

# FISHERMEN'S MEMORIAL

STATE PARK AND CAMPGROUND

NARRAGANSETT, RHODE ISLAND



AN ECOLOGICAL APPROACH TO LOW IMPACT DEVELOPMENT THROUGH BEST MANAGEMENT PRACTICES

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# ACKNOWLEDGEMENTS

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I would like to extend personal thanks to the Rhode Island Department of Environmental Management for granting the opportunity to investigate the issues associated with this educational project. Department Director Michael Sullivan in particular, along with a group of his colleagues, offered support and insight throughout the continuous process of preparing this publication, including gratefully presenting valuable comments and suggestions during a review of preliminary master plans which assisted in further advancing the completion of the project's design phase. Additional gratitude is extended to the University of Rhode Island College of the Environment and Life Sciences, as well as Professor Richard Sheridan, whose guidance and support contributed to this publication's successful completion.

Several supplementary publications and articles also served as major guiding references which aided in the ongoing progression through the conclusion of this project, including: *Landscaping at the Water's Edge: An Ecological Approach* (University of New Hampshire Cooperative Extension Program), *Vegetated Buffers in the Coastal Zone* (Prepared for the Coastal Resources Center at the University of Rhode Island by Alan Desbonnet, Pamela Pogue, Virginia Lee, and Nicholas Wolff), the *Urban Coastal Greenway Design Manual*, *Coastal Buffer Planting Guide*, *Rhode Island Invasive Plant Species Guide*, and the *Buffer Zone and Invasive Plant Management Guide* (Rhode Island Coastal Resources Management Council), as well as the article "Coastal Development in an era of Climate Change" written by Mary H. Cooper Ellis, Student ASLA, which appeared in the March 2008 issue of *Landscape Architecture* magazine.



# FOREWORD

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This project focuses on ecologically responsible design approaches incorporating low impact development methods through the utilization of best management practices for a campground primarily serving recreational vehicles. The practice of ecological responsibility strives to meet present human needs without endangering the welfare of future generations, while preserving the natural environment and minimizing environmental degradation. Ecologically responsible design involves creating places in such a way that the use of non-renewable resources are reduced and the impact on the environment is minimized, as well as relating people with the natural environment. Ecological responsibility responds directly to the current global environmental crisis which involves rapid economic and population growth, the exhaustion of natural resources and destruction of ecosystems, as well as a loss of biodiversity. Environmental issues negatively impacting our world which are discussed within this publication include poor water quality, sea level rise, coastal erosion, and global warming, as well as increasingly intense occurrences of storm surge.

This project also provides a unique opportunity for educating the public on several of the issues discussed above, including methods of low impact development and best management practices, as well as other coastal development issues such as coastal buffer plantings, coastal ecosystems, and habitat restoration and preservation. Educating the public on these important topics is extremely critical to halting and reversing these devastating impacts on our global environment in order to further promote positive improvements in securing a healthy and vital natural world for all to inhabit.

Similarly, this project presents “a return to nature” within a heavily developed residential area in order to combat “Nature Deficit Disorder.” The site itself is already rooted in a natural environment, which when coupled with the application of creative and unique design may be transformed into the prospect of a vibrant, exciting, and memorable place with timeless value. Such spaces encourage individuals to be drawn outdoors where community togetherness, enjoyment, and appreciation may flourish in harmony with nature.



# SITE INTRODUCTION

Fishermen's Memorial State Park and Campground is located along Route 108, or Point Judith Road, in Narragansett, Rhode Island. Currently, the 91.46 acre site presents visitors with a "seaside village" atmosphere which accommodates a family environment. While the majority of the campground serves recreational vehicles, tent camping is also available. The site also offers restroom and recreational facilities, and is within close proximity to Scarborough, Roger Wheeler, and Salty Brine State Beaches. Additionally, Fishermen's Memorial is less than a mile from the Port of Galilee and the Block Island Ferry, as well as 20 minutes from scenic Newport. The campground was opened on July 18, 1970 with 140 campsites, and in 1979 an additional 42 campsites opened for a total of 182. Each of the 182 campsites is sold out every season from Memorial Day to Labor Day.



# OBJECTIVES AND FOCUS

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The extent of the project involves two major objectives: 1) retrofit and update the existing site, and 2) expand into the adjacent Salty Acres property. Retrofitting and updating the existing site entails replacing outdated utility hookups, as well as adding new hookups to camping areas where utilities are currently absent. Utilities include electricity, water, and sewer hookups. Additionally, roadways within the park will be updated with wider turning radii in order to improve vehicular circulation for larger recreational vehicles accessing the site. The expansion into the approximately 50 acre Salty Acres property which was purchased in 1990 involves maximizing the capacity for camping while minimizing disturbance and responding to potential sea level rise.

The principal focus of the project engages the ideals of ecological responsibility in response to coastal development. Furthermore, the project also concentrates on related topics such as the implementation of coastal buffer plantings, low impact development techniques, best management practices, and habitat restoration and preservation. Additionally, importance is placed upon minimizing site disturbance, as well as preventing surface and storm-water runoff from entering the bay without being filtered through existing natural systems. Overall, the project constitutes opportunities and methodologies for designing along the coast.

# SITE HISTORY

Point Judith, Galilee, and Narragansett Bay were all key defense locations during World War II. Fishermen's Memorial Park, which was formally known as Fort Nathaniel Greene, served to protect the west side of Narragansett through the use of 16 inch mounted gun turrets located at the fort. During the war, the old military fortification was disguised to appear as a farm in order to divert any potential enemy attacks. The site was originally 98 acres, but in 1953 the Division of Parks and Recreation donated 6.54 acres to the Transportation Department in order to build an escape road from Galilee to Point Judith. On September 28, 1954, the remaining 8.37 acres of the west reservation of Fort Nathaniel Greene, with its 11 wood frame buildings, was purchased in order to complete the acquisition of the west reservation for further State Park development. The adjoining 83.1 acres of this reservation were purchased previously.

