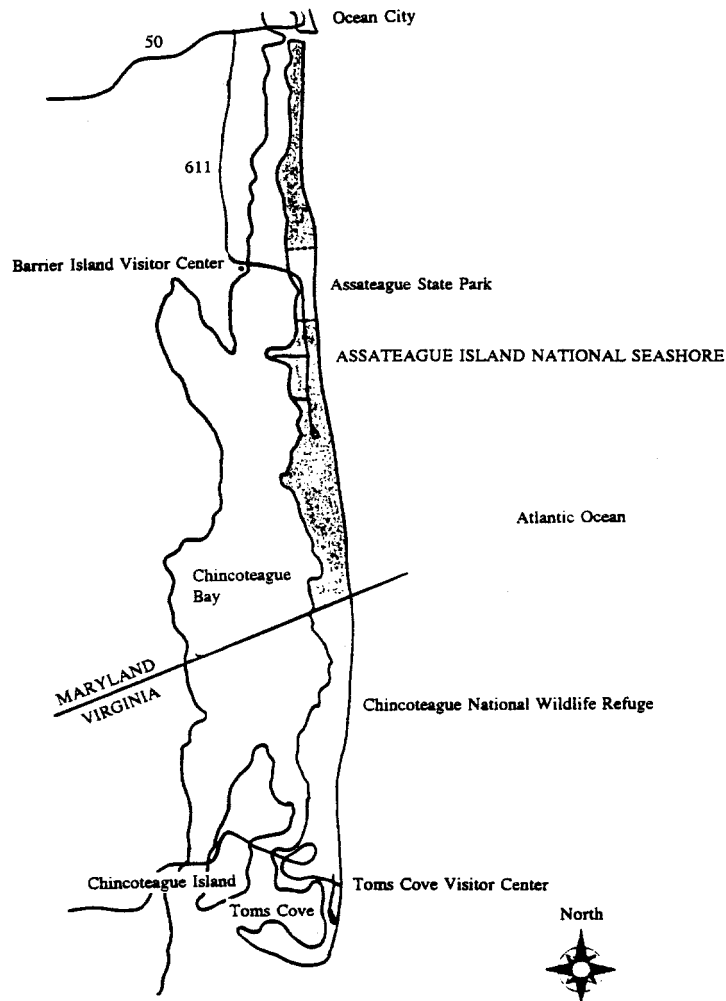
Figure 2.2 Assateague Island National Seashore

Natural History

Surely the horses (locally called ponies) are the island's most

famous residents. The romantic version of the pony legend says they

swam ashore from the wrecked Spanish sailing ship **Greyhound** in the

18th century. This legend is unsubstantiated.

More likely they are the offspring of colonists' horses. They are not true "ponies," but rather horses whose growth is stunted by living in the harsh habitat of a barrier island. They are feral as the National Park Service allows the Maryland herd to care for themselves. The bulk of their diet consists of American beachgrass and saltmarsh cordgrass; but they also eat greenbrier stems, bayberry twigs, rose hips, seaweed, poison ivy, and drink fresh water from inland ponds. As a result of the pony's negative impact on plant communities and wildlife the National Park Service is attempting to keep the population to 100 horses or less through use of a harmless anti-fertility vaccine.

Another introduced resident is the small Sika deer. Several of these Japanese elk were released on the island in 1923 by a troop of Boy Scouts after they had exhibited them over the summer in Ocean City. Sika deer presently outnumber the native deer population 7 or 8 to 1. Both the deer and the ponies are free to roam the island in Maryland as they please. In Virginia, some fencing restricts ponies from the beach.

If the ponies are the most famous residents the mosquito is certainly the most infamous. Mosquitoes abound from May to October, during the heaviest visitation months, especially in areas away from ocean breezes. The National Park Service will not intervene unless the

mosquitoes become a serious health problem, since pesticides could seriously affect other wildlife on the island.

Waterfowl and deer hunting is permitted as a recreational activity since this was authorized by Congress when the seashore was established. Coincidentally the harvest helps keep the deer population under control. Surf fishing and shellfishing for crabs and clams are also popular seashore pursuits.

Plant Life

Barrier island plant life needs to be tenacious to withstand the effects of sun, wind, salt and temperature. The island is comprised of seven typical life zones: bay, salt marsh, forest, shrubs, dunes, beach, and ocean. Each habitat contains plant material with coping strategies to survive in these zones. Plants of the marsh are subjected to tidal changes and various levels of salinity in the water. Forests evolve in the widest part of the island where they are buffered from the wind, but plants are still subjected to salt burn during storms. Plants in the beach/dune area need to conserve water and protect themselves against the wind and blowing sand.

In January 1985, Dr. Steven Hill completed a botanical survey and annotated checklist of vascular plant species of the island and found

96 families containing 492 species. Of these 158 species were exotic or introduced and the remainder were native.

ENDNOTES

[1]**World Book Encyclopedia**. Chicago: Field Enterprises Education Corporation, 1961, p. 271.

Chapter 3

ASSATEAGUE ISLAND NATIONAL SEASHORE

<u>Barrier Island Visitor Center</u>

The Barrier Island Visitor Center is located on the mainland on Maryland Route 611 just north of the Verrazano Bridge that crosses to the Island. The "Visitor Center" is an inconspicuous building built in 1970 as an addition to the maintenance garage. All visitor-oriented interpretive activities--evening slide lectures, indoor environmental education programs, aquarium talks, touch tank, and sales operations--now take place in one large room in this building. Not only is the space crowded, but the noise level can be distracting, making information dissemination difficult. At certain times during the summer the small parking lot cannot accommodate all of the visitors who would like to stop there. In these close quarters the plant life of the Island is mainly represented by a terrarium with poison ivy and a few slides in a do-it-yourself carousel.

Visitors are not required to stop at the Visitor Center to pay the entrance fee to either the state park or the national park as there are booths on the Island. Approximately one-quarter of the 800,000 visitors

to the Island in 1992 do come to the Visitor Center. They may stop for information before going to the island, or they may stop to ask questions on their way home.

Inside they can sit and watch a 22-minute video, "Assateague Island A Special Place" which provides a general introduction to the island. An auto tape tour allows visitors to drive a mapped route through the national park and listen to cultural or natural history information at selected stops. Or they can purchase a self-guiding trail booklet entitled The Life of Assateague which takes them through numbered stations for **The Life of the Dunes**, **The Life of the Forest**, and **The Life of the Marsh** trails. The booklet points out important plant and animal residents of these three barrier island habitats. Additional wayside exhibit panels throughout the Island talk about history, birds, shellfish, poison ivy, mosquitoes, and ticks.

Most of the in-depth information about the Island is presented directly to the public through the ranger programs. Only 20,200 visitors (or 2%) of the 800,000 visitors to the Maryland end in 1992 attended ranger programs. These one-and-a-half to two-hour guided explorations for adults and children are offered every day over the summer and on weekends between Labor Day and Columbus Day. Seasonal rangers and volunteers lead the majority of the programs between the end of June and

the end of August. Indoor programs include aquarium feedings and a variety of nightly slide lectures. Outdoors rangers and volunteers lead campfire programs, bird walks, canoe trips, shell and surf fishing demonstrations, and explorations of the beach and dunes. The programs are set up to cover specific material, but are highly interactive with the particular audience. Depending on the interest or expertise of the ranger, plants may or may not be highlighted.

The New Visitor Center

The Barrier Island Visitor Center Interpretive Plan/Design Concept states, "The main objective of the new visitor center will be to foster better understanding of the complex and fragile nature of Atlantic barrier islands in general and Assateague Island in particular."[1]

The document Assateague Island National Seashore Barrier Island Visitor Center-Desired Visitor Experience underscores the importance of this new facility:

> Precisely because the park's highest visitation occurs just when most of the island is uninviting to casual guests, an interpretive facility takes on added importance. Usually, the National Park Service discourages "surrogate" visits. Exhibits or audio visuals are never designed to make visitors feel that they have actually "seen" the park without leaving the visitor center or museum. Visitors are instead provoked to go out into the actual resources, presumably with a new perspective. At Assateague, however, no interpretation, no matter how clever, will convince most summer visitors to brave the biting bugs. During July and

August, unless we can successfully interpret the island's stories of change inside, thousands of visitors will leave without understanding the dynamics of fragile barrier islands.[2]

Realizing the limitations of the present space and the need for a single facility to provide an overview of barrier island ecology for the East Coast, a new visitor center was conceptually designed in 1987 by Brian Hardner, a graduate student in architecture, at Temple University. Edmundo Nieto, a National Park service architect, is currently refining the proposed 15,000 square foot structure.

One interpretive component will be 3,000 square feet of exhibit space to interpret the geology and geography of the Island, the plants and animals which make up the different life zones, and information about the ponies. The current plans call for two interactive computer stations through which visitors will be able to gain information on nine different topics: history; birds; plants; mammals (pony information will be on a separate terminal); seashells; insects, spiders, and ticks; reptiles and amphibians; and recreation.

Only one visitor, or one visitor group, can comfortably use a computer terminal at a time so a "slave" monitor will be mounted above the working terminal. This monitor or projection screen replicates exactly what is on the screen below allowing additional visitors to see, but not have input into, what is displayed on the lower monitor. (See the

illustration of the multimedia pony program in the National Park Service

drawing below in Figure 3.1.[3])

Figure 3.1 Architect's Rendering Showing Slave Monitor

Due to the destructive potential of ocean storms the new visitor

center will be built on the mainland. The proposed timetable calls for

Congress to appropriate a bill authorizing funds for the new center in

fiscal year 1994 (October 1993-September 1994), the building to be built

in fiscal year 1994, and the exhibits to be installed in fiscal year 1995

(October 1994-September 1995).

In January 1993 ownership of the land was transferred from

the state of Maryland to the National Park Service. Funds were approved

in fiscal year 1992 for a new sewage treatment plant and utilities

infrastructure, and that work is proceeding.

The Desired Visitor Experience document goes on to stress the

need for fostering a deeper understanding of Assateague's role in the

natural world:

> ... Unless we can bring a part of the outside inside, the majority
> of Assateague's audiences will only experience the beach and
> learn nothing about the wetland nursery responsible for so
> much of our food chain. In short, unless we successfully
> interpret the importance of all of this wild place, visitors will
> leave thinking that only a narrow strip of sand is worth
> preserving and the rest might just as well be tamed by
> chemicals and construction.[4]

Who Are Assateague's Visitors?

Even with the inadequate visitor center facilities Assateague

Island National Seashore still drew 800,000 visitors to the Maryland end.

Of the 800,000 visitors 209,000 entered the existing visitor center.

Ohio State University and the National Park Service completed a

research report on Characteristics and Expenditures of Visitors to

Assateague Island National Seashore based on data collected from 1,000

respondents for a Public Area Recreation Visitor Survey (PARVS) from
1985-1986. The survey included both Assateague Island National
Seashore and Chincoteague National Wildlife Refuge and results closely
matched those of an earlier survey done in 1978:

> Visitors to Assateague... are generally well educated, hold
> professional occupations and had incomes between $25,000
> and $45,000. They tend to be white and between the ages of
> 19 and 38. Almost all respondents were from the U.S. and
> 37% were from Maryland or Virginia. An additional 45% of
> respondents were from surrounding states such as Delaware,
> Pennsylvania, New York and New Jersey.
>
> The activities most frequently participated in were walking for
> pleasure, swimming, sightseeing, wildlife photography and
> observation and driving for pleasure.[5]

The average group size is between three and ten people. Two-
thirds of the visitor groups are families (parents and children), 13.5%
friend groups, and 10.8% family and friend groups. The Park has
substantial repeat visitation, especially from local residents.

In summer, the Island is visited primarily by families, but in
September, senior citizen or other organized bus tour groups arrive. Many
of these groups have only a limited amount of time to spend and may not
leave the bus during their trip around the Island.

During the spring of 1992, 2,800 local school children came for
supervised programs with a park staff member. This number will increase
considerably with a larger building and some volunteer staff.

The interactive multimedia computers are not intended to replace the human contact visitors presently have with the rangers, but rather to augment information dissemination especially during peak visitation times. The computers certainly cannot replace the enthusiasm and personal touch with which the rangers communicate, but can spark an interest in visitors who may not attend the ranger programs.

In the case of the plant program, visitors will be able to find out about plants they either will be seeing on the Island, or plants they may have already seen that were unfamiliar to them.

ENDNOTES

[1]Jauck, Andrea, <u>Barrier Island Visitor Center Interpretive Plan/Design Concept 1989</u>, National Park Service Assateague Island National Seashore Interpretive Division.

[2]Thompson, Ron, <u>Assateague Island National Seashore Barrier Island Visitor Center Desired Visitor Experience</u>, December 1, 1992.

[3]National Park Service, Denver Service Center, 1992.

[4]Thompson, Ron, <u>Assateague Island National Seashore Barrier Island Visitor Center Desired Visitor Experience</u>, December 1, 1992.

[5]The Ohio State University and National Park Service, <u>Public Area Recreation Visitor Survey 1985-1986. A Research Report on: Characteristics and Expenditures of Visitors to Assateague Island National Seashore</u>, September 1991.

Chapter 4

MULTIMEDIA

What Is Multimedia?

Multimedia means more than one media, or the use of more than one media to present information. Used in conjunction with computers it refers to hardware and software that uses multiple ways of communicating information to the user including any combination of:

text (written words)

still pictures (line drawings or photographs)

moving pictures (video clips or animation)

sound (voice, sound effects, or music).[1]

Combinations of any or all of these pieces allow the user to gain a more complete picture of the puzzle, or subject matter being presented, than any one piece alone could provide.

