NAME: Alley Pond Environmental Center (APEC)

TYPE: Field Work, Visitation

LEVEL: Elementary through Secondary

AREA: Queens County, New York City

Arrangements: The Center is open Weekdays except Wednesday 1 - 4:30, Saturday 10 - 4:30, and Sunday 11 - 4:30. Contact the Center at (212) 229-5314 for information and reservations. The park area is open from daybreak to sunset.

Directions: The Center is located at 228-06 Northern Blvd. Take the Long Island Expressway to Cross Island Parkway, exiting east on Northern Blvd. The Center is about 300 yards east of the exit.

Facilities: The Center contains a natural science library, natural history and aquaria exhibits, and a meeting room with a capacity of 125 individuals. Outside is a recycling center which processes bottles, newsprint, motor oil, and metals. The Center is surrounded by several hundred acres of undeveloped New York City parkland.

Water Facilities: There are no facilities at the Center or elsewhere in the immediate neighborhood for swimming or public boat rentals. A public boat launching ramp is available as is marine fuel (at the Nichols Bayside Marina which is adjacent to the Cross Island Parkway). Fishing and seining are possible from the shoreline.

Best Usage: To show the succession of organisms from a bay-estuary environment to a tidal creek which leads into an upland meadow and pond area, and finally ending in a fringe forest.

Type of Environment: A tidal creek extends from Little Neck Bay for several hundred yards into an upland meadow that is bordered by a fringe of forest. Spartina alterniflora and Spartina patens are scattered along the creek. The meadows contain several ponds and springs.

A short walk across Northern Blvd. lies Little Neck Bay. The western edge is bordered by the Cross Island Parkway and a bicycle path which starts near APEC on Northern Blvd. and extends northward to Fort Totten. The entire west shore of the bay along the path is open to the public. This stretch of the bay presents a varied mixture of rocky areas, mud and sand banks, and patches of marsh. At low tide it is an excellent place for walks and collecting marine specimens. During winter and migration time, sea birds gather in large numbers in this area.
Suggested Activities: Activities are available for school groups K-12 on Tuesdays and
Thursdays by appointment. However, the area can be used by individual
teachers with their classes anytime. Some suggested activities are:
1. succession studies from bay to upland forest
2. digging in rocky, muddy, and sandy areas for various invertebrates and
   then comparing to see if there are any differences in the type,
   number of organisms present
3. seining for fish
4. tidal study
5. determination of the fresh water influx
6. pollution study vs. amount of boats present

Preparation: Have students make a map of the area, indicating the number of ponds, creeks,
meadows and borderline forest. Things to bring on trip - boots, collecting
buckets, shovels, sieve, nets, binoculars, etc.

Warnings: Do not walk out too far, especially in the mud flats. Be very careful
when conducting the class on a walk near the Cross Island Parkway and
Northern Blvd. since traffic is moving at a high rate of speed.

Author - Educator: Richard McDermott, John Adams High School
101-01 Rockaway Blvd.
Ozone Park, New York

Suggested References: (GE) 10, 16, 22, 26; (B) 35; (I) 46; (PL) 68.
NAME: Gateway National Recreation Area

TYPE: Field (coastal) study activities - marine food chains

LEVEL: Elementary, intermediate, secondary, general public, college

Arrangements: Reservations for Ranger guided tours (minimum 10 people) must be made two weeks in advance through each Unit's Office: Jamaica Bay Unit 212/630-0126 Jamaica Bay Wildlife Refuge 212/474-0613 Breezy Point Unit 212/474-4600 Staten Island Unit 212/351-8700

Directions: Breezy Point Unit: Mass transit Subway: IRT 3 or 4 to Flatbush Avenue - Q35 bus to park; or IND A or E to Rockaway Park - Q22 bus to park. Bus: B6, B41, or B44 to Flatbush and Nostrand Avenues - Q35 bus to park; Q21 or Q53 to Beach 116th Street - Q22 bus to park. Auto: Belt Parkway to Exit 11-S, continue directly south across the Gil Hodges Bridge to Beach Channel Drive to park; or Woodhaven Boulevard to Cross Bay Boulevard, west on Beach Channel Drive to park.