In 1970, local fishermen requested that Fort Nathaniel Greene's name be changed to Fishermen's Memorial State Park in honor of all the fishermen in the Narragansett area, which at the time was known as "The Tuna Capital of the World." Previously owned by the United States Government, on July 18, 1970, Fishermen's Memorial State Park was dedicated by Governor Licht and opened as a campground with 140 available campsites. In 1979, an additional 42 campsites opened for a total of 182. From 1970 to 1977, camping permits were issued on a first come-first served basis. In 1978, the Division of Parks and Recreation changed its format to "reservations only" sent by mail. In addition, regional attractions currently nearby Fishermen's Memorial State Park include: Galilee Harbor, the Block Island Ferry, Block Island and the Block Island Lighthouse, Salty Brine State Beach and Jetty, Roger Wheeler State Beach, Point Judith Jetty and the Point Judith Lighthouse, Scarborough State Beach, Black Point Fishing Area, the Towers at Narragansett Pier, and Narragansett Town Beach.



TOWER OF MOUNTED GUN TURRETS AT CAMPGROUND OFFICE

# SITE ANALYSIS



**LAND USE** :: The Fishermen's Memorial Campground site is comprised of numerous different land uses, including: brush-land, forest, wetlands, developed recreation, and medium density residential. Each particular land use maintains its own character and ecosystem which relate with their respective uses. The residential area is considered medium density as the lot sizes measure  $\frac{1}{2}$  to 1 acre. The entire campground area is considered developed recreation, including the playground centrally located within the site. Both the brush-land and forest is located within and around the wetland areas, serving as buffers from roadways and containing small ecosystems which allow for plant and animal habitats.

The free growing wetlands on the site provide ideal wind protection, erosion control, and privacy barriers. With the development of new campsites, connections between use areas should be reexamined. Strong vehicular routes should provide a main artery for the site, along with a network of safe, pleasant, and clearly marked pedestrian pathways from one use area to the next. Ecologically responsible practices may evolve based on the types of materials used for roads and walks. Pervious paving systems for both road and walkways ensure that water drains properly by recharging the groundwater table.

As the majority of the site is already developed recreation, the possibility for redevelopment is high and easily attainable due to the existing zoning regulations. Prior to being strip cleared of all existing vegetative growth, the Salty Acres expansion property was predominantly brush-land with small, yet significant wetland features. Any proposed design for this area should minimize site disturbance and promote methods of low impact development due to the environmental sensitivity of the area, as well as incorporate the restoration of natural habitats.



**SOIL TYPES** :: There are several different soils types located on the Fishermen's Memorial Campground site. Each different soil type has a distinct character, physical, and chemical composition which makes the soil unique. Additionally, each type of soil demonstrates which is suitable for development based on their properties. The Fishermen's Memorial Campground project provides a beneficial development opportunity where minimal permanent structures are required to be constructed, resulting in soil type becoming a negligible issue. The main soils which are being dealt with are mainly RgA and RgB, both of which maintain seasonally high water tables. Thus, areas where these soils are present are prone to flooding and hold water at the surface, which results in the creation of puddles and other standing bodies of water. These constraints must be considered when citing new tent sites in order to ensure that campers will not be subject to sleeping in pools of water.



# SITE ANALYSIS



**HYDRIC SOILS** :: Hydric Soils are located in numerous areas on the Fishermen's Memorial Campground site. According to the United States Natural Resources Conservation Service, "hydric soils are those soils that are sufficiently wet in the upper part to develop anaerobic conditions during the growing season." Due to the fact that they remain wet throughout the majority of the growing season, hydric soils need to be considered during the design process. Areas in which these soils are present should remain undeveloped. Hydric soils are also instrumental in delineating areas that are considered wetlands by national or state environmental agencies, such as the Department of Environmental Management.

It is imperative that hydric soils remain undisturbed, as these moist soils are unsuitable for construction. However, hydric soils are extremely useful in their natural state, which when left to flourish can act as natural barriers between campsites. Hydric soil locations are also beneficial in controlling erosion. Undeveloped areas may serve as places to establish native vegetation and wildlife, both of which contribute to a natural camping experience.

Hydric soils as well as wetlands should remain free of built structures. If a design requests the construction of a permanent structure, stilt buildings are a suitable alternative to the more typical foundation structures. Stilt buildings offer sturdy construction with little impact on existing water flow and are also better protected from any potential flooding.

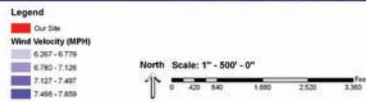
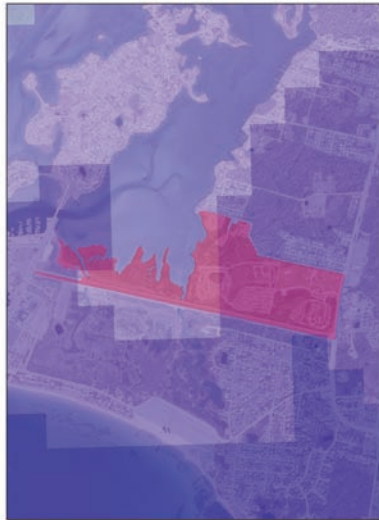


**WETLANDS** :: A series of wetlands reside throughout the Fishermen's Memorial Campground site which need to be considered throughout the design process. According to the United States Environmental Protection Agency, "wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface." The wetlands on site are considered freshwater wetlands within the vicinity of the coast and therefore are under the jurisdiction of the Rhode Island Coastal Resources Management Council. Wetlands are protected by both the Rhode Island Department of Environmental Management, as well as the Rhode Island Coastal Resources Management Council. If a proposed design will affect the wetlands within Fishermen's Memorial Campground, a proposal must be filed and approved by the Rhode Island Coastal Resources Management Council.