Interactive multimedia has all of the above plus **interactive links**. The user can highlight an object on the screen and cause the program to respond in a certain way. The user is directing the information gathering

process to fit their needs. The umbrella term for interactive links and the information to which they link is **hypermedia**. Terms such as **hypertext**, **hypergraphics**, and **hypersound** refer to the type of information being linked. In the screen below a multimedia program is being used to teach tennis. The screen below on Service presents text, a line drawing, and a narrated animation. The hotwords (or hypertext) "ad court" and "center mark" are in purple type. The cursor (yellow hand) is placed over the term ad court with the mouse. (See Figure 4.1.)

Let's Play Tennis!

Service

When serving, be sure to toss the ball out in front of you as far as possible while still able to effectively hit the ball. This will help you reach out and begin moving toward the net.

The three basic serves to the ad court are shown in the diagram below. Your position and aim should take advantage of the lowest part of the net, keeping your shot low and more difficult to return. You want to be left of the center mark because as you serve from this position, you will

Three Basic Serves

Pause   Replay

Next

Previous

Contents

Figure 4.1 Example of Hypertext[2]

(See Figure 4.3 below.)

Linear

Hierarchical

Nonlinear
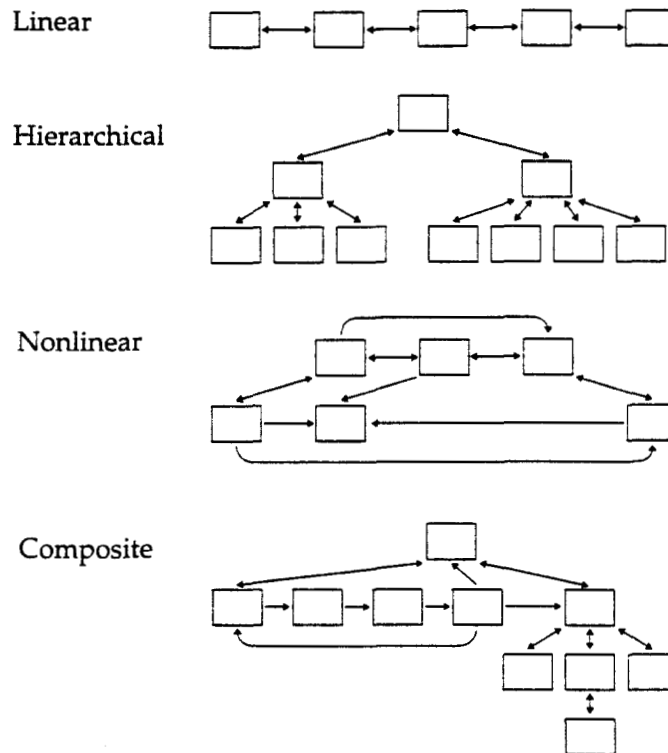
Composite

Figure 4.3 Navigational Structures of Multimedia Computer Programs[4]

Instead of passively reading a book from cover to cover or page to page the electronic document user takes an active role in directing the information gathering process. It could mean taking a cursory look (browsing) at a subject, probing some aspect of it in more depth, or deciding to skip a topic altogether and moving onto another one.

In a visitor center setting a multimedia computer allows visitors with different interest levels to access information which will make their trip more educational or enjoyable.

Multimedia is a dynamic and highly visual medium (and sometimes auditory). Good multimedia is an all encompassing experience not easily explained by static text on a page.

History of Multimedia

Multimedia has its roots in the days of President Franklin Delano Roosevelt. He hired Vannevar Bush to supervise and coordinate research projects coming out of the Office of Scientific Research and Development. Bush wanted to use a machine called a memex to store, maintain, and link through cross-reference and navigational trails scientific writings on microfilm. In July 1945 he published an article called "As We May Think" in Atlantic Monthly where he talked about high-resolution displays, mass storage, and fast information retrieval in the future. His ideas were not taken seriously and the memex never came to life.

The next link in the multimedia story is the creation of the mouse, windows, computer conferencing, and elecronic mail by Douglas Engelbart. He published a paper in 1962 called "A Conceptual Framework

for the Augmentation of Man's Intellect" in which he proposed a

conceptual framework for an interactive multimedia hypertext system.

In the mid-1960s Ted Nelson created the term hypertext to

describe a form of non-sequential writing.

MacIntosh exploited this technology with the Hypercard,

indexing information on "cards" so that users could jump from one topic

to another.

In May, 1992 The Microsoft Corporation and several hardware

manufacturers defined Multimedia Personal Computer (or MPC) Standards

for the industry. This standard requires certain computer hardware and

software requirements to be labeled as MPC to ensure that consumers

could purchase applications and be confident they would be compatible

with their hardware. These standards are being revised and upgraded.

See Appendix B for the May 1992 version.[5]

How Is Multimedia Being Used?

Multimedia educational applications range from sales and

marketing presentations, tutorials in the workplace, elementary and

secondary school instructional materials, to career-oriented self-paced

instruction. The Wall Street Journal reported that President Clinton is

installing multimedia personal computers for use in White House briefings.[6]

Multimedia products such as <u>Compton's Family Encyclopedia</u> (with 30,000 articles; 15,000 photographs, charts, maps, a world atlas; 30 minutes of audio; and the Merriam Webster Dictionary), <u>Macmillan Dictionary for Children</u> (12,000 entries, 1,000 color illustrations, 400 sound effects, and pronunciations of words), and the <u>Great Literature Personal Library Series</u> (943 literary works with color illustrations and spoken passages)[7] create a new standard for reference "books."

Currently computer games comprise a large segment of multimedia entertainment applications. Literature is included in the entertainment segment, and future visions call for electronic novels that include multimedia sound, images, and animation as plot background material. Microsoft Corporation envisions multimedia as a tool to support creative endeavors. "Better tools let you focus on the act of creation itself. ...Incorporating the elements of multimedia enhances existing applications and creates entire new genres of tools for creative development."[8]

<u>What Are the Components of Multimedia?</u>

The technology producing this kind of information experience is changing rapidly resulting in newer and more powerful products at a lower cost. Hardware required to view multimedia is a computer with color monitor, sound amplifier, laser disk drive or player, and input device such as a mouse, keyboard or touch screen. Software required is called retrieval software because it allows the user to search massive amounts of data and find information. At this time images and sound are provided by videodiscs or CD-ROM discs.

Videodiscs are double-sided 12" diameter discs read by a laser disk drive or player attached to the computer. Videodiscs have the capacity to store up to 54,000 individual still images, one half-hour of full-motion video, or any combination of either on a side. In addition the videodisc has two narrative tracks for sound. Movies are now available for home viewing on videodiscs as well as references such as encyclopedias or museum collections. Unlike videotapes, videodiscs offer higher quality picture and sound plus the ability to access any frame on the disc in a matter of seconds. The information is in a "read-only" format meaning the user can access and view it but not change it or overwrite it.

CD-ROM stands for "Compact Disc - Read Only Memory" and like the videodisc provides information that cannot be altered by the user. The CD-ROM disc (or disk) is a laser disc the same size as a compact

audio disc. Inside the CD-ROM drive (or player) attached to the computer is a laser which shines on the disc encoding the data and outputting it in digital format. The storage capacity of a single CD-ROM is the equivalent of 1,500 floppy disks, or 300,000 pages of single spaced typewritten pages, or 24 volumes of an encyclopedia, or 5,000 full-color images.[9] A CD-ROM disc can store text, data, graphics, sound, animation, or video. University and school libraries use CD-ROM as a fast and simple way to update text reference volumes such as bibliographies, scientific collections, and specialized dictionaries. For a few hundred dollars the entire reference can be replaced by a current CD-ROM.

Another technology is emerging called Compact Disc Interactive (CD-I). CD-I is a hardware and software package intended more for home use and is compatible with television and stereo systems. The CD-I player can play audio CD's, Photo CD's, and CD-I discs. The CD-I disc contains text, graphics, animation, video, still images, and audio as well as the application program.

The Eastman Kodak Company has developed a product called Photo CD which digitizes and transfers customers' 35mm negatives or slides to disk. Each disk can store up to 100 photos in five different resolutions from thumbnail (for selecting and previewing) to full detail (for photographic-quality printing and enlargement). Images can be displayed

on a television with a Photo CD player. In the future it will be possible to add sound and graphics to the Photo CD.

Other standards will emerge as demands for capacity and speed increase. As multimedia becomes easier to use products will be more available and less costly.

How Does Multimedia Work?

A multimedia application pulls pre-selected photographs, graphics, and segments of sound tracks, video clips, and animation sequences from storage marrying them with text and graphics to provide the end user with information they've requested.

For example, National Geographic put together a CD-ROM entitled Mammals: A Multimedia Encyclopedia from material from their TV documentaries and Book of Mammals. This reference tool includes 45 full motion video clips, 700 photos, 150 range maps, and 155 authentic vocalizations. It also provides users with a pop-up glossary of terms and definitions, vital statistics screens, essays on each animal, and a classification game. Classification game players try to guess which family animals belong to from photographs displayed. A computer, color VGA monitor, CD-ROM player and a mouse are required to be able to use the disk.[10]

monitor, CD-ROM player and a mouse are required to be able to use the disk.[10]

Using a **mouse** to input choices, the end user selects an animal from a list of over 200 species in the encyclopedia by positioning the **arrow pointer** (see Figure 4.4) over the name of the animal and **clicking** the button on the mouse.
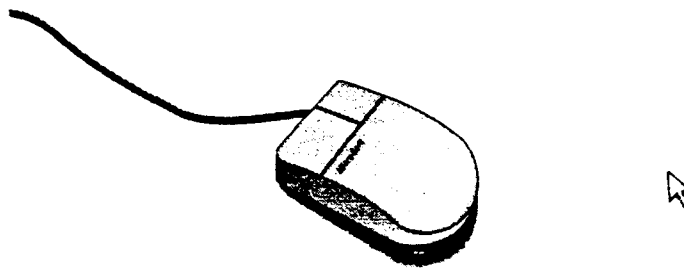

Figure 4.4   Example of Computer Mouse and Arrow Pointer[11]

A screen with a still photo of the animal, text information, and several symbols appears. If the user positions the arrow pointer over the microphone symbol and clicks he or she can hear a short audio segment of the animal's voice; the movie camera symbol brings up a video clip animal behavior; the camera additional photographs. Other symbols bring in textural information about habitat, diet, height, weight, sociability, or a map indicating the range of that species. (See Figure 4.5.)

ENDNOTES

[1]Tway, Linda E., Welcome to Multimedia, New York, NY, Management Information Source, Inc., 1992, p.6.

[2]Ibid. Color Plate 1.

[3]Ibid. Color Plate 2.

[4]Vaughan, Tay, Multimedia: Making It Work, Berkeley, CA: Osborne McGraw-Hill, 1993, p. 108.

[5]Microsoft Developer Network, Multimedia Authoring Guide, Microsoft Corporation Pre-Release Program CD-ROM, September 1992.

[6]Pope, Kyle, "Juiced Up PC's Build a Market for Multimedia," The Wall Street Journal, March 9, 1993, p.B1.

[7]CD-ROM Summer 1992 Product Guide. Bureau of Electronic Publishing, Inc., Parsippany, NJ.

[8]Microsoft Developer Network.

[9]Parker, Dana and Bob Starett, Guide to CD-ROM, Carmel, IN: New Riders Publishing, 1992, p. 25.

[10]CD-ROM Summer 1992 Product Guide, p. 27.

[11]O'Hara, Shelley, Easy Windows, Carmel, IN: Que Corporation, 1991, p. 14.

[12]Vaughan, Tay, Color Plate C-11.

Chapter 5

THE PROCESS OF CREATING A MULTIMEDIA PROGRAM

The key to producing a good multimedia program is organization and planning.   To avoid "muddymedia"[1] or bad multimedia it is better to think the process through at the beginning, and include all possible elements to make a cohesive whole.   It is much easier to delete from the design later on than to add to it once the production process has begun.

The three main elements in creating a multimedia program are: content, design, and delivery.   These three elements are interdependent. Building a preliminary proposal for a multimedia application is like building anything else - you need to start with the foundation, yet all the pieces work together to hold the structure intact.   Content provides the basis on which to design, but the mechanics of delivering the program also drive the design, just as content and design drive the delivery program.

What follows are items to consider in planning a multimedia program keeping in mind that computers cannot be all things to all people, and they cannot replace the need for human contact.

Identify the Audience

Identify the potential audience for the program and determine: age range, type of visitor (single, family group), comfort level with computers, and the speed with which they need answers.

If the audience is multicultural an option for text in a language besides English should be considered.

Content

Without content there is no reason to create a program. Splashy graphics will enhance the visual appeal of the program, but content is the foundation.

The content phase is very time consuming because it requires not only determining what information should be included in the program, but also the research necessary to obtain and verify the information.

Establish Design Standards

Determine the purpose of the program. Is it meant to be informational, educational, or entertaining? Would humor make the program more user friendly? Will there be an animated guide as part of the program (a park ranger for example) to talk or lead visitors through it?