Jamaica Bay Unit: Jamaica Bay Wildlife Refuge Mass transit Subway: IRT 2 to New Lots Avenue - Q21A bus to refuge; or IND A or E to Broad Channel - walk to refuge. Auto: Belt Parkway or Woodhaven Boulevard to Cross Bay Boulevard, south to refuge. Floyd Bennet Field Mass transit Subway: IRT 3 or 4 to Flatbush Avenue - Q35 bus to Field entrance. Auto: Flatbush Avenue to Floyd Bennett Field entrance. Canarsie Pier Mass transit Subway: BMT LL to Rockaway Parkway - free transfer to B42 bus to entrance. Auto: Belt Parkway to Rockaway Parkway. Plumb Beach Auto: Eastbound only on Belt Parkway to entrance between Knapp Street and Flatbush Avenue exits.

Staten Island Unit: Mass Transit Rail: SIRT to R111 bus at Oakwood Heights Station. Bus: R103 or R111 to Great Kills; R7 to Sand Land and Hylan Boulevard and R103 to Great Kills; Domenico bus to Great Kills from Port Authority terminal; R117 to Miller Field. Auto: Verrazano-Narrows Bridge and I-278 to Hylan Boulevard to New Dorp Land for Miller Field; straight ahead on Hylan for Great Kills.

Facilities: There are few facilities for food, except at Riis Beach and Canarsie Pier. Restrooms are available at all locations as well as shelter from foul weather. Tours may be a distance from facilities, so that appropriate dress is required. Consult Park Ranger staff as necessary.

Water Facilities: Swimming activities are allowed at designated Beach areas. Fishing takes place on Cross Bay Boulevard bridge across Jamaica Bay and at Fort Tilden, Breezy Point.
Best Usage: Open year round, the Jamaica Bay Wildlife Refuge has provided a full-time or seasonal habitat for more than 300 species of birds, including horned owls in the winter, and egrets and glossy ibis in the warm weather months. The teeming marine life of the bay provides recreation for fishermen at the North Channel Bridge and Canarsie Pier.

The best usage of the area includes seining in the intertidal zone at Breezy Point and Jamaica Bay (Dead Horse Bay), bird nesting, along with behavior studies at the Wildlife Refuge, dune walks at Breezy Point (Fort Tilden), and a tour of a White Oak Swamp at the Staten Island Unit.

Type of Environments: Freshwater Ponds are located at the Jamaica Bay Wildlife Refuge; estuarine (marine) environments associated with Breezy Point, dune ecology and coastal wetland marshes are all easily accessible.

Preparation: Teachers are requested to attend a pre-trip workshop. Generally, the public should contact the Park Ranger at the site they wish to visit.

Author - Educator: John T. Tanacredi, Environmental Education Specialist, Gateway National Recreation Area - Headquarters, Floyd Bennett Field, Brooklyn, New York 11234. Office phone: (212) 630-0293(4)

Suggested References: (GE) 4, 10, 16, 26.
Name: Dead Horse Bay Environmental Study Area

Type: Field Work, Collecting and Museum Visit (optional)

Level: All levels

Area: Brooklyn, New York

Arrangements:
Dead Horse Bay is part of the Jamaica Bay Unit of the Gateway National Recreation Area. The unit headquarters are located at Floyd Bennett Field, Building 272, in Brooklyn, 11234. Reservations can be made by contacting the Unit at 252-9286 or 252-9287. You can request a ranger-led tour with sufficient advance notice. A self-guided tour is also allowed, with reservations. An application for a collecting permit should be filed with the Unit Manager if materials are to be collected. A workshop is required for those teachers who have not participated in any previous workshops.

Directions:
Dead Horse Bay is located at the southern end of Flatbush Avenue, just before the Marine Parkway Bridge, opposite the entrance to Floyd Bennett Field. The trail system begins about 100 feet west of Flatbush Ave. at the traffic light.

Facilities:
Building 272 houses the Jamaica Bay Unit and a New York City Board of Education cooperative, the Gateway Environmental Studies Center. On the first floor there is a meeting room, restrooms, and a soda machine. In addition there is a small museum that students can visit. Limited parking is available at the guard station at the entrance to Floyd Bennett Field. Ample parking is available at Building 272, which is ½ mile from the entrance. A trail system at Dead Horse Bay is composed of four looping trails, cut through the reed grasses. One of these trails is presently self-guided, and is marked by wooden posts.

Water Facilities:
A private marina is located at the northern end of Dead Horse Bay. At the present time there are no other launching facilities for boats in the area. Swimming is not permitted. A number of areas along the shore are excellent for seining collections.