Wetlands are extremely important and beneficial natural systems as they allow groundwater to recharge, provide plants and animal ecosystems with natural habitats, and preserve existing native green space from development. Rhode Island wetlands generally consist of a wide variety of plant species which provide a basis for natural ecosystem habitats.

A major area of concern on the Fishermen's Memorial Campground site is the Salty Acres expansion area in which all the existing vegetation was strip cleared. The current environment remains extremely sensitive and should be approached with minimum disturbance. Wetland habitats within this area require restoration in order to reestablish the appropriate natural ecosystems. Incorporating storm-water management systems in order to promote proper drainage is also a positive design possibility.

# SITE ANALYSIS



**WIND VELOCITY** :: The related wind analysis map illustrates the average intensity of wind (in MPH) affecting Fishermen’s Memorial Campground and surrounding sites. The strongest winds are those which travel off of the ocean in the southeast portion of the site. The general direction of the wind blows from the southeast to the northwest during the summer months and oppositely during winter months. This information will be beneficial when considering buffer placement in order to promote cool breezes throughout campground during warmer months.

The results of the wind analysis also demonstrate that constraints upon wind speeds are not strong enough to be utilized as an adequate source of energy. However, if a wind turbine were to be constructed on site, the most appropriate location would be within the southeastern portion of the site.

Wind velocity on site varies roughly from 6.78mph to 7.497mph. These constant winds hold a slim potential to be utilized for generating energy via a wind turbine. A system operating throughout the year could accumulate energy during the “off season”. Studies have shown that even a small turbine capable of generating enough electricity for a house requires a consistent wind velocity of 12.9mph. Further investigation would be required in order to justify the proper wind velocity needed for wind turbine operation.

In addition, constrained, cool breezes throughout the site are ideal. Well circulating air will remove fire smoke and dry sites for campers. Southern edges of campsite require planting in order to slow wind and deter fire smoke from intruding upon neighboring sites. These plantings will also provide afternoon shade and offer privacy between sites. Finally, implementation of wind protection for recreational facilities should be considered.



**RARE SPECIES** :: Numerous rare species are located near Fishermen’s Memorial Campground, and thus it is likely that these species will also access the site. Due to the potential of rare species utilizing the site, their needs must be considered, as well as an understanding of the environments in which they live. The Rhode Island Department of Environmental Management maintains information on these species and their living conditions.

An important aspect of site development is designing in harmony with these species and their ecosystems. Understanding the various rare species within the area is essential for providing educational opportunities to visitors about these species and the proper means of respecting their habitats.

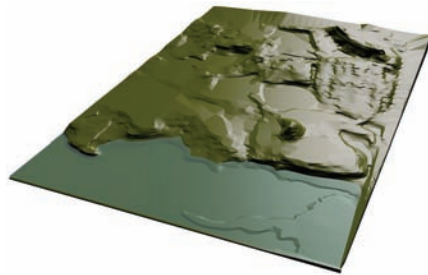
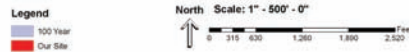
Educating the public about the nearby wildlife may be accomplished through informational signage describing plants and animals dwelling in the area, which will offer a “face” to sensitive ecosystems and the destructive impacts, such as pollution, which negatively influence them. Through educating the public about the precarious state of rare species, both the potential for public cooperation, and ultimately the possibility for species survival will improve.

# SITE ANALYSIS

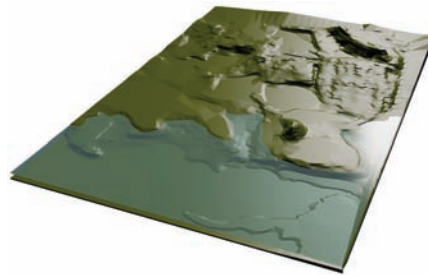


**FLOOD ZONES** :: The majority of the Fishermen's Memorial Campground site resides in what is considered a flood plain. This is significant as any design proposals must consider flood potential. The related map illustrates the level to which a "100 year" storm will raise water to, as well as the level to which a "500 year" storm will raise water to. In both the 100 year and 500 year storm instances, the Fishermen's Memorial Campground site will be inundated, thus precautions must be taken in order to combat storm surge and accommodate excessive water flow.

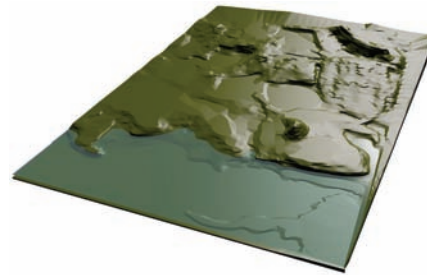
Due to flooding, erosion, and structural failure concerns, several basic, yet important design guidelines should be followed. Proper setbacks from the ocean's median tidal line must be calculated and implemented. These setbacks will allow for a substantial erosion control buffer which will also encourage wildlife and native plant material to thrive. A setback will ensure that design construction will be placed away from a hurricane's seething ocean current. Furthermore, any potential structures should be constructed on high ground with proper reinforcement and situated within a safe distance from the coastline. Rather than attempting to prevent flooding from occurring, areas should be designed to withstand storm surges. Additionally, all sewage and any other potential pollutants require proper maintenance and disposal in order to prevent washout.