Determine how many topics of interest the program will cover, how many levels of information will be tied to each topic, and how the user will navigate around inside the structure. It is helpful to draw a route diagram showing where each touch will take the user. (See Figure 5.1.)
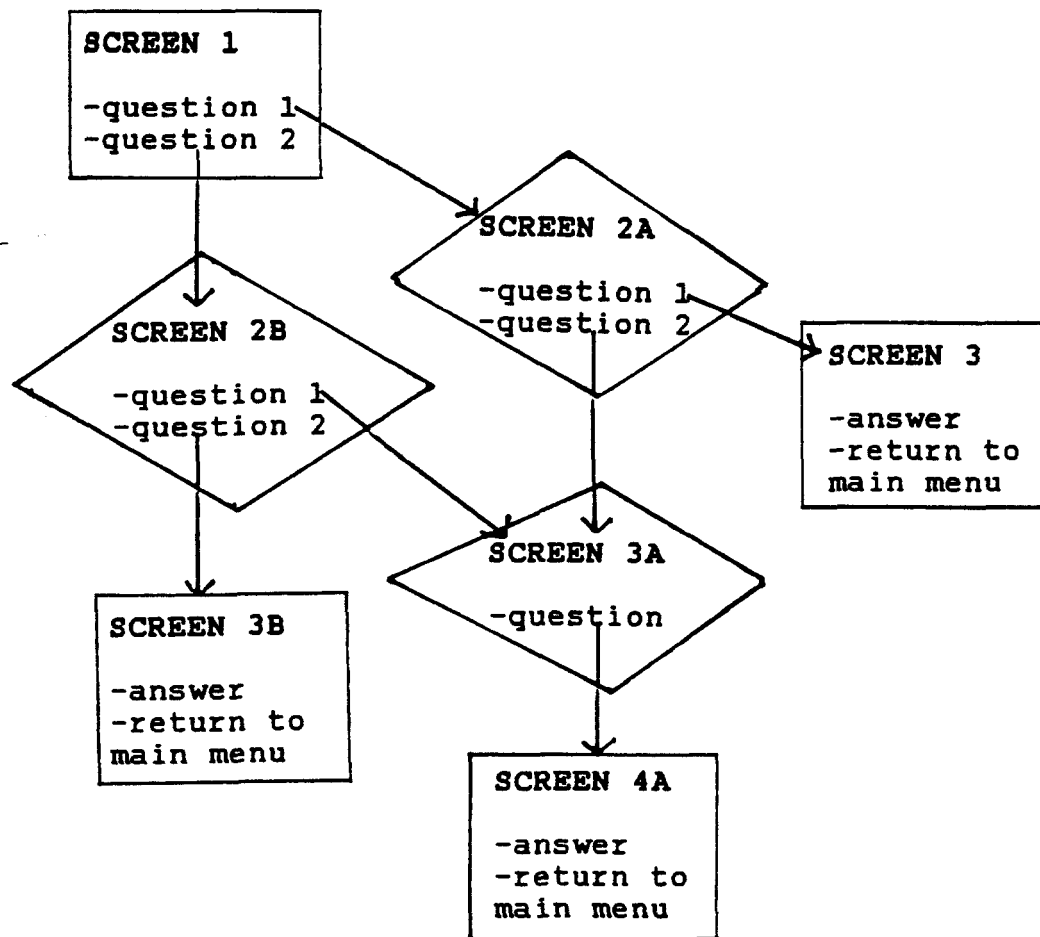

Figure 5.1 Route Diagram

Each topic should have the same "look" with a consistent style for borders, illustrations, and backgrounds. Color can be used to delineate the different topics, but the colors used for title, text, background and borders within each topic should be harmonious.

Develop a "working screen" format which is consistent for each topic. **Buttons** to navigate from one screen to another should always be in the same position. Once a visitor learns how to navigate in one topic they can feel comfortable that all topics will work the same way, and the program author's job will be easier if there are fewer screen styles. (See Figure 5.2.)
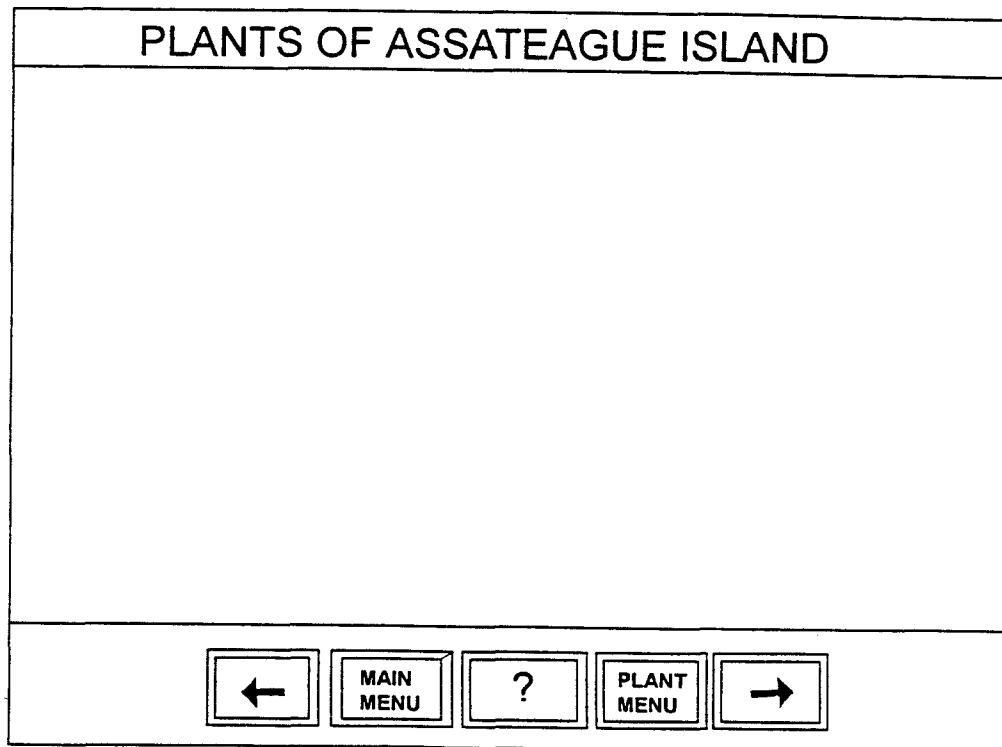
PLANTS OF ASSATEAGUE ISLAND

← | MAIN MENU | ? | PLANT MENU | →

Figure 5.2 Example of a Computer Working Screen Format

Use of Images and Animation

"One picture is worth a thousand words." Photographs, graphics, and motion sequences will illustrate difficult concepts more easily than text. If photographs appear less than full-screen size the image will be sharper.

Images can be stored as **bitmaps** or as **vector graphics** (line drawings, clip art, art from Draw programs). Bitmaps require more disc storage space, but vector graphics take longer for the computer to regenerate.

Graphics, sound, motion should add something to the program and have a reason for being there. Choose the minimum media - if a silent clip video conveys the message there is no need to include sound. Capitalize on work done in other areas by re-using the same artwork, music, or video clips. This will help to add consistency between the multimedia and other collateral materials. If professional artists are hired or images are borrowed from other sources check into the copyright restrictions before including any clips into the multimedia program.

Type

The typeface used should not only be aesthetically pleasing but also easy to read. Avoid mixing too many different typestyles which

creates a busy look by using one consistent typestyle throughout the program. Sans serif fonts are used for titles and headlines and Serif fonts are used for large blocks of text on the printed page. Some designers feel the fonts should be reversed to make video type more legible. (See Figure 5.3 for examples.)

This is a Serif typeface.

This is a Sans Serif typeface.

Figure 5.3 Typeface Examples

The type size will depend on the quality of the monitor and the resolution. Lower resolution monitors require a larger typeface for readibility, especially for visually impaired visitors.

Audio

Audio should be clear and easy to understand with consistent decibel volume levels. Sound clips taken from several sources that will be used together should have consistent quality. The higher quality the sound the more disk storage space required. If portions of the program

are narrated consider closed captioning of those portions for hearing impaired visitors.

Data Management

Supporting text information for the multimedia program should be entered and stored in a database that can be accessed by the program through "hooks" built in by the programmer. When a visitor uses the program the hooks retrieve text from the database into the appropriate spot. As new information becomes available it can be updated in the database far more easily than if the information is an integral part of the program.

If there are several topics in the multimedia program the database should have an overarching design that works with all of them. Databases can be either **flat file** (each field stands on its own) or **relational** (information in one field connects with information in another field). For example a plant has only one scientific name, but several common names. The two fields are connected to each other in a one to many relationship. Information about plants could be (related) connected to the animals, birds, and shellfish they affect.

Each plant is considered a **record**, and every record must have exactly the same number of **fields** even if some of the fields are left blank.

Fields can contain either text or numbers and can be either fixed length or variable length. The size of the field is determined by the length of the longest entry. Letters, numbers, dates, spaces, or punctuation marks each count as a character in a field. Where possible use codes to indicate data, for example R stands for red, 4 stands for April. Codes take up less room in the storage mechanism and allow for faster retrieval of information. Some databases are capable of storing graphics in a field (called object linking and embedding).

Once the database design is set a front-end form is created to input the data. The form should be self-explanatory to whomever will be entering data by prompting for information for each line of the form. When input is completed a verification report should be printed to check for errors and to test queries. If the query was created properly it should bring up the right response.

Delivery System

The delivery system includes hardware (input, output and storage devices) and software (authoring tools) that will be used.

Multimedia programs quickly consume massive amounts of storage space. This means the speed of the computer and the amount of memory are important issues. For example, a full-color photograph which

fills the entire screen can use up 250,000 to 300,000 **bytes**, 60 seconds of motion video requires about 10 million bytes (10 **megabytes**), and 10 seconds worth of sound between 110,000 to 1,764,000 bytes. By comparison the chapter you are reading now uses 15,556 bytes of storage space.

Every time the computer is asked for information it must search through all this stored data. Two measures of the computer's speed are **access time** or **seek time** (measured in thousandths of a second or milliseconds) and **transfer time** (measured in thousands of bytes or **kilobytes** per second). Access time is the amount of time it takes for the drive to find the requested information and transfer time is the time it takes to read the information from the disk. Both of these will affect how quickly the computer responds to the user, and whether the motion video sequences flicker. The optimal situation is low access time with a high transfer rate.

The output device the visitor sees is a **monitor**. The **aspect ratio** (relationship of width to height) of the monitor affects the layout of graphics and text on the screen.   Most monitors have a horizontal format (the width is 640 **pixels** and height is 480 pixels).

The **resolution**, or clarity of the images is dependent not only on the size of the screen and the size of the image, but also the number of

colors the monitor displays. The amount of memory in the graphics board will determine whether the monitor can display 16 colors or 256 colors. Sharp color images require 256 colors.

Input devices include: **keyboard, joystick, trackball, mouse, or touchscreen.** Anticipated use of terminals in a museum setting requires the equipment be rugged.

The choice of touch screen or mouse input will affect the screen design and number of choices offered. A mouse can accurately point to very small symbols (as small as 1/4" square), but touch screen buttons need to be large enough to accommodate any sized finger. Larger buttons are easier for visitors to work with, but limit the number that will fit on the screen. The button should respond with a visual or an audio cue that lets the user know the computer has registered the request. These cues could make the button appear to be depressed, change colors, send up a puff of smoke, or respond with a sound.

Computers are often situated in a **kiosk** (similar to a cabinet) which hides working parts from the public and curious fingers. If sound is incorporated into a multimedia program the kiosk could be designed to form a surround that would encapsulate the sound cutting down on the ambient noise level in the exhibit room.

Both The National Endowment for the Arts and the Federal

Register have published guidelines for wheelchair accessibility to

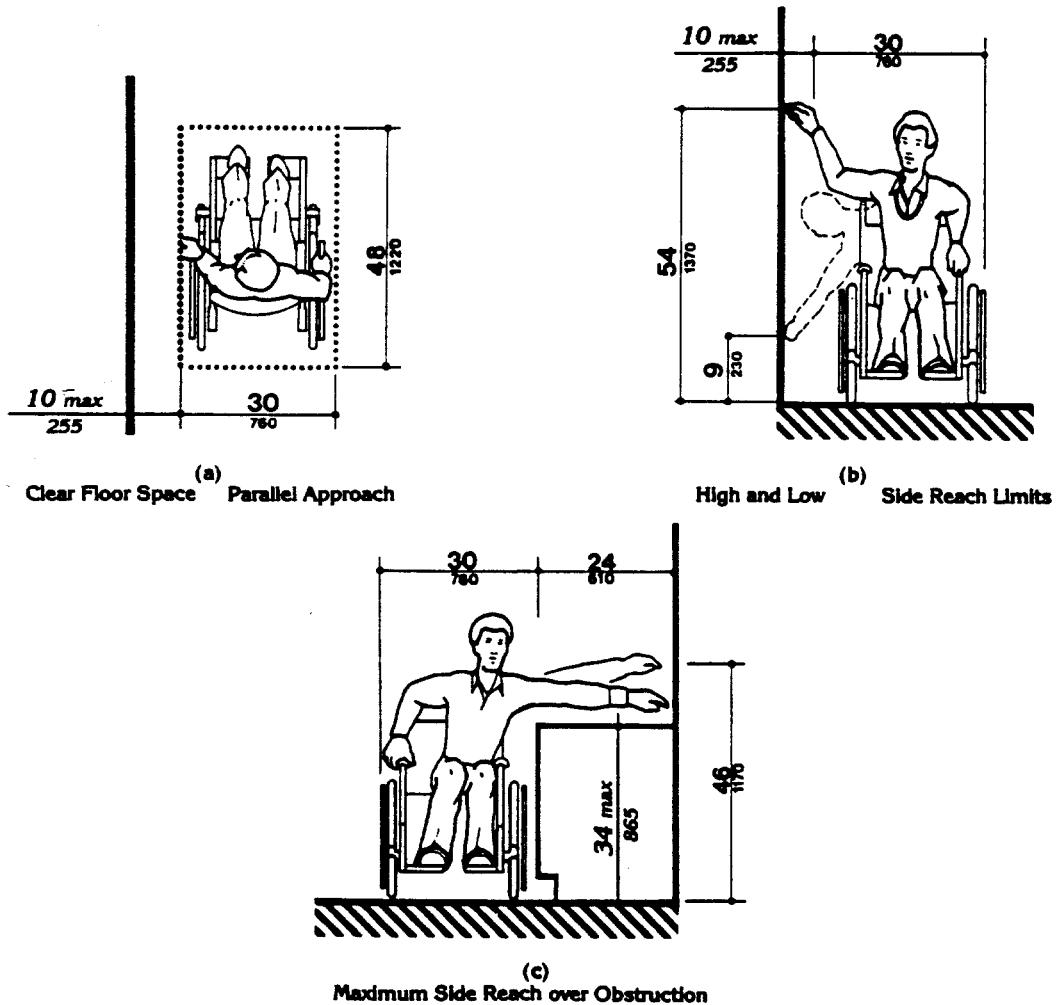computer terminals and kiosks in public settings. (See Figure 5.4.)