Suggested Activities:
historical significance of the docks, mills, landfill
economic significance of the area
seining for invertebrate and vertebrate forms
beach succession
beach erosion
upland vegetation
fouling (piling) community
bird watching - including the nesting of terns and pheasant
tidepool communities
food-chain relationships
micro-climatic studies of the beach versus the uplands
beach zonation
Dense spartina found in a salt marsh

**Type of Environment:**
The environment includes an uplands, sand dunes, sandy beach, salt marsh, mud flat, rock jetty, piling community and an estuarine bay. There is a variety of natural successional environments as well as man-made or man-influenced environment.

**Typical Flora:**
Phragmites, cordgrass, dune grass, seaside goldenrod, broomsedge, salicornia, bayberry, sea blite, ailanthus, old field toadflax, soapwort, camphorweed, butter and eggs, pokeweed, virginia creeper, morning glory, Russian olive, wild rose, Northern cottonwood, rockweed, sea lettuce and other assorted algae.
Typical Fauna:
Rabbits, field mice, pheasant, sea gulls, terns, red-wing blackbirds, egrets, sandpipers, ducks, assorted shorebirds, insects, (assorted), killifish, spearing, flounder, blackfish, sea bass, eel, rock crabs, spider crabs, hermit crabs, mussels, soft shell clams, oyster drills, sand shrimp, glass shrimp, sandworms tube worms, mud snails, periwinkles.

Geological Studies:
Sand spit
Dune formation
Erosion of dunes and marsh areas
Succession on Landfill - differential decomposition of materials.

Preparation:
Boots or waders are advisable for work in the water
Nets
Buckets
Jars
Field Guides

Warnings:
Submerged rocks and pilings
Broken glass and cans
Insect repellent for summer use
Uneven terrain in uplands

Authors:
Alan Ascher
South Shore High School
6565 Flatlands Avenue
Brooklyn, New York 11236

Denise DiRienzo-Skalecky
Bishop Ford Central Catholic High School
500 19th Street
Brooklyn, New York 11212

Publications and References: (GE) 4, 8, 10, 16, 26; (B) 36; (F) 40; (I) 46, 51; (PI) 64, 67, 70, 72.
NAME: Gateway N.R.A. - Plumb Beach

TYPE: Fieldwork: zonation, diversity of organisms, topographical studies

LEVEL: Elementary through college

Arrangements: Programs for school groups are offered during the spring, summer, and fall by the rangers of the Jamaica Bay unit of Gateway. Call (212) 630-0126 for all visits. Teachers are required to attend special workshops organized by Ruth Eilenberg of the Gateway Environmental Center (212) 252-7307. Note that some limited waivers are possible where a NYSSEA member can demonstrate competency in the field.

Directions: The only access is an entrance from the Eastbound lane on the Belt Parkway between the Knapp Street and Flatbush Ave. exits. Special permission for buses to use the parkway can be obtained from Gateway.

Facilities: During the warmer months, when programs are run by the park, bathrooms and a one-room Nature Center with several aquariums containing local organisms can be utilized.

Water Facilities: Wading is permitted, but swimming is not allowed in the salt marsh, lagoon and mudflat areas. There are no facilities for boat launchings, with the exception of nearby Barren Island marina.

Best Usage: There are 5 different environments present at Plum Beach: upland forest, primary, secondary dunes, salt marsh, lagoon, and mudflats. Within these areas a wide diversity of plant and animal species can be found. The area is especially suited for transect and small-scale topographical studies.

Suggested Activities:

1. Zonation can be demonstrated by the plant communities which may be found within distinct areas having uniform elevation (resulting from exposure to wind and salt spray, freshwater availability, etc.). These can either be done in the form of a walk, or with sufficient preparation, the students can conduct a transect study.

2. Tide pool studies. The mudflats of Plum Beach provide an excellent area for the study of these interesting communities. Groups of students can be set up to compare the number and type of organisms which can be found (a) in the tide pools (b) on the dry mud flat (c) on the upper beach face (d) in the sub-tidal zone. Changes in temperature, salinity and oxygen concentrations can frequently be illustrated by these studies.

3. The rich variety of organisms present in the small area provides an excellent living laboratory for the exploration of the diversity of life. Evolutionary trends and taxonomic groups, as well as ecological concepts can be explored. Reminder: Collecting is allowed only with a permit.
4. The salt marsh environment provides an excellent setting for a discussion of the value of salt marshes, and coastal zone management in general.

5. For a geology or earth science class, the quick changing elevations of the sand dune areas provide an excellent area for practicing mapping, orienteering, and transect techniques.