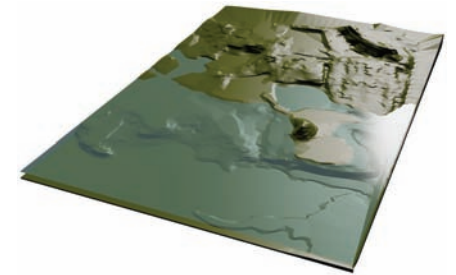
CURRENT MEDIAN HIGH WATER



CURRENT STORM SURGE



5 FOOT SEA LEVEL RISE



5' RISE WITH STORM SURGE

\* Sea level models prepared by Benjamin Morton

# PROJECT STATEMENT AND GOALS

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## PROJECT STATEMENT ::

Fishermen's Memorial Campground presents a unique opportunity to create a naturally aesthetic environment through ecologically responsible design while employing low impact development techniques and best management practices. A response to past, present, and future will guide solutions towards halting and reversing current global environmental crises, while providing opportunities to educate the public on coastal development and storm-water management issues, as well as habitat and ecosystem restoration and preservation. Additionally, the enhancement of internal circulation routes will connect separate use areas through safely oriented methods.

## GOALS ::

- Engage the ideals of ecological responsibility in response to coastal development
- Implement coastal buffer plantings
- Employ methods of low impact development
- Apply best management practices
- Restore and preserve natural habitats and ecosystems
- Minimize site disturbance
- Prevent surface and storm-water runoff from entering the bay
- Educate the public regarding opportunities and methodologies for designing along the coast
- Create a naturally aesthetic environment which combats "Nature Deficit Disorder"
- Respond to past, present, and future in order to halt and reverse current global environmental crises
- Enhance internal circulation through safely connecting use areas
- Renovate hook-ups for existing utility connections
- Improve the recreational space in order to establish a community atmosphere

# MASTER PLAN



# PARK ENTRANCE



A new entrance into Fishermen's Memorial Campground decreases the previous amount of paved surface, while simultaneously instituting a pervious asphalt paving system which is prevalent among all roadways throughout the campground. The newly introduced pervious pavement will facilitate improved means of storm-water management through permitting surface runoff to drain in a controlled manner by recharging the groundwater table. Additionally, pervious pavements aid in the prevention of flooding, and provide time for sedimentation and filtration, which reduce water pollution. The additions of street tree plantings along the edges of the entrance roadway soften views and edges and direct users into the space. Just north of the entrance, a previously underutilized field now provides an area for a farmers market where locally grown organic fruits and vegetables, along with an assortment of other goods, may be distributed throughout the community. The layout of the market ensures a friendly, plaza-like atmosphere, with wide grass-crete perimeter paths connected via smaller walks constructed of a permeable paver system, ensuring percolation of water runoff into the groundwater table. Parking for the farmers market is served by on-street spaces as well as the park interior.



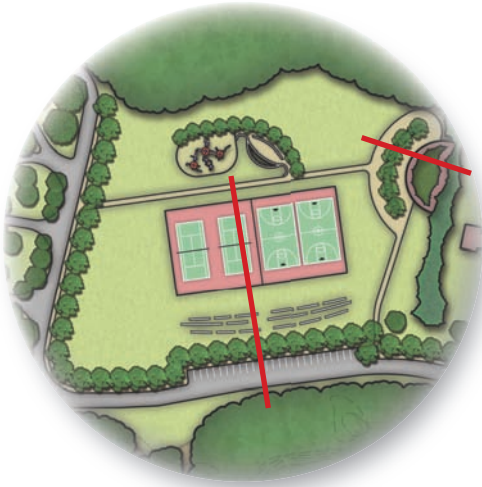
A NEW STONE WALL DEFINES THE SPACE'S EDGE.

THE RENOVATED STONE WALL DEFINES THE EDGE OF THE SPACE WHILE A REESTABLISHED LAWN AND NEW PLANTINGS LIVE THE ENTRANCE AND PROVIDE A BACK-DROP FOR SIGNAGE.

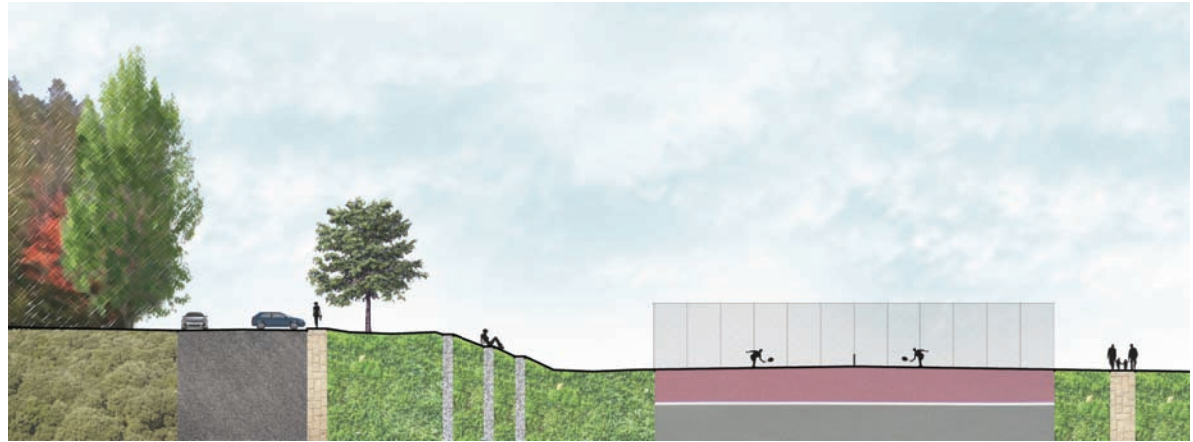


THE ADDITION OF STONE PLANTERS EXCITE THE ENTRANCE WHILE A NEWLY PLANTED ALLEY CREATES A NATURAL EDGE WHICH SOFTENS VIEWS AND DIRECTS USERS INTO THE SPACE.

# RECREATION AREA



The improved recreational area now features a state of the art playground with nearby seating for parents to maintain a safe view of children at play, as well as refinished tennis and basketball courts among a vast open lawn area. Granite slabs have been integrated with the topography in order to present seating with optimal views of the courts. Walkways connect the remainder of the park to an open plaza, which provides picnic facilities beneath a planting of shade trees. The walkways and plaza institute a system of permeable pavers which manages the filtration of storm-water runoff through recharging the groundwater table. A new, larger pavilion featuring a green roof has been constructed into the existing hillside, offering concessions and picnic vicinities for both visitors and campers alike. An evergreen planting atop the hill buffers the unsightly view of the service area.