(a)
Clear Floor Space   Parallel Approach

(b)
High and Low   Side Reach Limits

(c)
Maximum Side Reach over Obstruction

Figure 5.4 Wheelchair Accessibility to Computer Terminals[2]

Authoring Software

At present there are several software packages available that supply the underlying structure to create multimedia programs. In an attempt to design software for a wide potential audience the flexibility of the resultant programs has been diminished. If flexibility is important a programmer or consultant can be hired to create the authoring program that fits the needs.

Testing

Once the design format has been established and the text written the program can be delineated in storyboard form. The storyboards should be tested staff members not familiar with the project, volunteer staff, and selected visitors. Any problems with workability of the program or readability of the content will show up in this testing phase and can be corrected before the program is actually produced.

Data Capture

Multimedia is the high-tech equivalent of cut-and-paste. Once all the visual, audio, and text information has been assembled it must be digitized (or captured) through a scanner or an audio or video capture board as depicted in Figure 5.5 below.
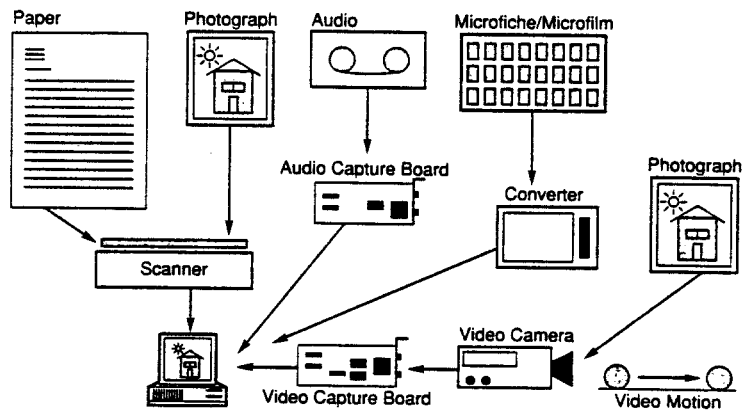
Figure 5.5 Diagram of Computer Data Capture[3]

Personnel

The personnel available to work on a multimedia project is a key element. A well-rounded design team should include: content experts (people familiar with the subject matter), a program designer to lay out the structure, an artist to make it visually appealing, and a programmer (computer wizard) to make it function.

ENDNOTES

[1]Rosenborg, Victoria, <u>A Guide to Multimedia</u>.　Carmel, IN:　New Riders Publishing, 1993, p. 359.

[2]<u>Federal Register</u>.　Department of Justice, Office of the Attorney General, 28 CFR Part 36, July 26, 1991, p. 19.

[3]Parker, Dana and Bob Starrett, <u>Technology Edge:　A Guide to CD-ROM</u>.　Carmel, IN, New Riders Publishing, 1992, p. 262.

Chapter 6

PROTOTYPE FOR ASSATEAGUE ISLAND NATIONAL SEASHORE

CONCLUSIONS AND RECOMMENDATIONS

Throughout the multimedia development process I worked closely with the Chief of Interpretation at Assateague Island National Seashore, and Park Service staff.

Audience

Visitors studies and observations indicate the typical Barrier Island Visitor Center visitor is a family group (parents or grandparents and children). At different times during the year, however, the majority of visitors may be senior citizens, school groups, or couples with or without children.

Children will naturally be drawn to the computer because most are familiar and comfortable with them from school. Adults, including senior citizens, may or may not be computer literate but after seeing how

easily children work through the program may feel confident in using it themselves.

Content

An initial plant list was drawn up by a ranger with seven years experience, and a local botanist. My research included conversations with staff members to find out the most common plant questions, and observing visitors interactions with plants on the island. Based on this information plants were added to or deleted from the list. It is now comprised of the 54 plants (see Appendix A) that are either the most visible or are mentioned in ranger programs and brochures about the Island.

None of the listed plants are unique to Assateague, but are found (within the northern and southern limits of their range) along the East Coast. Most of the reference texts contained generic information for East Coast or Mid-Atlantic region plants, and inaccurate information from one source is often repeated in subsequent sources. My research involved verifying the accuracy of the fun fact information with park consultants and staff.

The Park Service has determined that interpretative text should be written at the eighth grade level so the information can be easily

understood by the general public. Breaking down plant content

information into simple **info bites** at this reading level can be difficult

when the content author is knowledgeable about the subject.

The text for the content information will be stored in a database

with the fields and field types shown in Table 1 on the next page.

Additional fields could be set up in the database to record video

frame numbers, copyright information, bytes of storage an image takes,

or production time and costs.

An additional front-end form could be designed to allow rangers

to manually override (but not change) the database. For example, if the

weather was unseasonably cold and plants which should bloom in April

do not start blooming until May, the bloom time could be adjusted for that

season. Or if rabies among raccoons becomes a serious problem a

warning message could be inserted in the mammal program under

raccoons.

TABLE 1

PROPOSED DATABASE FIELDS AND FIELD TYPES

FIELD NAME	FIELD TYPE
Unique Plant Identification Number (record number)	numeric
Common Name	character
Scientific Name	character
Common Family Name	character
Scientific Family Name	character
National Park Service Slide Number	alpha-numeric
Habitat	character
Nativity	character
Bloom Color	character
Bloom Time (start and stop date)	date
Fruiting Time (start and stop date)	date
Leaf Color Time (start and stop date)	date
Fun Fact 1	text
Fun Fact 2	text
Note	text

Design

Plants are not easily categorized into nice, neat slots, but in researching content some common themes among the varied plant material emerged: bloom time, bloom color, and habitat. These themes helped to shape the hierarchical design of the program. Since heaviest visitation is between the months of April and October we concentrated on plants visitors would be likely to see during that time span.

The next step was to draw out a route diagram showing how the program worked. The first draft took 5-6 touches to get to the answer, so the sequence was revised and simplified to work in the recommended 3-4 touches. (See Figure 6.1 below.)
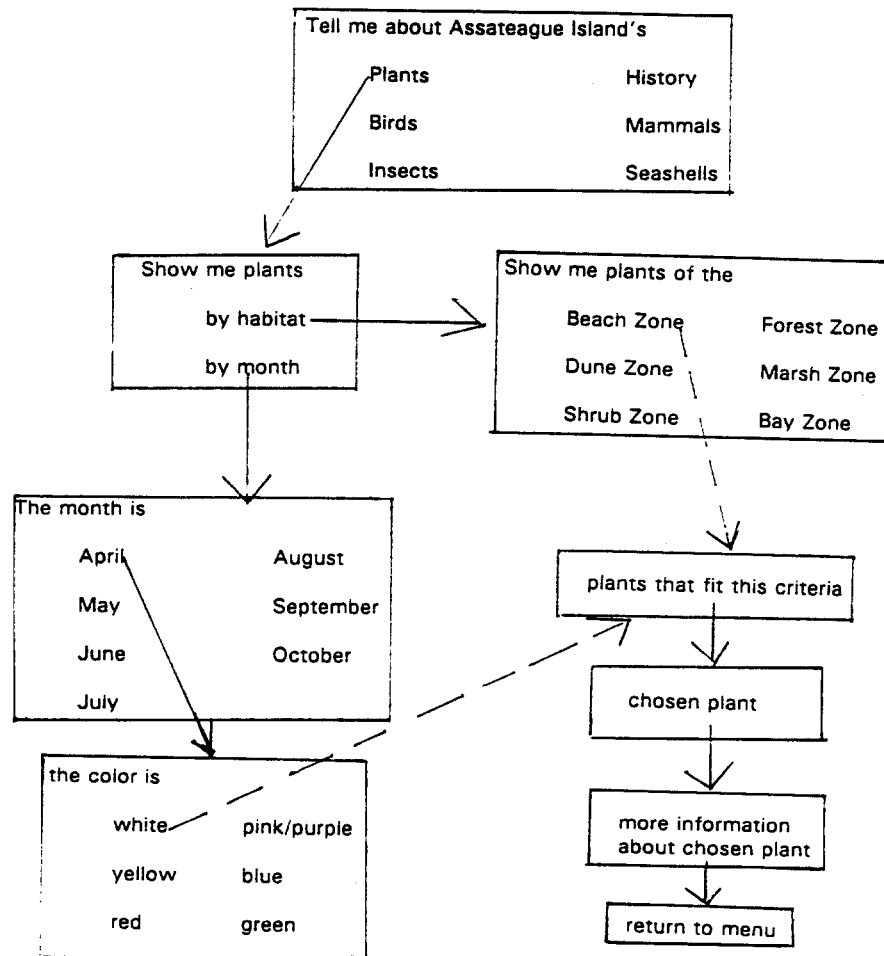
Figure 6.1   Route Diagram

Many multimedia programs include games to test the visitors' knowledge of a particular subject matter. The number of different topics on a single terminal in the Barrier Island Visitor Center requires users get their information quickly and move on so a game was not added.

Next I put together the working screen template. (See Figure 6.2 for a mock-up of the screen.) The top of the screen will read "Plants of Assateague Island" so the user always knows what program they are in. The left and right arrows allow the user to go back to the previous screen or forward to the next screen in the sequence. The button for Main Menu will return the user to the topic screen. The button for Plant Menu will go to the beginning of the plant program. The same layout could be used for Bird Menu, Fish Menu, etc. These navigational buttons help the viewer to move around in the program without getting lost.

The question mark brings up a help option to explain to visitors how to use the program. My research indicates very few people will use the help screen, but the option is available should they need it.

PLANTS OF ASSATEAGUE ISLAND

← | Main Menu | ? | Plant Menu | →
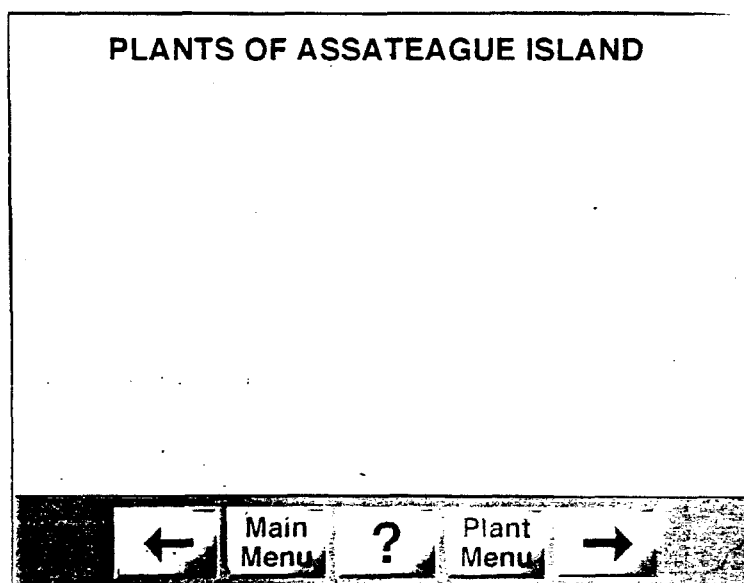
Figure 6.2 Working Screen Template

The testing phase will indicate whether visitors understand the symbols (arrows, question mark) or whether the buttons need to be labeled back, forward, or help.

The program is simple so a visitor working through a series of questions (similar to a plant key) can find the answer in no more than three to four screens. Bearing in mind the visitor is probably on vacation, program directions are self-explanatory, and the equipment used to run the program should access the information quickly.

The format of the program was devised so visitors who are and are not familiar with plants could understand how to use the key. The initial choices are plants by: habitat (life zone) or month (time). An additional level could be added under month for color. Realizing a certain percentage of the population is color blind, this could pose some problems.

The plant information was simplified to include only:

common name

scientific name

time of color (flower, fruit, fall color)

habitat(s)

2 fun facts.

The fun facts address historic or current plant uses, talk about how the plant functions in its habitat, or how it relates to the rest of the Island. The fun facts help visitors understand interrelationships in nature, and as a part of that larger picture understand plants are not only here for humans to enjoy.

I recommend an additional field for a "note" be included in the database. The note would direct visitors to pertinent exhibits about that particular plant, or other information displayed elsewhere in the Visitor Center or on the island. This field may not be used for every plant.

I decided that for plants, sound and motion probably would not add as much to this program as it would to the bird and animal programs. Time-lapse photography of a flower opening, or the sound of the wind in the grasses would be a nice touch, but would probably be less effective than a video of birds flying or audio bird calls.

The plant program will use color photography (slides) for the images. Graphics such as line art, illustrations, or color photographs will be used to represent habitats and fun fact information.