6. Plumb Beach is an excellent site for viewing horseshoe crab mating during the spring.

**Preparation:** See information about mandatory teacher workshops above. There are many books and materials available for this type of environment. See references.

**Warnings:** Make sure that students are prepared to get wet, even if you do not plan to go in the water. Require that all students wear sneakers or some other shoe covering at all times, in or out of the water. The quality of the water varies greatly with the weather; avoid head or internal contact with the water. Always have students dress warmer than normal, due to the frequent cooling onshore wind pattern.

**Author-Educator:** Lou Siegel, John Dewey High School, 50 Avenue X, Brooklyn, N.Y.

**Suggested References:** (GE) 4, 8, 10, 14, 16, 26; (B) 36; (F) 40; (I) 46, 51; (PL) 64, 67, 70, 72.
NAME: N.Y. Aquarium

TYPE: Visitation

LEVEL: Elementary, Intermediate, Secondary

AREA: New York City

Reservations:
(212) 266-8540 - Must be made for a class trip or a program one month in advance of your visit. To reserve a date in the months of April, May or June a teacher must have attended an Aquarium Teacher's Workshop.

Directions:
By car: The Aquarium is located at the intersection of West 8th Street and Surf Avenue in Brooklyn, N.Y.
By train: Take the TD "F" train or BMT "M" train to West 8th Street station.
By bus: (in Brooklyn)
B36 Nostrand Avenue - West 37th Street (East-West) to Surf Avenue and West 8th Street, Brooklyn.
B68 Prospect Park West - Sea Breeze Avenue (North-South) to Surf Avenue and West 5th Street, Brooklyn. Then walk three blocks west.

Facilities: The Aquarium has ample parking and restrooms. There is a cafeteria and snack bar and picnic tables are available outdoors in the summer months. Some Aquarium exhibits are unsheltered, outdoor exhibits.

Water Facilities: The Coney Island beach is located immediately adjacent to the Aquarium. Rocky jetties house an abundance of seashore life.

Best Usage: The Aquarium can provide a "living laboratory" where students can observe a variety of marine life, observe behaviors, methods of locomotion, reproduction, food-getting, and defense mechanisms. The beach provides an opportunity to study several natural habitats.

The Aquarium can be used to distinguish ecological zones such as marine life indigenous to intertidal, littoral, pelagic, rocky coast, marsh, tropical areas and indigenous species to the Northeast coast. They can teach the making of marine tools and artistic designs.

Type of Environment: The Aquarium is located on the Coney Island beach, a good example of a man-made, heavily impacted sandy shore. Man-made rocky jetties provide the opportunity to observe some of the characteristics of a rocky coast.

Suggested Activities on all three levels: There is a tremendous number of different activities that can be carried out at the Aquarium - most are of an observational nature. A teacher's approach will depend on the curriculum he or she is dealing with and the age and experience of the students.
Pre-trip:
It is recommended, whether or not you visit the Aquarium during the months when it is prescribed, that you attend a teacher's workshop. You will receive materials, suggestions and instructions for activities, and guided tours of the Aquarium and behind-the-scenes. Aquarium Education Kits can be purchased by mail from the Education Department. They contain information that you will find helpful in planning pre-, on-site and post-trip activities; bibliographies, resources for information, and information and activities on various marine topics.

On-Site:
Do not fail to take advantage of the Coney Island beach for observation of seashore life, realia, and comparison with other less heavily utilized beaches.

Post-Trip:
Most discussions of observations made at the Aquarium should be delayed until you return to the classroom. The Aquarium's size and layout do not facilitate meaningful discussions on-site.

Preparation: Students should be focused before they arrive at the Aquarium. Knowing what to look for will enable them to get a lot more out of their visit.

General Comments: The Aquarium is open every day in the year from 10 to 5. Admission rates are $2.00 for adults; 75¢ for children 2-12 years old. Special rates for groups.

The Aquarium offers programs on a variety of topics for a fee year-round. We offer an Aquarium camp experience and formal lecture programs, including pre- and post-trip materials and, in some cases, Aquarium tours or beach experiences. Contact the Aquarium Reservations Department (212) 266-8540 for free brochure.

An area is provided for viewing sea stars, shells, and other marine specimens in the aquarium and collecting on the nearby beach; viewing the electricity emitted from an electric eel; the feeding of whales, sharks, anemones, octopus, penguins, seals and others are available. Collages, bracelets, photographs, and seaweed prints can be designed from the above. The availability of this ideal location in the tri-state area between a multi-faceted, well staffed and equipped aquarium and juxtaposed beachfront will be greatly appreciated and enjoyed by participating faculty, assisting parents and students.