SECTION ILLUSTRATING GRANITE SLABS INTEGRATED WITH EXISTING TOPOGRAPHY

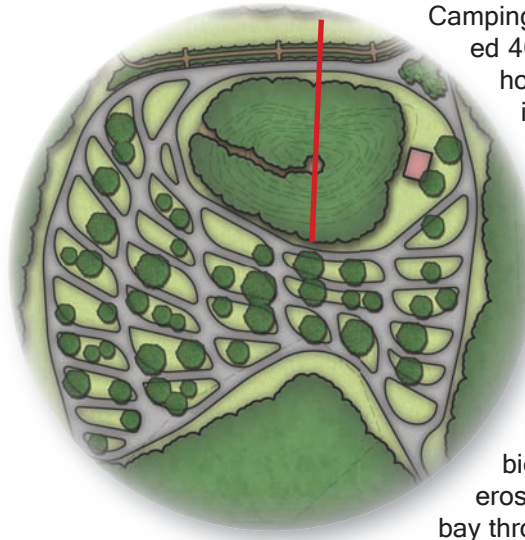


CONCEPTUAL IMAGES ILLUSTRATING PROTOTYPICAL EXAMPLES OF THE PROPOSED PLAYGROUND BY LANDSCAPE STRUCTURES INC.



SECTION ILLUSTRATING PLAZA AND PAVILION WITH GREEN ROOF CONSTRUCTED INTO HILLSIDE

# RV CAMPING :: AREA 1



Camping area 1 located on the western edge of the site previously supported 40 recreational vehicle campsites with electric, water, and sewer utility hookups. A permeable asphalt paving system has replaced the previous impervious roadways for improved management of storm-water runoff, and one way roadways with wider turning radii have also been implemented to improve the circulation for larger recreational vehicles. The area now encompasses 31 campsites with modern electric, water, and sewer utility hookups for small to midsize recreational vehicles. The hillside covering the World War II military bunker within the camping area has been replanted with native species in order to restore wildlife habitats and ecosystems and prevent surface erosion. The existing pathway leading up to the hilltop has been preserved in order to provide access for campers to a peaceful, secluded setting. Directly north of the restored habitat, opposite the roadway, a large bioretention system has been implemented in order to prevent coastal erosion, remove pollutants and deter storm-water runoff from entering the bay through chemical, biological, and physical properties of plants, microbes, and soils. Processes involved with the facility include sedimentation, adsorption, filtration, and decomposition, as well as phyto and bioremediation. The system has been designed to mimic the existing hydrologic conditions while providing storage capacity to treat peak volumes of runoff.



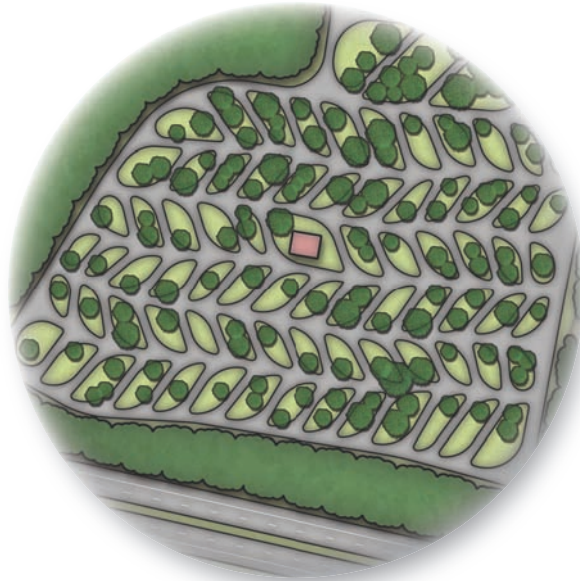
EXISTING COASTAL EROSION CREATED BY RUNOFF FROM ROADWAY



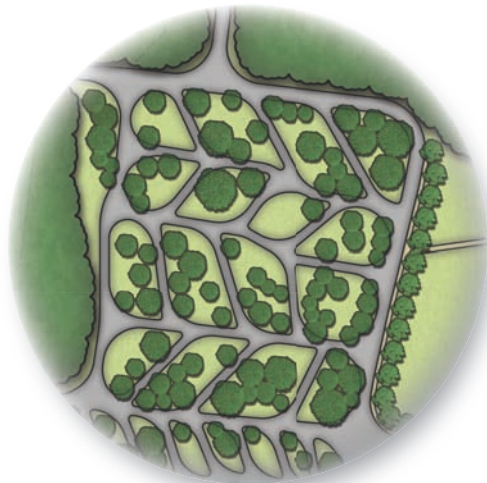
SECTION ILLUSTRATING REVEGETATED WILDLIFE HABITAT ON BUNKER HILLSIDE WITH SECLUDED SEATING AREA AND BIORETENTION SYSTEM WITH RAISED BOARDWALK



# RV CAMPING :: AREAS 2 AND 3



**TYPICAL RV CAMPSITE DESIGN FEATURING PULL-THROUGH SPACES AND MODERN UTILITY HOOKUPS, AS WELL AS A PICNIC TABLE AND FIRE PIT. EACH SITE INTRODUCES THE ADDITION OF NATIVE PLANTINGS FOR A NATURALISTIC CAMPING EXPERIENCE AND EVER-GREEN BUFFERS TO PROVIDE PRIVACY AND SEPARATE EACH SPACE.**



Camping area 2, directly to the east of area 1, previously provided a capacity of 65 recreational vehicle campsites with electric and water utility hookups, as well as a bathhouse with restroom facilities. Pervious asphalt paving has been introduced in order to employ appropriate storm-water management methods, and one way roads with widened turning radii enhance movement throughout the area for larger recreational vehicles. The area now boasts 76 campsites with updated bath facilities, as well as contemporary electric, water, and sewer utility hookups for mainly small size recreational vehicles.