The program starts with the Main Menu or topic screen. Several topics will be on one terminal similar to the sample shown here with: plants, birds, insects, history, mammals, and seashell. The visitor

presses the button for the topic they want to see. (Figure 6.3 for a mock-up of the screen.)
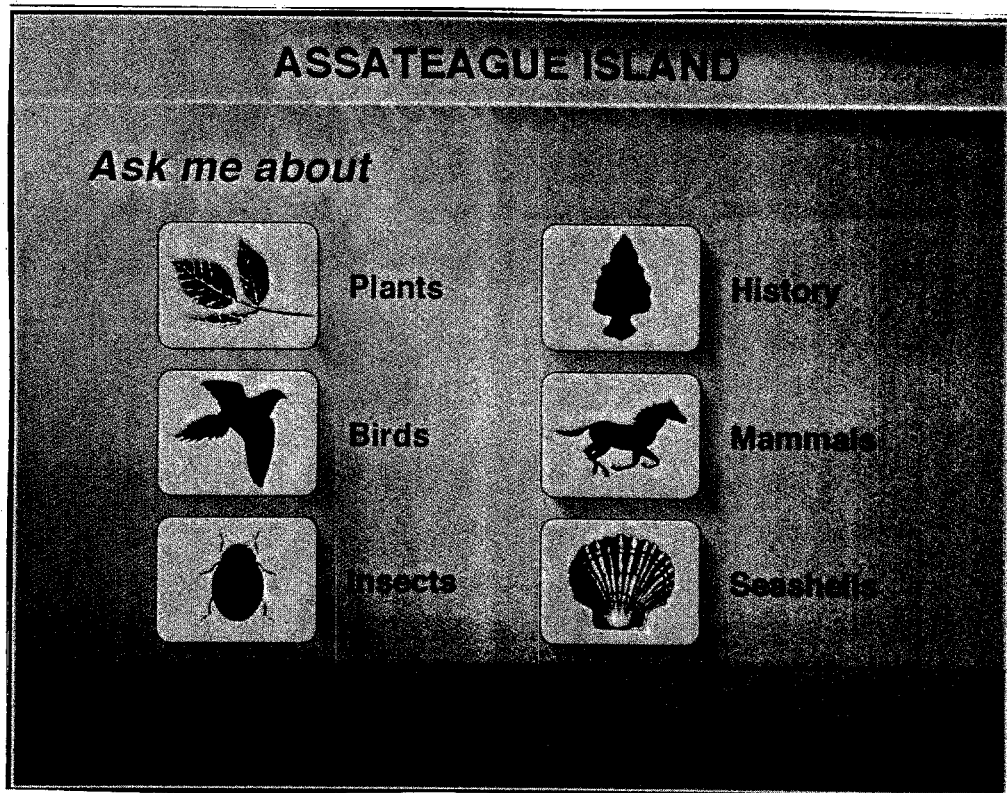

Figure 6.3 Topic Screen

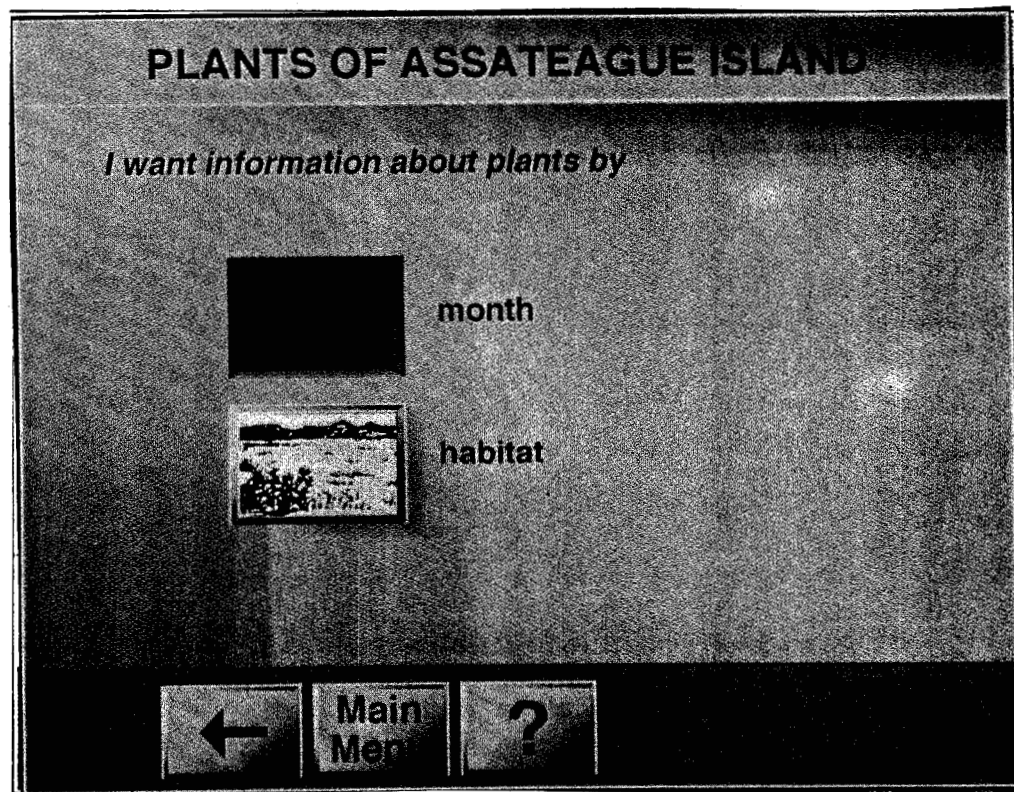If Plants is selected the next option is to see plants by habitat or by month. (See Figure 6.4.)

Figure 6.4 Habitat or Month Screen

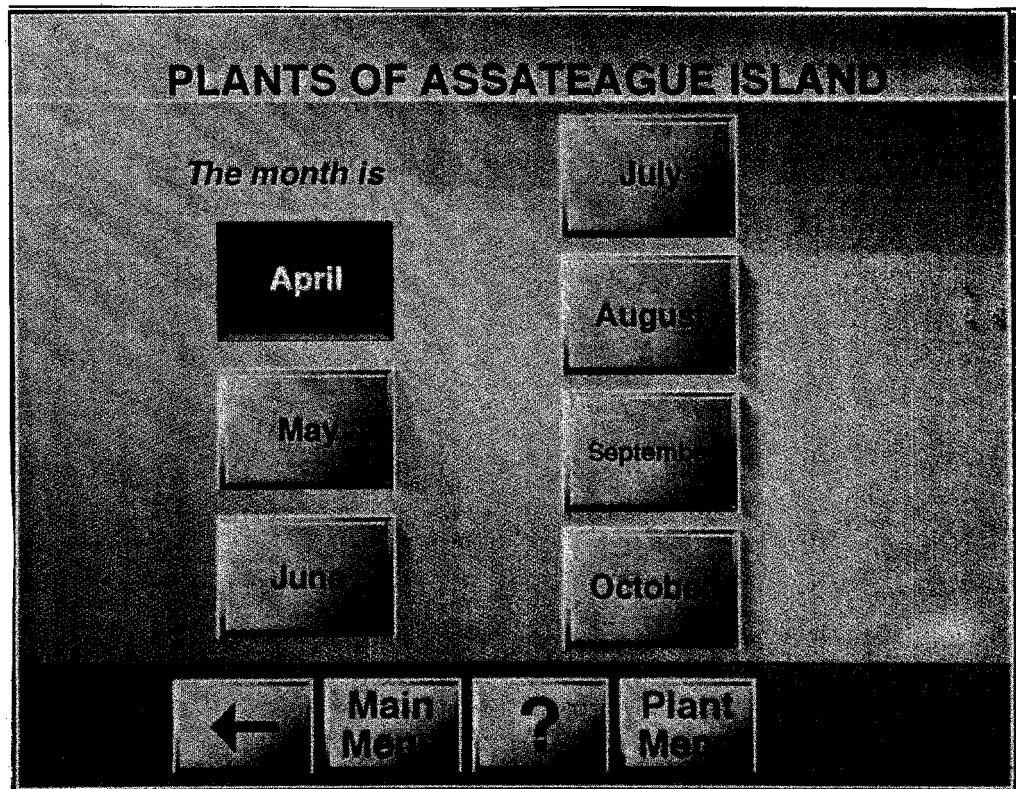If Month is chosen the visitor is then asked to select a month.

(See Figure 6.5.)

Figure 6.5 Month Screen

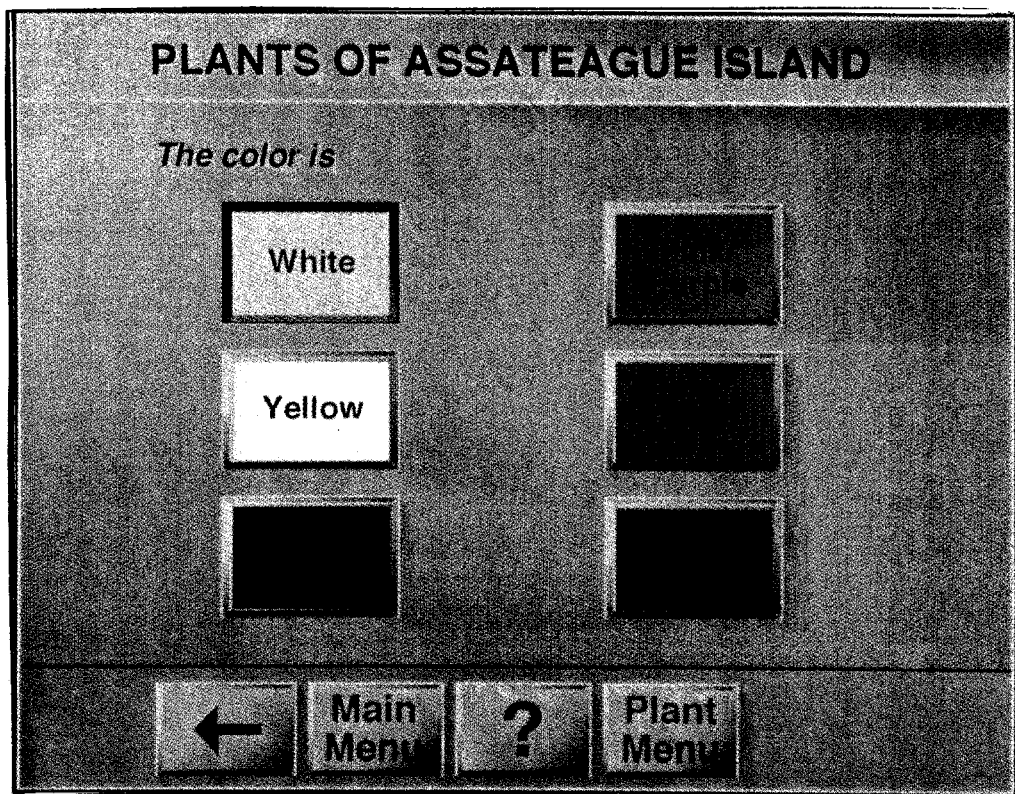Visitors can select the color of the flower they saw blooming in that month. (See Figure 6.6.)

Figure 6.6 Color Screen

Those two choices bring up a small photo of each plant that matches the criteria. Visitors then touch the picture of the plant for a full-sized picture of the plant. (See Figure 6.7.)
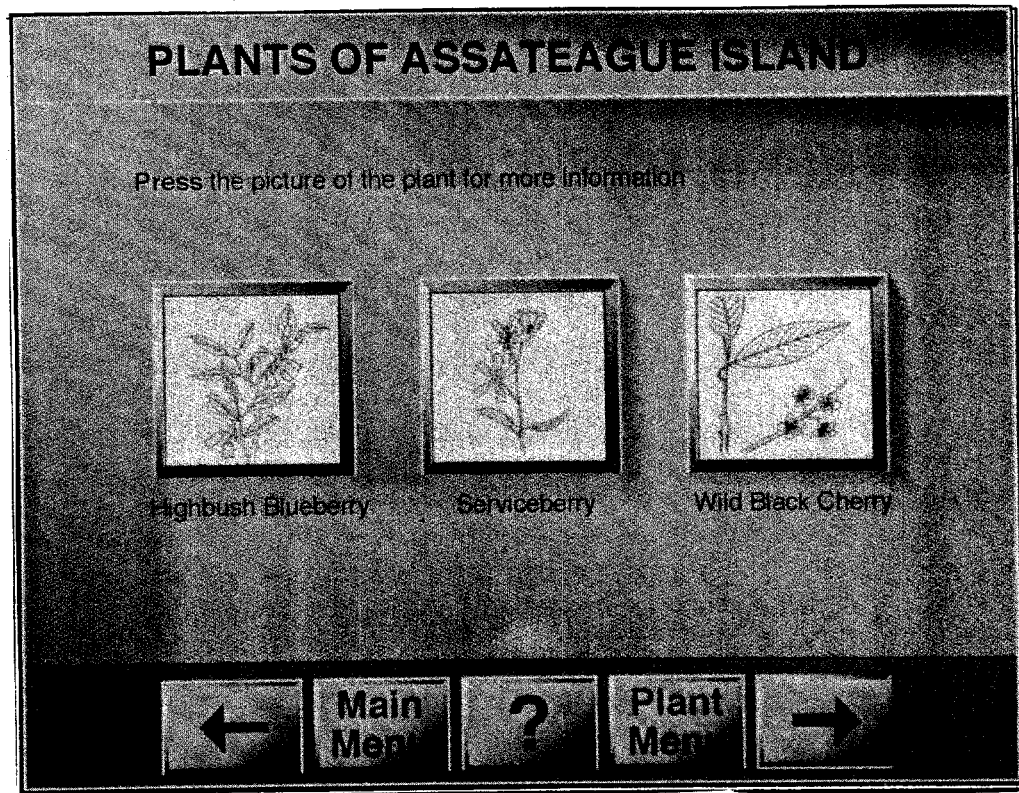
Figure 6.7 Plant Choices