Author-Educators:  Karen Hensel
Curator of Education
N. Y. Aquarium

Mark Alan Goldberg
Dept. of Biological Sciences
Adlai E. Stevenson High School
1980 Lafayette Avenue
Bronx, N. Y. 10473

Suggested References: (F) 43.
NAME: BATTERY PARK AREA, LOWER MANHATTAN, NEW YORK CITY

TYPE: Historical, economic, and cultural walking tour, museum visit, and boat trips in an area which holds much of the immigration history of this nation and which is still one of the busiest ports of trade in the world.

LEVEL: Elementary through high school.

AREA: The Battery Park area is located on the west side of lower Manhattan, at the tip of the Island. The area includes Battery Park on which is located Castle Clinton, a fortress built to defend the harbor in the War of 1812. From the Battery Ferries leave for Staten Island, the Statue of Liberty and the American Museum of Immigration and Ellis Island. The Seamen's Church Institute of New York is located across the street from Battery Park at 15 State Street and houses a museum and public cafeteria. Within walking distance are the U.S. Custom House, the site of the future Battery Park City, and the World Trade Center.

Arrangements: No arrangements are needed for Castle Clinton, but information may be obtained from the National Park Service; Heritage Trail Markers are located throughout Battery Park. No arrangements are needed for the Staten Island Ferry and the round-trip cost is 25 cents per person.

Arrangements for the ferry boats to the Statue of Liberty and the American Museum of Immigration which is also located on Liberty Island may be made through:

The Circle Line - Statue of Liberty Ferry, Inc.
Battery Park, South Ferry
New York, New York 10004
(212) 269-5755

Ferries leave every hour on the hour from 9 a.m. through 4 p.m. Visitors should allow two and a half hours for the complete round trip. The round trip fare is $1.50 for adults and $.50 for children under 11 years. There is a group rate for adults in groups of 25 or more, and no reservations are necessary for the ferry.

Arrangements for ferry boats to Ellis Island may also be made through the above address. This ferry does not operate during the winter months and information should be obtained as to schedule from the above address. Ellis Island, the major port of immigration after the close of Castle Garden is open and is in the process of restoration.

A self-guided tour of the Seamen's Church Institute of New York is available on a walk-in basis, but pre-arrangements for large groups is recommended; a 15-minute film and 30-minute guided tour is also available on request. Arrangements should be made for groups of over 15 to:

The Communications Dept.
The Seamen's Church Institute of New York
15 State Street
New York, New York 10004
(212) 269-2710 ext. 206
The Institute requests that visitors be at least of intermediate school age.

Directions: It is suggested that public transportation be used to reach Battery Park since parking is limited during the week. Any of the following subways may be taken to Battery Park: IRT Broadway 7th Avenue Local to South Ferry; IRT Lexington Avenue Express to Bowling Green; BMT Local Subway to Whitehall Street. The Broadway Bus #M6 may be taken to the last stop which is South Ferry. Battery Park is located close to the Battery Tunnel and parking although difficult during the week may be available in nearby public and private lots for a fee. There is very limited on-street metered parking also.

Facilities: This trip is suggested for good weather, since much of it is outdoors. The ferries are enclosed, but might be uncomfortable in bad weather. Restrooms are available on the ferries and on Ellis Island as well as Liberty Island. The Seamen's Church Institute has the cleanest restrooms in the area. It is suggested that the restrooms in Battery Park not be used. Food and refreshments are available from a wide variety of sources in the area. Cafeterias are located on Liberty Island, in Battery Park (limited in size), and in the Seamen's Church Institute. Snack bars are located aboard all of the ferries and there are vendors in Battery Park. Picnicking may be done in Battery Park; it is not permitted on Liberty Island or Ellis Island and it is discouraged in the Seamen's Church Institute cafeteria.

Water Facilities: These are limited to boat trips, although there is a training program for sail-boating during the warmer months which is based close to the Circle Line's pier.