Camping area 3 situated to the west of the recreational facilities previously consisted of 35 tent campsites with a bathhouse and restroom facilities, but lacked utility hookups. Permeable asphalt now replaces the previous impervious pavement in order to properly manage storm-water runoff. The addition of one way circulation and wider turning radii among the roadways now supports easier usage for larger recreational vehicles. The area now contains 16 campsites with modern electric, water, and sewer utility hookups for large recreational vehicles.

# RV CAMPING :: CAMPING AREA 4



Camping area 4 located to the south of the park entrance was previously comprised of 42 recreational vehicle campsites with electric and water utility hookups, as well as a bathhouse with restroom facilities. Previous asphalt paving has been instituted to promote proper storm-water management practices, and one way circulatory routes along with wider turning radii have been applied to the roadways in order to accommodate easier access for larger recreational vehicles. The area now offers 28 campsites with updated bath facilities, as well as contemporary electric, water, and sewer utility hookups for mid to large size recreational vehicles. The forested area adjacent to these campsites remains intact in order to preserve the existing habitats and ecosystems. A natural woodland trail system winds through this forested overlook, providing educational signage with information regarding the wildlife habitats, ecosystems, and plant species prevalent throughout the area.

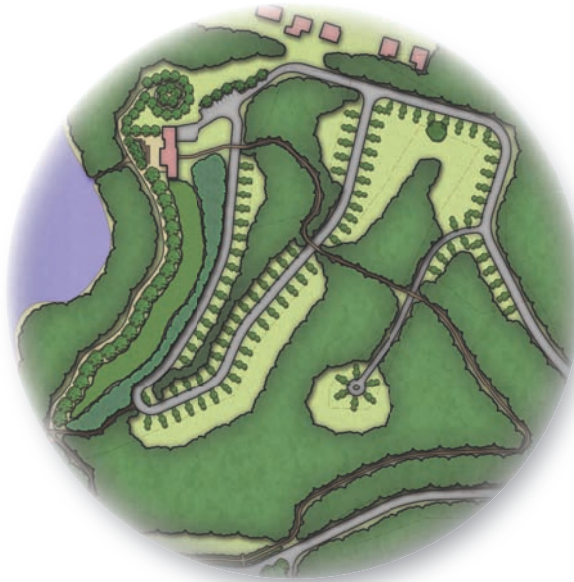
**CONCEPTUAL IMAGE ILLUSTRATING THE WOODLAND TRAIL. THE AREA REMAINS UNTOUCHED IN ORDER TO PROVIDE A NATURAL RECREATIONAL ENVIRONMENT AND PRESERVE WILDLIFE HABITATS AND ECOSYSTEMS.**



**PROTOTYPICAL EXAMPLE OF INTERPRETIVE SIGNAGE DISPLAYED THROUGHOUT THE WOODLAND TRAIL SYSTEM**



# TENT CAMPING :: SALTY ACRES



102 tent campsites are situated on the Salty Acres expansion property. Each campsite measures approximately 20' x 30' and features grass-crete parking areas, as well as rain garden buffers to separate and enclose each individual site. The remainder of each site offers lush lawn areas to pitch tents, picnic tables for dining, and fire pits for evening use. The overall Salty Acres expansion site has been designated as strictly tent camping due to the environmental sensitivity of the area and significant spatial and environmental limitations. Recreational vehicles require utility hookups and more space per site, resulting in more site disturbance than traditional camping methods. Due to these circumstances, the choice for strictly tent camping was appropriate in order to preserve the ecological sensitivity of the area.



CURRENT EXISTING CONDITIONS SHOWING CLEAR-CUT WETLAND HABITATS AND COMPACTED, IMPERVIOUS DIRT ROADWAYS WHICH CREATE UNNECESSARY SURFACE RUNOFF.



TYPICAL TENT CAMPSITE DESIGN FEATURING RAIN GARDEN BUFFERS WITH MEADOW AND WETLAND BACKDROP. RAIN GARDENS ARE AN ATTRACTIVE, LOW IMPACT METHOD OF MANAGING STORM-WATER BY ABSORBING RUNOFF FROM IMPERVIOUS SURFACES AND INFILTRATING THE GROUNDWATER TABLE. ADDITIONALLY, EACH SITE IS EQUIPPED WITH PICNIC TABLES FOR DINING AND FIRE PITS FOR EVENING USE.

# SALTY ACRES :: WETLAND RESTORATION



The existing residence located on the western edge of the Salty Acres expansion property will be converted into a kayak rental center and bathhouse with restroom facilities for the nearby campsites. A gathering area behind the building offers space for seating as well as instructional demonstrations. A pathway leads from the kayak center to the bay for easy water access, and a wooden boardwalk meanders among the camping area and through wetlands to provide easy and pleasing connections for campers. Wetland areas within the Salty Acres property will be revegetated with native wetland plant species. The revegetated wetlands will provide opportunities to reintroduce wildlife habitats in order to support a diversity of ecosystems. A 50' meadow will appropriately buffer the wetlands in order to ensure the safety and security of the sensitive habitats.



THE MAJORITY OF WETLAND HABITATS AND THEIR SURROUNDING VICINITIES HAVE BEEN STRIP CLEARED.



CURRENT VIEW OF UNTOUCHED WETLAND HABITAT



A WOODEN BOARDWALK MEANDERS AMONG THE REESTABLISHED WETLANDS, BOASTING EXTRAORDINARY VIEWS OF THE NATURAL ECOSYSTEM, INCLUDING NATIVE VEGETATION AND WILDLIFE.