The full-sized photo and name of the plant appears. If the

visitor is satisfied with the level of information they can return to either

the Plant Menu or the Main Menu. If they want more detail they can

continue to the next screen. (See Figure 6.8.)
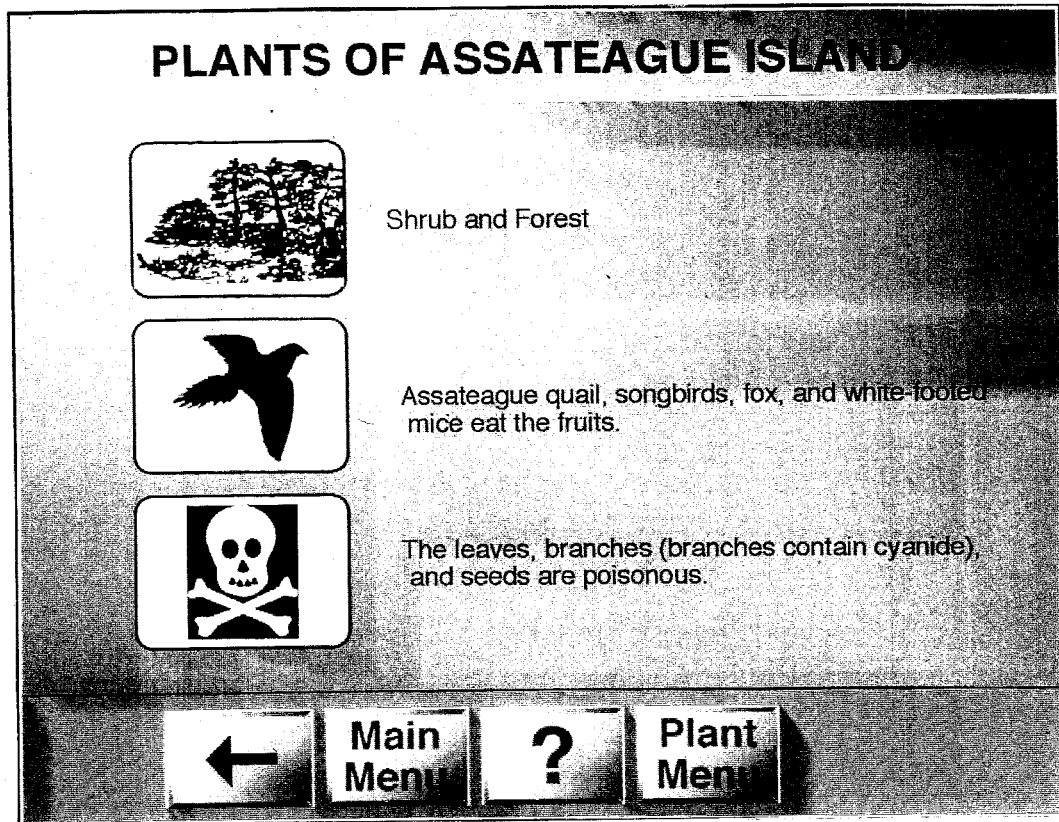
Figure 6.8 Plant Information Screen

The alternate route would have been for plant information by habitat. (See Figure 6.9.)
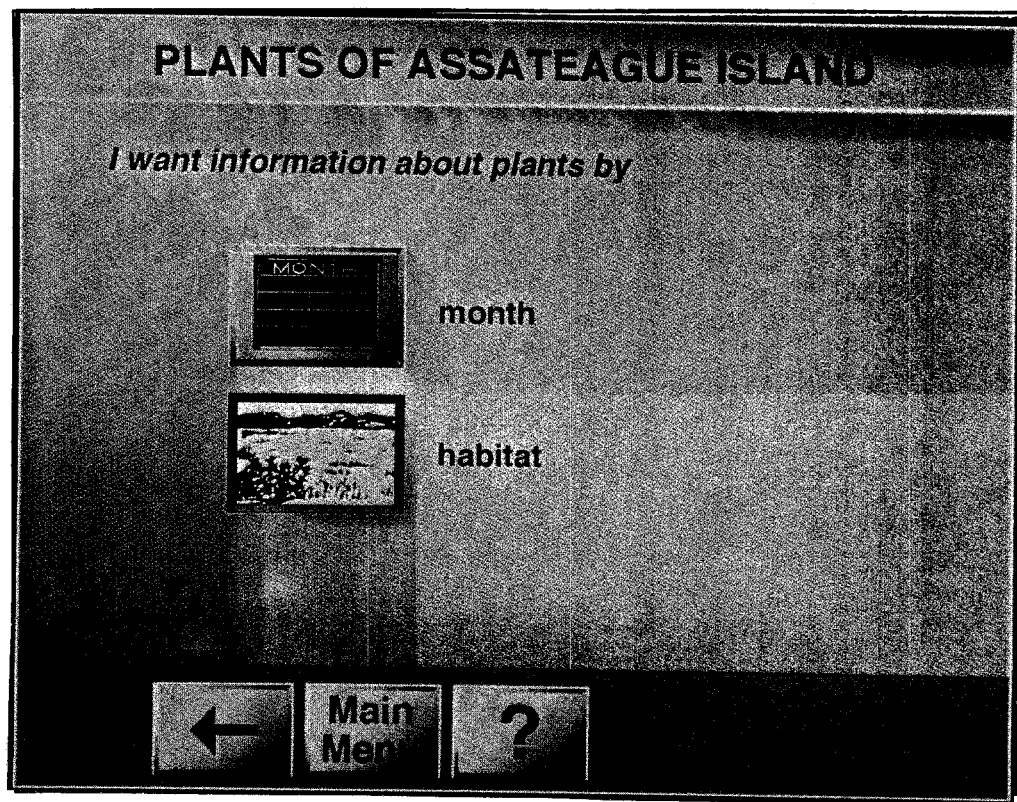
Figure 6.9 Habitat

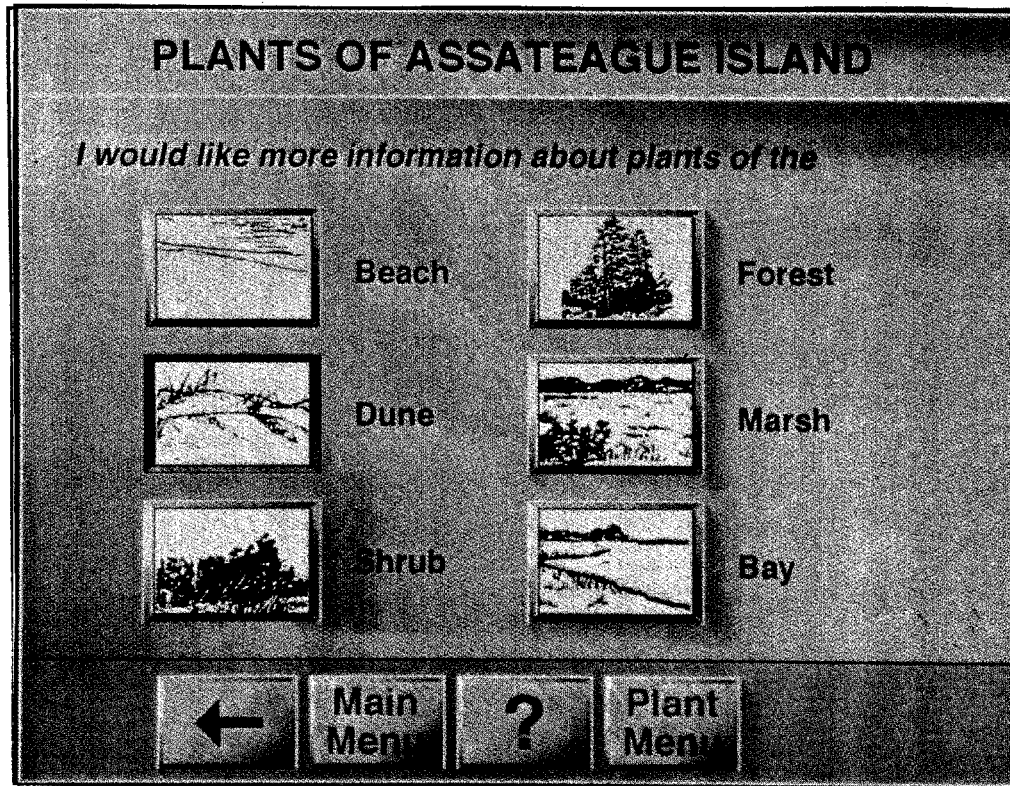This choice will bring up a screen with the list of habitats. (See Figure 6.10.)

Figure 6.10 Plants by Habitat

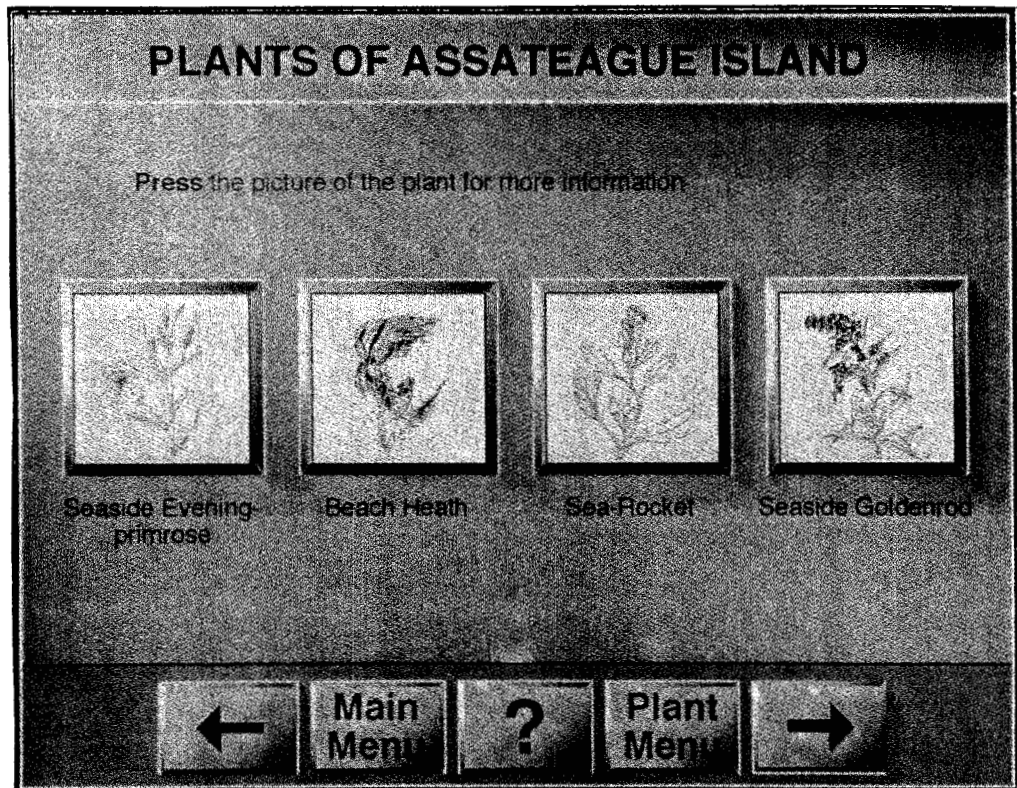If Dunes was chosen small photos of all of the plants in the dune zone appear. (See Figure 6.11.)

Figure 6.11 Plants of the Dune Zone

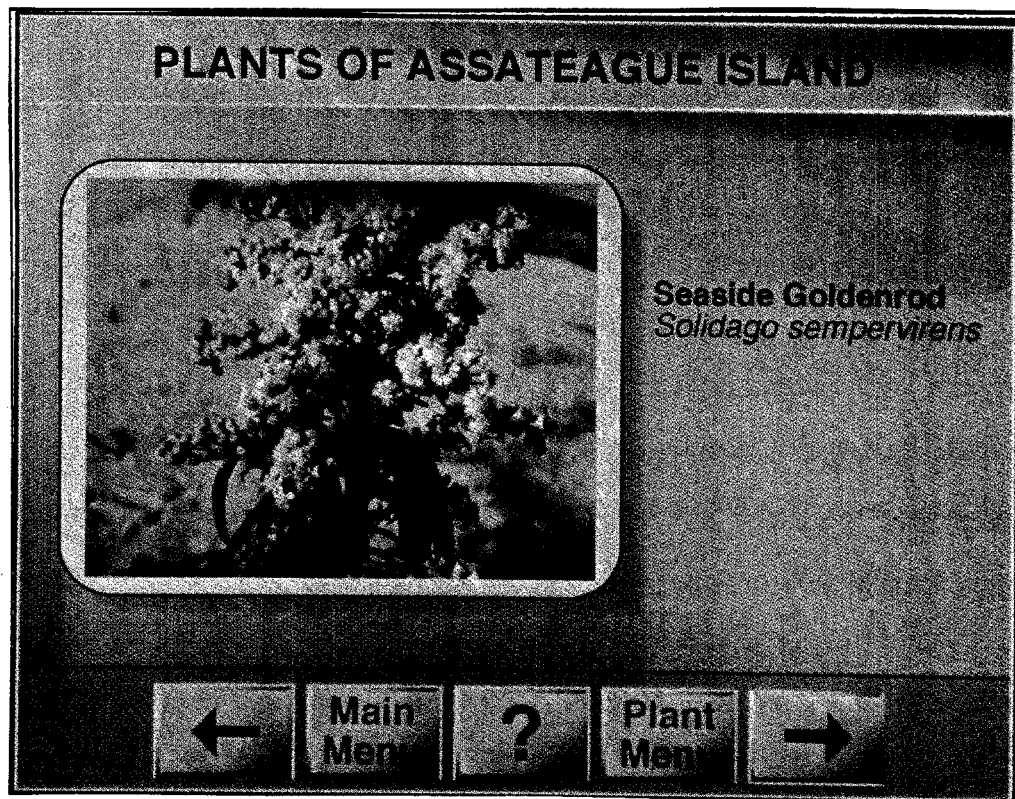If Seaside Goldenrod is chosen the full-sized photo and name appear. (See Figure 6.12.)

Figure 6.12 Seaside Goldenrod

If the visitor wishes additional information the next screen appears when the right arrow is pressed. (See Figure 6.13.)

PLANTS OF ASSATEAGUE ISLAND

Dune

The thick, smooth leaves help the plant survive the hot sun and drying wind of the dune zone.