Best Usage: This area will give the student an opportunity to explore an environment that demonstrates the interrelationship between human activities and the marine environment. The teacher and class should select from the many possible activities the ones best suited to their needs; it would be impossible to do all of the things available on one trip. The early history of this nation could be studied using Castle Clinton as an example of the protection of a port and Manhattan Island. This fortress was built between 1807 and 1811 and was used to defend the harbor area. It was renamed Castle Garden in 1824 and used as a public theater until 1855 when it became the nation's principal immigration processing center to 1890, processing over seven million immigrants. Now it is operated by the National Park Service. Immigration history has no better representation than the Statue of Liberty and the American Museum of Immigration as well as Ellis Island. A trip to these places is a trip back into one's own roots for many of the students. The economic base for the City of New York is illustrated by this busy port. Containerized shipping operations can be seen in the harbor as well as a marine fire-fighting station near Battery Park. (Younger students might especially enjoy this). Battery Park City, which is in the process of being built on land fill in the Hudson, is an
example of the City's continued development as are the new World Trade Center buildings which dominate the lower Manhattan skyline. The Seamen's Church Institute illustrates the human side of the economics of shipping; it is a service institute for working merchant seamen of which 300,000 visit the ports of New York and New Jersey each year; most of these people are foreign and speak no English. The Institute contains a sizable collection of ship models, nautical artifacts, figureheads, stained glass windows, paintings, photographs of early New York, ships' bells, nautical knots, and macrame.

**Type of Environment:**
The Hudson River is an estuary that is rich in historical as well as commercial sites. Of note is the lower Manhattan skyline and the many interesting buildings both old and new. As noted earlier this experience should be for many students a trip into their own origins.

**Suggested Activities:**
The historical importance of the area should be stressed.
A photographic essay could come out of the experience and even younger students should be encouraged to take cameras with them. The students should be encouraged to imagine what it would have been like to come into the port of New York from a foreign land at the height of immigration and land at Castle Garden or at Ellis Island. Many movies, such as "America, America", and many books such as *World of Our Fathers* tell this story and might be used.

**Preparation:**
Advanced planning on the part of the teacher and students is necessary as the numbers of activities are great and the time is usually limited.

**Warnings:**
This area is very busy with people and traffic and it is suggested that students be chaperoned by one or more adults in addition to the teacher; this is especially true for younger students.

**Author-Educator:**
Gary Schechter, J. F. Kennedy High School, Kennedy Drive
Plainview, New York 11803

**Suggested References:** (GE) 20, 22, 26, 31.
NAME: Playland Beach, Rye, N.Y.

TYPE: Field Work and Collecting

LEVEL: All levels

AREA: Rye, N.Y. - Western Shore of Long Island Sound in Westchester County

Arrangements: None

Directions: Take New England Thruway to Exit 11 - Playland Parkway, Rye. Parkway leads into Playland. Go through the parking lot to the back of the property; park behind the fishing shack. Walk north along the beach, past the fence to the area adjacent to the ball fields and the bird sanctuary.

Facilities: Parking, emergency phone. No restrooms but the area is nearly deserted during all but the summer season. Spacious area for work. No shelter.

Water Facilities: Boats can be launched and landed at area. Seining and the use of plankton net by wading are possible. Swimming is possible but neither pleasant nor safe.

Best Usage: General field work requiring sandy beach and tide pools.

Succession and zonation studies as well as collection of marine and intertidal specimens. Introduction to multi-use problems in county-owned areas.

Type of Environment: Large beach with rocky areas, grassy areas and sandy areas; beach slopes gently. Crabs and snails are especially abundant. Have seen a limited number of anemones, colonial sea squirts, bryozoans and starfish. Abundant seaside plants and algae can be found here.

Suggested Activities:

A. Comparative studies of three types of beach areas can be done at any level.

B. Collecting is possible here in the spring and fall; heavy usage during the summer tends to deplete the local flora and fauna. Small marine tanks can be set up in the classroom with a few specimens. Killifish caught here in the "stream" that connects the beach to a nearby brackish lake have proved to be remarkably hardy.

C. The effects of storms on the biological and physical characteristics of the area can be investigated.

D. Photographic studies are easily carried out.

E. Large murals can be prepared after the field trip using the results of transect studies in the different areas. These can serve as a basis for discussions in other classes.
F. Animal behavior studies of crabs, snails and other organisms in the intertidal zone can be studied. Longer range studies can be carried on during the off season. There may be some disturbance but we have done successful studies on home ranges over periods of several weeks.

G. Follow-up studies with advanced classes on the multi-use concept for Long Island Sound and the Westchester County Park System have been successful.

II. Preparation of a seafood meal, including some exotics such as seaweeds, can involve students and guests. Help from the Home Economics Department makes this easier and foreign dishes, such as those from Japan and the Mediterranean countries, make the feast more interesting.