# SALTY ACRES :: COASTAL PARK



A raised, spiral walkway culminates the northern edge of a coastal parkway. The park's trail winds along and among the coastal buffer planting zone. The pathway features a permeable paving system which allows surface runoff to recharge the groundwater table and prevents pollutants from entering the bay. An evergreen buffer along the western most roadway on the Salty Acres expansion property acts to separate the coastal park system from the camping area and enclose the spaces. The evergreen planting will also serve as a foundation for a vegetative bioswale system which stretches the length of the entire roadway. The bioswale system will intercept, capture, and filter runoff pollutants before entering the bay. An alley of Black Cherry trees border the waterfront park's walkway and assist in combating storm surge. An intermediary planting of low growing, native coastal species massed between the Black Cherry trees and evergreen buffer functions as an extension of the coastal buffer zone.

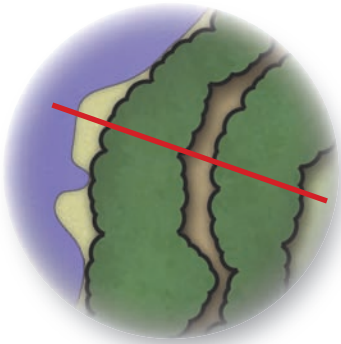
**SECTION ILLUSTRATING THE RAISED, SPIRAL WALKWAY CULMINATING THE COASTAL PARK SYSTEM. THE AREA PROVIDES A POCKET-LIKE SPACE WHERE USERS MAY CONGREGATE AND REFLECT IN A SERENE ATMOSPHERE.**



**VIEW NORTH ALONG THE COASTAL PARK WALKWAY WITH INTERMEDIARY COASTAL BUFFER PLANTING AND EVERGREEN BUFFER TO THE EAST. THE PATH'S PERMEABLE PAVERS ALLOW SURFACE RUNOFF TO RECHARGE GROUNDWATER, PREVENTING POLLUTANTS FROM ENTERING THE BAY. AN ALLEY OF BLACK CHERRY DEFINES THE WALKWAY EDGE AND AIDS TO COMBAT STORM SURGE.**



# COASTAL BUFFER



A 200' coastal buffer planting zone originating near the southern tip of the coastal park will involve aggressively combating exotic invasives with the replacement of hardy native plant species. Coastal buffer plantings serve to combat storm surge, prevent coastal erosion, and provide wildlife habitats for a diverse range of ecosystems. The overall goal of restoring a coastal buffer planting zone entails creating a restored native plant community that mimics naturally vegetated shoreline areas. Appropriate native plant material should be selected in response to the conditions on site, and the vegetative habitat should be structured in layers to emulate natural occurrences. A diversity of plant material should be introduced, with similar species clustered together in order to create a natural aesthetic. Diverse ranges of plant species create an ecologically healthy landscape, providing food and shelter for a wide variety of wildlife, while also increasing the likelihood of a successful, native vegetative community. As the walkway of the coastal parkway penetrates the coastal buffer zone, the path converts into a natural trail and provides educational information regarding wildlife habitats and ecosystems, as well as coastal buffers, low impact development techniques, and best management practices utilized throughout the site in order to promote ecological and environmental responsibility.

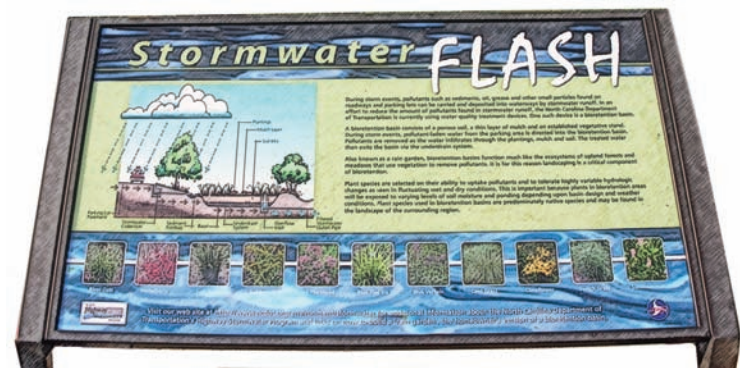


CONCEPTUAL IMAGE ILLUSTRATING PROTOTYPICAL EXAMPLE OF INTERPRETIVE SIGNAGE FOR COASTAL HABITATS AND ECOSYSTEMS



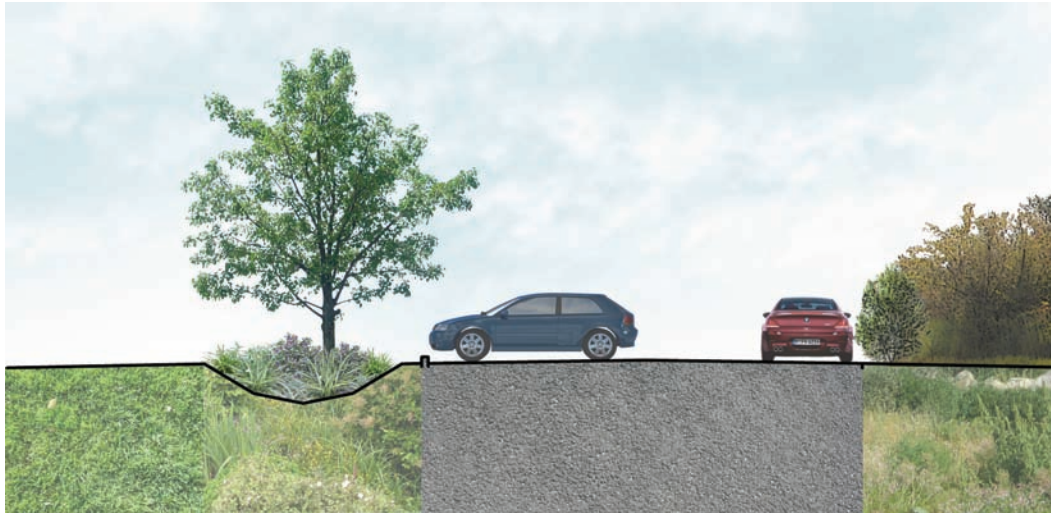
SECTION ILLUSTRATING THE NATURAL TRAIL THROUGH THE COASTAL BUFFER PLANTING ZONE AND FRINGE MARSH BOUNDARY WITH CURRENT MEDIAN HIGH WATER LEVEL AND 5 FOOT SEA LEVEL RISE. LOWER GROWING NATIVE VEGETATION HAS BEEN SELECTED FOR THE WESTERN BANK OF THE TRAIL IN ORDER TO MAINTAIN VIEWS OF THE WATER. SIGNAGE ALONG THE TRAIL EDUCATES USERS ABOUT COASTAL BUFFERS, HABITATS, AND ECOSYSTEMS, AS WELL AS LOW IMPACT DEVELOPMENT METHODS.