Monarch butterflies stop to drink nectar from the flowers on their way to their winter home in Mexico.
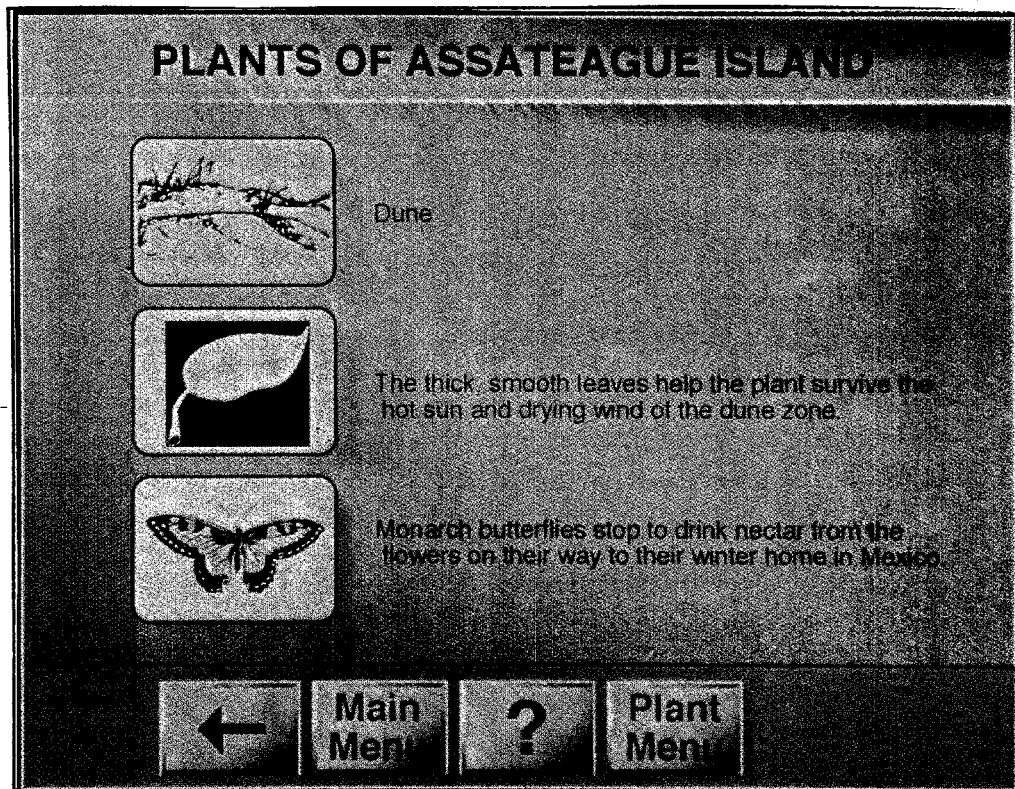
Main Menu | ? | Plant Menu

Figure 6.13 Plant Information Screen

The screens are designed so hot buttons that will cause the program to go somewhere are always square. Images that do not retrieve additional information appear in boxes with rounded edges.

I recommend if the monitor is not used for a specified length of time it revert back to the main menu or topic screen so the next visitor will always start at the beginning of the program. The amount of time will need to be worked out based on the way visitors use the terminal. It would be annoying if two visitors were discussing information on one screen and the computer flipped back to start, and equally as annoying if a visitor walked up and the program was stopped in the middle of a sequence.

The program could be set up for **attract mode**. If the terminal is not in use several different images alternate on the screen creating a sense of motion which attracts visitors to the monitor. At any time the visitor can push a **button** on the touch screen to start the program.

I recommend installing a counter in the program which would tally the number of times a week or a month a button is pushed. The results would provide useful information for future planning by indicating which features were the most popular. A simple, brief visitor survey could be added to the program which would provide general information to the Park Service.

Delivery System

       The final production of this program will be handled by the National Park Regional Design Center in Harpers Ferry, West Virginia. Issues of hardware and software have not been resolved yet as the Barrier Island Visitor Center exhibitry is still in the planning stage.

       Some issues were clear from the beginning. **Touch screen** seemed a logical choice as an input device, it needs to be cleaned periodically but has no breakable moving parts so requires minimal staff maintenance. Users simply touch pre-programmed areas on the screen's surface to input their choices, their eyes do not need to leave the monitor to use the computer.

       The computer should be housed in a **kiosk** to protect the working parts from visitor interference.

       One consultant I spoke with suggested connecting a printer to the computer so visitors could take information home with them. I recommended against this because of the maintenance and staff time required to keep the printer running and stocked with paper.

       Studies show that, "people retain 10 percent of what they see, 20 percent of what they hear, half of what they see and hear (the multimedia advantage), and 80 percent of what they see, hear and do (the interactive edge)."[1] Although multimedia applications have been in

use in business and education, research is still sketchy as to how the design of the program has a positive or negative effect on learning.

Interactive shopping, banking, and entertainment by means of television, telephone, and computers is the wave of the future. How far in the future the technology will be available, and how it will be simplified so everyone can use it are still unanswered questions. These newer technologies may change or completely replace current media standards.

At the present multimedia applications are only affordable to large public institutions like the National Park Service. As the technology improves and the cost decreases multimedia will be readily accessible to smaller institutions. The program developed for Assateague Island National Seashore is educational and simple, and will serve as a useful prototype for the future.

ENDNOTES

[1]Begley, Sharon, "Teaching Minds to Fly With Discs and Mice," <u>Newsweek</u>, May 31, 1993, p. 47.

Appendix A

Alphabetical Listing of Common Plants of
Assateague Island National Seashore

I used Dr. Steven Hill's book as the authority for the scientific name, family name, flowering times, and habitats (zones). Additional plant fact information came from ranger Rachelle Daignault, Larry Points, Jack Kumer (wildlife biologist, Natural Resources), Elaine Furbish (botanist, Natural Resources), Dr Jay Kirkpatrick (field biologist, Eastern Montana University), Dr. Ronald Keiper (Pennsylvania State University, Mount Alto), Joan Maloof (botanist), plus several references on plants of the East Coast.

Slide numbers listed are for slides from the National Park Service Library at Assateague Island. Those slide references marked with an * indicate that I photographed the plant and have slides in my files. Format for the data listed is:

common name (s)

scientific name

common family name - scientific family name

National Park Service slide number

habitat (zone)

nativity

plant type

flower color and bloom time

fruit color and fruiting time

leaf color, season of interest

fun fact 1

fun fact 2

An N/S after fruit or leaf indicates the color is not significant.

An N/A after Fun Facts indicates information was not available.

Agalinis, Gerardia
Agalinis species
Figwort Family - Scrophulariaceae
(NPS slide B81-7, B81-8, B81-9, B81-10)*

- marsh
- native
- annual
- pink to purple flowers July to September
- fruit N/S
- fall color N/S
1 Agalinis flowers open completely only on sunny days between mid-morning and noon
2 N/A

American Beachgrass, Marram
Ammophila breviligulata
Grass Family - Poaceae
(NPS slide B8a-18)*

- dune zone
- native
- perennial grass
- pale green flowers July to September
- fruit N/S
- fall color tan
1 Beachgrass is a major part of the ponies' diet
2 It spreads by underground stems that trap windblown sand and help dunes to form

American Holly
Ilex opaca
Holly Family - Aquifoliaceae
(NPS slide B50-7 to B50-9)

- shrub and forest zones
- native
- shrub or small tree
- white or yellow-green flowers April to June
- red to orange berries September to October
- evergreen leaves
1 Only female plants have red to orange berries during September to October

2 American Holly provides year round protective cover for birds and animals

Bayberry
Myrica pennsylvanica
Bayberry Family - Myricaceae
(NPS slide B20-17, B20-20)*

- shrub and forest zones
- native
- shrub
- white flowers May to June
- grayish berries fall and winter
- fall color N/S, may be evergreen
1 Waxy coated berries were used for making candles and dyes
2 Tree swallows and yellow rumped warblers feed on berries in fall and winter

Beach Heath, False Heather
Hudsonia tomentosa
Rock-rose Family - Cistaceae
(NPS slide B56-15 to B56-19)*

- dune zone
- native
- native perennial
- yellow flowers May to June
- fruit N/S
- fall color N/S
1 Hudsonia roots help to hold sand in place and stabilize the central dunes
2 Dune wolf spiders often dig holes for their homes near the base of these plants

Black Needle Rush
Juncus roemerianus
Rush Family - Juncaceae
(NPS slide B14-9, B14-10)*

- marsh zone
- native
- perennial rush
- yellow-green flowers July to October

- fruit N/S
- fall color N/S
1 muskrats and cottontails feed on rushes
2 provides protective cover for nesters and small animals

Blackberry
Rubus species
Rose Family - Rosaceae
(NPS slide B40-59 to B40-63)*

- shrub and forest zones
- native
- shrub
- white flowers May to June
- black fruits summer
- fall color N/S
1 Watch out for prickly stems
2 Birds, animals, and humans eat the black fruits in summer

Blue Toadflax
Linaria canadensis
Figwort Family - Scrophulariaceae
(NPS slide B81-12, B81-13)*

- shrub zone
- native
- annual or biennial
- pale violet flowers May to June
- fruit N/S
- fall color N/S
1 It is called Toadflax because when you squeeze the flower it opens its mouth like a toad
2 N/A

Camphorweed, Goldenaster
Heterotheca subaxillaris
Aster Family - Asteraceae
(NPS slide B88i-7)*

- shrub zone
- native
- annual
- yellow flowers July to October

- fruit N/S
- fall color N/S
1 The plant has a camphor-like smell. Some people believe it repels insects
2 N/A

Common Reed
Phragmites communis
Grass Family - Poaceae
(NPS slide B8d-9, B8d-10)*

- marsh zone
- native
- perennial grass
- purple flowers August to October
- fruit N/S
- fall color golden yellow after the first frost
1 Native Americans made arrow shafts from stems
2 Common Reed is aggressive and crowds out plants that have more value to wildlife

Dog-fennel
Eupatorium capillifolium
Aster Family - Asteraceae
(NPS slide B88K-39, B88K-40)*

- shrub zone
- native
- perennial
- white flowers September to October
- fruit N/S
- fall color purplish
1 The feathery leaves are aromatic
2 N/A

Eel-grass
Zostera marina
Eel-grass Family - Zosteraceae
(NPS slide B7-3)

- bay zone
- native
- perennial

- flowers hidden in between leaf sheaths July to August
- fruit N/S
- fall color N/S
1 Eelgrass is the favorite winter food of Brant Geese
2 Grows in the shallow water of the bay providing good hiding places for crabs, fishes, and other marine animals

Glasswort, Saltwort
Salicornia species
Goosefoot Family - Chenopodiaceae
(NPS slide B25-29 to B25-34)*

- marsh zone
- native
- annual or perennial
- green flowers August to October
- fruit N/S
- fall color red
1 The stems of Glasswort turn bright red in September to October
2 This fleshy plant is able to survive in salty, marshy ground by storing water in its branches

Grape
Vitis species
Grape Family - Vitaceae
(NPS slide B53-4 to B53-7)*

- shrub and forest zones
- native
- perennial vine
- green flowers June to July
- purple edible fruits in fall
- fall color N/S
1 Bobwhite, quail, woodland birds, raccoons, fox, rodents, and humans eat the purple fruits
2 N/A

Greenbrier
Smilax species
Greenbrier Family - Smilacaceae
(NPS slide B15a-3 to B15a-7)*

- shrub and forest zones

- native
- perennial vine
- yellow flowers May to June
- blue-black fruits
- fall color purplish
1 Deer, rabbits, and birds hide from hunters in the thick tangles of greenbrier vines
2 Deer, ponies, and 50 different species of birds feed on fruits and foliage

Groundsel Tree
Baccharis halimifolia
Aster Family - Asteraceae
(NPS slide B88b-1 to B88b-5)*

- marsh zone
- native
- shrub
- white flowers August to September
- white fruit late September
- fall color N/S
1 Bristled seed heads on female plants look like hundreds of tiny plumes in late summer
2 Groundsel Tree grows in the high parts of the marsh

Hibiscus, Rose Mallow
Hibiscus moscheutos
Mallow Family - Malvaceae
(NPS slide B54-18 to B54-20)*

- marsh zone
- native
- perennial or shrub
- pink or white flowers July to September
- fruit N/S
- fall color N/S
1 This hibiscus has the largest flower of any native northeastern perennial plant
2 Hibiscus seeds are eaten by black ducks

Highbush Blueberry
Vaccinium corymbosum
Heath Family - Ericaceae

(NPS slide B68-6 to B68-9)

- shrub and forest zones
- native
- shrub
- white or pinkish flowers April to May
- bluish fruits June to August
- fall color orange or red
1 rabbits, deer, birds, and humans eat berries in summer and early fall
2 N/A

Hyssop-leaved Eupatorium
Eupatorium hyssopifolium
Aster Family - Asteraceae
(NPS slide B88k-37)

- shrub and forest zones
- native
- biennial or perennial
- white flowers August to October
- fruit N/S
- fall color N/S
1 N/A
2 N/A

Indian Pipe
Monotropa uniflora
Indian Pipe Family - Monotropaceae

- forest zone
- native
- perennial
- white flowers June to September
- fruit N/S
- fall color N/S
1 Indian Pipe is "saprophytic" meaning gets its food from decaying plant
  material
2 Native Americans used Indian Pipe to make a remedy for sore eyes

Jointweed, Coast Jointweed
Polygonella articulata
Smartweed Family - Polygonaceae
(NPS slide B24-2, B24-3)*

- dune zone
- native
- annual
- white to pinkish flowers September to October
- fruits glossy brown
- fall color N/S
1 The reddish-brown stems stand out against white sand
2 Jointweed hugs the dry sandy soil of the dunes

Loblolly Pine
Pinus taeda
Pine Family - Pinaceae
(NPS slide B5-43 to B5-46)

- shrub and forest zones
- native
- tree
- green "flowers" April to May
- fruit brown cones
- evergreen needles
1 Salt spray stresses plant growth creating grotesquely shaped trees
2 Loblolly Pine offers protective cover for the endangered Delmarva Fox
  Squirrel on the southern end of Assateague Island

Marsh Pink
Sabatia stellaris
Gentian Family - Gentianaceae
(NPS slide B74-12, B74-13)*

- marsh zone
- native
- annual
- pink to white flowers July to September
- fruit N/S
- fall color N/S
1 Marsh Pinks are salt tolerant plants and are usually found in the higher
  areas of salt marsh
2 The flower color can vary from pink to white, but the centers are
  always yellow

Marsh-elder
Iva frutescens
Aster Family - Asteraceae
(NPS slide B88c-5)*

- marsh zone
- native
- shrub
- greenish flowers August to September
- fruit N/S
- fall color N/S
1 Marsh Elder can tolerate the salty growing conditions of the marsh
2 This plant is found frequently on the bayside of island

Narrow-leaf Cattail
Typha angustifolia
Cattail Family - Typhaceae
(NPS slide B6-10 to B6-11)

- marsh zone
- native
- perennial
- brown flowers June
- fruit rust-brown
- fall color yellowish-brown
1 Cattail grows in fresh marsh, disturbed wet soil, or wet ditches
2 The flat swordlike Cattail leaves were used for weaving seats for chairs

Panicgrass
Panicum amarulum
Grass Family - Poaceae
(NPS slide 8f-61)*

- dune zone
- native
- perennial grass
- tan flowers July to September
- fruit N/S
- fall color N/S
1 Panicgrass grows behind dunes forming small mounds
2 Sparrows feed on Panicgrass seeds

Poison Ivy
Toxicodendron radicans
Cashew Family - Anacardiaceae
(NPS slide B49-20, B49-23)*

- shrub and forest zones
- native
- shrub or perennial vine
- small yellowish-green flowers May to June
- round white berries August to October
- fall foliage brilliant red/orange
1 Leaflets of three, let them be! Sap in the plant causes an itching rash when it comes in contact with the skin
2 Poison Ivy is eaten by ponies, deer, rabbits, opossum and 50 different species of birds. It does not seem to bother them.