WARNING! Most of the organisms collected in this area, especially in the non-swimming season, have been subject to extensive pollution. Buy the food; don't collect it.

Preparation: Students should be familiar with study methods; i.e. transects, plankton tows and sampling techniques. The use of a key should be reviewed if identification is to be tried. Photographs of the area can be used to help the students hypothesize about what they expect to find in their investigations. Materials for collecting should be prepared and assigned. Tanks for organisms must be prepared. Principles of conservation should be discussed so that the investigators create the minimum disturbance.

Warnings: Watch the tides when you plan a visit. A tide chart for the area is available at the Playland Fishing Pier. Visit should be made as the tide is going out and close to the time of low tide. Students must bring anything they will need, including lunches. Warn students about broken glass, etc. and insist that they wear sneakers or boots at all times.

General Comments: This area should be visited in the spring before May 15th, or in the fall, after October 1. The area belongs to Westchester County and is adjacent to a heavily used fishing pier and near a swimming beach. During the late spring and summer, the area is greatly disturbed. A brackish lake is across the road from the beach and is available for study. There is a bird sanctuary adjacent to the area that is open to the public. There is no charge for parking on weekdays in the off-season.

Author-Educator: Virginia A. Curry, Westlake High School, Thornwood, N.Y. 10594

Suggested References: (GE) 2, 19, 24, 26, 29; (I) 46, 49; (PL) 64, 66.
NAME: Marshlands Conservancy

TYPE: Field Work or Visitation

LEVEL: All levels

AREA: Rye, NY - western shore of Long Island Sound in Westchester County

Arrangements: Contact Allison Beall, Marshlands Curator for conducted field trips and information at 914/835-4466. She is available Wednesday - Sunday. Groups may visit on their own.

Directions: Entrance is through a private road off Route #1 (Boston Post Rd.) in Rye, NY. Take the New England Thruway to Exit 11 - Playland Parkway, Rye. Use the first exit off Playland Parkway marked Rye, Harrison. Turn left and go one block. Turn onto Old Post Road (follow sign marked Mamaroneck). Continue until the road merges with Old Post Road (Route #1) at the light, then continue on Route #1 for .9 mile. Marshlands is on the left just south of the Rye Golf Club.

Facilities: Parking facilities, picnic area, restrooms and shelter are available. The shelter and a small museum are available if prior arrangements have been made with the curator.

Boating Facilities: None; boating is prohibited.

Type of Environment: This is a model salt water marshlands habitat with a fresh water estuary. The area also includes a small rocky shoreline, a very small sand area and fields and a small forest. Nearly every organism that can be expected in a salt marsh along the northeastern U.S. coast can be found here. A large number of birds are in residence and can be seen from a good vantage point.

Best Usage: This is an ideal place for ecological studies. A comparison of fresh water and marsh organisms can be done. Special programs have been developed for elementary school children; for secondary students and for adults. It is an excellent place to visit during the bird migration seasons.

Suggested Activities:
A. Observation of ecological changes along the slope of the freshwater stream until it reaches the marsh, the spot where the tide enters the stream is easy to identify with "marker" organisms.
B. A study of adaptations to the marsh habitat can be made as well as a comparison of marsh and beach adaptations by similar organisms, e.g. the blue mussel of the rocky shore and the ribbed mussel of the marsh.
C. Observation of a wide variety of flora and fauna.
D. Observation of succession in the field and forested areas.
Preparation: Preparatory reading and discussions of the physical and biological features of salt water marshes is helpful.

Warnings: Watch the tides; the marsh can only be seen properly at low tide. Binoculars and hand lenses will be useful. The area is a conservation area and should be protected. Collecting is prohibited.

General Comments: The curator is excellent; she is a knowledgeable young woman who is really liked by the students. Having Ms. Beall as a guide really adds to the trip.

Author-Educator: Virginia A. Curry - Westlake High School, Westlake Drive, Thornwood, N.Y. 10594

Suggested Publications and References: (GE) 2, 19, 26, 29; (1) 46, 49; (PL) 64, 66.

Marshland: the beginnings of the aquatic food chain
NAME: Kensico Reservoir

TYPE: Field Work

LEVEL: Intermediate and above

AREA: Westchester County

Arrangements: No arrangements are required for individuals or small groups except that students over 16 who plan to fish must have a license, available at the offices on Westlake Drive. Teachers planning a class trip to the area should file a request form on school stationery which includes the information on the sample form attached.