CONCEPTUAL IMAGE ILLUSTRATING PROTOTYPICAL EXAMPLE OF INTERPRETIVE SIGNAGE FOR LOW IMPACT STORM-WATER MANAGEMENT METHODS



# LOW IMPACT DEVELOPMENT

Low Impact Development, or LID, is a versatile and innovative design approach for managing storm-water runoff which emphasizes conservation and the use of natural features on-site to protect water quality. The goal of LID is to mimic a site's existing hydrology through the use of design techniques which implement small-scale, engineered hydrologic features that infiltrate, filter, store, evaporate, and detain surface runoff at its source. These techniques are based upon the premise that storm-water management is not equal to storm-water disposal. Rather than managing and treating storm-water runoff in large and costly facilities located at the bottom of drainage areas, LID manages storm-water runoff through small, cost-effective landscape features located on-site. Low Impact Development boasts many benefits, including the protection of habitats, improved management of water quantity to reduce the risk of flooding, reducing impervious surfaces and runoff to minimize peak flow volume and rate, recharging groundwater through infiltration, improving water quality, increased aesthetics, and cost savings. Typical systems of LID practices include bioretention, rain gardens, vegetative bioswales, and pervious paving.



SECTION ILLUSTRATING VEGETATIVE BIOSWALE AT KAYAK CENTER PARKING. VEGETATIVE BIOSWALES ARE LANDSCAPE ELEMENTS CONSISTING OF A SWALED DRAINAGE COURSE WITH GENTLY SLOPED SIDES WHICH ARE PLANTED WITH A VARIETY OF PLANT SPECIES AND DESIGNED TO REMOVE SILT AND POLLUTION FROM SURFACE RUNOFF. THE PATH IN WHICH THE WATER FLOWS, ALONG WITH THE WIDE, SHALLOW DITCH, ARE DESIGNED TO MAXIMIZE THE AMOUNT OF TIME WATER SPENDS IN THE SWALE, THUS AIDING IN THE TRAPPING OF POLLUTANTS AND SILT WHERE THEY ARE TREATED BEFORE BEING RELEASED INTO THE WATERSHED.

# LOW IMPACT DEVELOPMENT

Rain gardens, an innovative, resourceful, and attractive Low Impact Development practice, are planted depressions that are designed to increase filtration through absorption and decrease storm-water runoff from impervious surfaces while simultaneously reducing the risk of flash flooding. The systems allow runoff to soak into the ground and recharge the groundwater table, as opposed to flowing into storm drains and surface waters which leads to erosion, water pollution, flooding, and diminished groundwater. Rain gardens should be planted with native vegetation, as native species generally do not require fertilizer and are more tolerant of local climate, soil, and water conditions. A selection of wetland edge vegetation, such as wildflowers, sedges, rushes, ferns, shrubs, and small trees, absorb excess water flowing into the rain garden, which is filtered through soil layers before entering the groundwater table. The vegetative root systems enhance infiltration and redistribute moisture, and through the process of transpiration, plant material returns water vapor to the atmosphere. Surface runoff not absorbed by rain gardens slows significantly due to the swale and vegetative barrier, thus reducing sediment load and pollution downstream and mitigating peak flow. Rain garden construction involves excavating soil to approximately six inches below the level of the surrounding land and amending with a blend of 20% organic matter (such as compost), 50% sandy soil, and 30% top soil in order to promote adequate drainage and ensure deterioration of pollutants. Clay content should not exceed 10% of the soil mixture as it inhibits drainage. After planting, a 3" layer of hardwood mulch should be added in order to suppress weeds and aid in the removal of heavy metals from precipitation before percolating down into groundwater.



SECTION ILLUSTRATING TYPICAL RAIN GARDEN DESIGN AS IMPLEMENTED INTO TENT CAMPSITES



# CONCLUSION

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The design approaches and subsequent development methods discussed throughout this publication present solutions which create a naturally aesthetic environment through the ideals of ecological responsibility, as well as the institution of low impact techniques and best management practices. A response to past, present, and future guided these solutions towards halting and reversing current global environmental crises, while providing opportunities to educate the public on coastal development and storm-water management issues, as well as habitat and ecosystem restoration and preservation.

The extent of this project engaged two major objectives: retrofitting and updating the existing site with improved circulation routes and contemporary utility hookups, and expanding into the adjacent Salty Acres property while maximizing the capacity for camping, minimizing disturbance, and responding to potential sea level rise. Overall, the project explored constituting opportunities and methodologies for designing along the coast.

The principal focus of this publication involves exposing individuals to innovative topics and new concepts, while bringing attention to urgent actions which are required to halt and reverse our current global environmental crisis. Additionally, it presents design solutions that will give back to the local community through encouraging a greater appreciation for the natural environment and providing spaces where visitors may interact with nature.

This project would not have been possible without the support of the Rhode Island Department of Environmental Management, who graciously provided funding to investigate the issues associated with this educational endeavor.