Prickly Pear Cactus
Opuntia humifusa
Cactus Family - Cactaceae
(NPS slide B58-15 to B58-17)

- shrub and forest zones
- native
- perennial
- yellow flowers May to June
- fruits are green to dull purple
- fall color N/S
1 Prickly Pear Cactus has barbed bristles instead of spines. The bristles can be difficult and painful to remove from your skin.
2 The fleshy pads which hug the ground are actually stems

Queen Anne's Lace
Daucus carota
Parsley Family - Apiaceae
(NPS slide B45-7 to B45-9)*

- shrub and forest zones
- introduced from Europe
- biennial
- white flowers June to September
- fruit N/S
- fall color N/S

1 The single dark blossom in the center of the flower represents a drop of the blood of Queen Anne (1665-1714) who pricked her finger while she was making lace
2 Queen Anne's Lace is also known as Wild Carrot

Red Cedar
Juniperus virginiana
Cypress Family - Cupressaceae
(NPS slide B5-35 to B5-37)

- shrub zone
- native
- tree
- yellow-green flowers March to April
- fruit bluish cones
- evergreen needles
1 Red Cedar fruits are eaten by birds
2 The aromatic wood was used for making furniture and fence posts

Red Maple
Acer rubrum
(NPS slide B51-5 to B51-10)

- shrub, forest, marsh
- native
- tree
- red flowers Marsh to April
- fruits reddish in spring
- scarlet fall color
1 Birds use seed, stalks, and leaves for building nests
2 Red Maple also grows in freshwater tidal swamps and bogs

Russian Thistle, Saltwort, Tumbleweed
Salsola kali
Goosefoot Family - Chenopodiaceae
(NPS slide B25-35)

- dune zone
- native
- annual
- greenish or pink flowers June to October
- red fruits in October
- fall color N/S

1 Sparrows and mice eat the seeds of Russian Thistle
2 Russian Thistle is related to the Glasswort plant found growing in the marsh

Salt Marsh Aster
Aster tenuifolius
Aster Family - Asteraceae
(NPS slide B88k-15, B88k-16)*

- marsh zone
- native
- perennial
- pale lavender or whitish flowers August to October
- fruit N/S
- fall color N/S
1 You can also see the Annual Salt Marsh Aster (Aster subtulatus var. subtulatus) blooming nearby from July to November
2 N/A

Saltgrass
Distichlis spicata
Grass Family - Poaceae
(NPS slide B8f-39, B8f-40)

- marsh zone
- native
- perennial
- pale green flowers August to October
- fruit N/S
- fall color N/S
1 Saltgrass is one of the plants in the salt marsh that can tolerant high concentrations of salt in the soil
2 It spreads or extends by lines of roots parallel to the surface

Saltmarsh Cordgrass
Spartina alternifolia
Grass Family - Poaceae
(NPS slide B8b-22, B8b-23)*

- marsh zone
- native
- perennial grass
- whitish-green flowers July to September

- fruit N/S
- fall color N/S
1 Saltmarsh Cordgrass is the main food in the ponies' diet. Second is American Beachgrass
2 A bacteria breaks the leaves down to form "detritus" (a rich protein food) which periwinkles eat

Saltmeadow Hay, Saltmarsh Hay
Spartina patens
Grass Family - Poaceae
(NPS slide B8c-10, B8c-11)*

- marsh zone
- native
- perennial grass
- brown flowers June to October
- fruit N/S
- fall color N/S
1 New growth of Saltmeadow Hay resembles clumps of "cowlicks." Insects live under and meadow voles tunnel through the cowlicks
2 It grows in the high marsh which is only flooded by storm tides or a high lunar tide

Sandbur, Grassbur
Cenchrus tribuloides
Grass Family - Poaceae
NPS slide B8e-4, B8e-5)

- dune zone
- native
- annual
- flowers enclosed in yellow to purple burs July to October
- fruit N/S
- fall color N/S
1 The spiny burs hitch a ride on skin, clothing, or fur, moving seeds to new growing locations
2 Sand Bur lies down and roots in late summer, helping to hold itself and sand in place

Sea-Lavender
Limonium nashii var. trichogonum
Leadwort Family - Plumbaginaceae
(NPS slide B70-10, B70-11)*

- marsh zone
- native
- perennial
- small purple to lavender flowers August to October
- fruit N/S
- fall color N/S
1 Grows in the upper parts of salt or brackish marshes along with Salt Meadow Hay
2 Sea Lavender is able to survive in the salty marsh because it stores water in the leaves and taproot

Sea-Rocket
Cakile edulenta
Mustard Family - Brassicaceae
(NPS slide B36-13, B36-14)*

- dune zone
- native
- annual
- small lavender to white flowers June to July
- fruits green and rocket-shaped
- fall color yellow
1 Waves help to disperse seeds to other shorelines making Sea Rocket one the first beach colonizers. You can see thousands of seedlings along beaches in the early spring
2 The thick rubbery leaves hold water so the plants can survive the dry dune conditions

Seashore-Mallow
Kosteletzyka virginica
Mallow Family - Malvaceae
(NPS slide B54-21, B54-22)

- marsh zone
- native
- perennial
- pink flowers July to September
- fruit N/S
- fall color N/S
1 Seashore-Mallows can grow in fresh, brackish, or salt marshes or thin, swampy woods
2 Scientists have discovered the seeds are a good protein source for people in third world countries

Seaside evening-primrose, Seabeach Evening Primrose
Oenothera humifusa
Evening-primrose Family - Onagraceae
(NPS slide B62-17)*

- dune zone
- native
- annual to biennial
- pale yellow flowers June to October
- fruit N/S
- fall color N/S
1 The flowers open in late afternoon and close in morning, and are pollinated by night-flying insects
2 The low growing leaves and stems are covered with fine hairs which prevent the plant's internal water supply from evaporating in the harsh, dry dune conditions

Seaside Goldenrod
Solidago sempervirens var. sempervirens
Aster Family - Asteraceae
(NPS slide B88a-12 to B88a-14)*

- dune zone
- native
- perennial
- bright yellow flowers September to October
- fruit N/S
- fall color N/S
1 The thick, smooth leaves help the plant to withstand the hot sun and drying wind of the dune zone
2 Monarch butterflies stop to drink nectar from the flowers on their way to their winter home in Mexico

Seaside Spurge, Dune Spurge
Euphorbia polygonifolia
Spurge Family - Euphorbiaceae
(NPS slide B47-9)*

- dune zone
- native
- annual
- inconspicuous white flowers July to September
- fruit N/S

- fall color N/S
1 Low-growing Seaside Spurge hugs the sand to avoid the drying wind
2 The milky sap from the plant is poisonous if eaten, and can irritate the skin

Serviceberry, Shadbush
Amelanchier canadensis
Rose Family - Rosaceae
(NPS slide B40-16 to B40-20)

- shrub and forest zones
- native
- tree
- white flowers April to May
- fruit black
- fall color yellow
1 Squirrels, deer, and ponies feed on foliage and twigs
2 Called Serviceberry because ministers held services underneath trees in the spring

Slender Blue-eyed Grass
Sisyrinchium atlanticum
Iris Family - Iridaceae
(NPS slide B17-1, B17-2) *

- dune zone
- native
- perennial
- blue flower with yellow eye May to June
- fruit N/S
- fall color N/S
1 Slender Blue-eyed Grass is not really a grass. It is the smallest member of the Iris family.
2 The blossoms only last one day, but the blue and yellow color attracts bees

Southern Red Oak, Spanish Oak
Quercus falcata
Beech Family - Fagaceae
(NPS slide B22-4 to B22-8) *

- shrub and forest zones
- native

- tree
- flowers N/S
- fruit brown acorn
- fall color N/S
1 Acorns provide food for deer, fox, raccoon, and several species of birds
2 Decaying oak leaves enrich the soil under the trees encouraging other plants to grow

Sundew
Drosera intermedia
Sundew Family - Droseraceae
(NPS slide B37-3)

- dune zone
- native
- annual or biennial
- white flowers August to September
- fruit N/S
- fall color N/S
1 Sundew catches tiny insects on its sticky leaves and digests them as a source of nitrogen.   It is one of two insect-eating plants on the island
2 Sundew seeds are small and easily distributed by the wind

Trumpet Creeper, Cow Itch
Campsis radicans
Trumpet Creeper Family - Bignoniaceae
(NPS slide B82-3 to B82-5)*

- shrub and forest zones
- native
- perennial vine
- red or orange trumpet-shaped flowers June to August
- fruit N/S
- fall color N/S
1 Trumpet Creeper can grow in wet or dry areas
2 Hummingbirds drink the nectar from the flowers

Virginia creeper
Parthenocissus quinquefolia
Grape Family - Vitaceae
(NPS slide B53-8, B53-9)

- shrub and forest zones

- native
- perennial vine
- white flowers June to July
- dark blue to black fruit fall and winter
- brilliant fall color
1 Virginia Creeper has five leaflets, and is often confused with Poison Ivy which has only three leaflets.
2 The fruits provide fall and winter food for wildlife

Wax-myrtle, Sweetgale
Myrica cerifera
Wax-myrtle Family - Myriaceae
(NPS slide B20-15, B20-16)

- shrub and forest zones
- native
- tree or shrub
- white flowers in May
- waxy, blue-gray fruits
- evergreen leaves
1 twigs, leaves and berries are aromatic
2 Wax-myrtle is the southern version of Bayberry

Wild Black Cherry
Prunus serotina
Rose Family - Rosaceae
(NPS slide B40-42 to B40-46)

- shrub and forest zones
- native
- tree or shrub
- white or pinkish flowers April to May
- purple-black fruits July to August
- fall color yellow to red
1 The leaves, branches (branches contain cyanide), and seeds are poisonous
2 Assateague quail, songbirds, fox, white-footed mice eat the fruits

Wild Bean
Strophostyles umbellata
Bean Family - Fabaceae
(NPS slide B41b-22, B41b-23)

- shrub and marsh zones
- native
- perennial or biennial vine
- purplish-pink, sometimes yellow flowers July to October
- fruit N/S
- fall color N/S
1 Seeds from the pods are probably eaten by birds and rodents
2 N/A

Wild Crabapple
Pyrus angustifolia
Rose Family - Rosaceae
(NPS slide B40-47 to B40-49)

- shrub and forest zones
- native
- tree
- white flowers in May
- yellowish-green fruit
- fall color semi-evergreen
1 Tree roots help to anchor the inner dunes
2 Wild Crabapple may have a short life span on the island. The stress of salt spray affects their growth pattern, often resulting in twisted, gnarled shapes

Winged Sumac
Rhus copallina
Cashew Family - Anacardiaceae
(NPS slide B49-14 to B49-17)*

- shrub and forest zones
- native
- shrub
- small green flowers August to September
- brilliant red fruits August to October
- fall color red to scarlet
1 Wildlife will eat fuzzy fruit clusters in winter when there is nothing else to eat
2 Native Americans used stems for peace pipes

INDEX TO APPENDIX A BY COMMON NAME

INDEX TO APPENDIX A BY SCIENTIFIC NAME

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Appendix B

MULTIMEDIA PERSONAL COMPUTER STANDARDS

MPC Standards from May 1992 were taken from Microsoft Developer Network, <u>Multimedia Authoring Guide</u>, Microsoft Corporation Pre-Release Program CD-ROM, September 1992.

Explanations and definitions of the technical terms below can be found in the computer owner's manual.

Intel 80386 microprocessor running at 10 Mh minimum

2 megabytes of random access memory (RAM)

3.5" high density floppy disk drive

30 megabyte hard drive

VGA display adaptor

color VGA monitor

101 key IBM style keyboard

two-button mouse with bus connector

serial port

parallel port

MIDI port

joystick port

internal sound synthesizer hardware with multi-voice/multi-

timbral capabilities

Microsoft Windows 3.0 or higher

Microsoft Multimedia Extensions

CD-ROM Drive with average access time of 1 second or less,

sustained 150 kilobyte/second data transfer rate, and

standard audio outputs

Appendix C

SAMPLE PROJECT FORM FOR PLANT INFORMATION SCREENS

Date_____   Page Number _____

PLANTS OF ASSATEAGUE ISLAND	PLANTS OF ASSATEAGUE ISLAND
Common Name Scientific Name	

Scientific name: _____

Common name(s): _____

Image: ____35mm slide   ____illustration   ___video frame

Source: _____

Copyright: __yes   __ no

Habitat graphic: _____   Text: _____

FF1 graphic: _____   Source: _____

Text: _____

_____

FF2 graphic: _____   Source: _____

Text: _____

_____

Note graphic: _____   Source: _____

Text:_____

_____

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