Directions: The reservoir can be reached from Route 22 in North White Plains or Westlake Drive in Valhalla. Good access sites, with parking, are marked on the map. There is also access from Route 22 where it is adjacent to the reservoir.

Facilities: No facilities, but portable boats can be launched from the sites marked.

Water Facilities: Boats are allowed on the reservoir as long as they do not have motors. Swimming is specifically forbidden as this reservoir is part of the New York City Water Supply system.

Best Usage: This reservoir forms a large lake and supports a substantial flora and fauna. It is stocked regularly with fish. It can be used for studies of fresh water bodies in biology or earth science. Its construction history, economic impact on the surrounding area from a tax point of view, and large dam are all subjects that can be studied.

Type of Environment: This is a large lake with islands. The depth varies considerably. The reservoir is stocked each year with fish of known numbers and types by the N. Y. State Dep't. of the Environment.

Suggested Activities:
A. Field studies at the site can involve a chemical, biological and physical investigation of lake characteristics.
B. Mini-ecosystems can be maintained in the school in one-gallon jars. These can be stocked with water, plants and animals brought from the reservoir.
C. Microbiological analysis of the water can be made to determine the bacterial content of the water. The types of treatment given to reservoir water so that it will be safe for drinking can be studied. Miniature treatment tanks can be constructed to simulate and test these techniques.
D. Analysis of turnover can be made in the spring and/or fall by advanced students.
Sample Request Form - Should Be Sent On School Stationery

Date

Hon. Francis X. McArdle
Commissioner, New York City Dep't. of Environmental Protection
Municipal Building
New York, N.Y. 10007

Dear Sir:

This is to request permission for a group of approximately [describe size and nature of group] to visit Kensico Reservoir for the purpose of [describe purpose].

I [am duly authorized to make the following statements in connection with such a visit:

1. That the City of New York will not be held liable for any accident or injury which may be incurred by the students or employees while on Department property in conjunction with this visit.

2. That the [name of school district] will assume all responsibility and save the City of New York harmless from any and all damages resulting from this visit.

Signature and Title (responsible administrator)

Have Notarized

Send copy to:

George Mekianian, P.E.
Deputy Chief Engineer (Watersheds)
P.O. Box 66
Valhalla, N.Y. 10595
E. Since Kensico is listed as a high-risk dam because of its location, a study of dam construction and safety problems can be made by secondary students.

F. Erosion factors and soil composition studies can be made at various sites around the reservoir. Trees have been planted in some areas to control erosion and some of these have been killed recently by a blight. A study of the effect on the soil and water of these plantings and the death of certain trees can be made.

G. A comparison of the fishing potential between Kensico and the nearby Croton Reservoir is an interesting study. This should be made in conjunction with an analysis of as many factors as possible which might affect the fishing potential.

**Preparation:** Students should be familiar with testing kits, sampling techniques and safety precautions. Tanks or jars should be prepared to receive organisms if these are to be collected. Testing materials should be prepared.

**Warning:** Since this area is part of the N.Y. City Water Supply, students must be cautioned strongly about swimming. There are no bathroom facilities and it is important that they recognize the importance of not contaminating the water. The reservoir is surrounded by woods in many areas. This is not suitable for a full day trip. Fishing licenses should be obtained for anyone over sixteen who plans to fish.

**Author-Educator:** Virginia A. Curry, Westlake High School, Thornwood, N.Y. 10594

**Suggested Publications and References:** (GE) 2, 21, 30; (PL) 64, 69, 71, 73.
NAME: Freshwater Pond Environment

TYPE: Field Work & Visitation

LEVEL: All Types

AREA: Westchester County, Pleasantville, NY

Arrangements: Pat Shea
              Angelo Spillo
              Frank Comisso
              (Notify 2 weeks in advance)

Directions: Take 117 towards Pleasantville. Come in Entrance #3. The Environmental Center is about 1/4 mile down the road on the left. Parking area on right. Enter office located in brown farmhouse.

Facilities: Cafeteria in student center; ample parking nearby; restrooms in all buildings. No boating except as indicated. Classroom located on Farm grounds. Shelter can accommodate large numbers if Student Center is used.

Water Facilities: Row boat available for sampling. Can take no more than 3 adults at a time. No swimming. Equipment for plankton seining available.

Best Usage: Survey of plankton, nekton, benthos, and shore plant ecosystems available. Specimen collecting possible on a small scale.

Type of Environment: Farm pond with stream inlets; outlet to Saw Mill River.
Associated with Environmental Center/Farm of Pace University in Pleasantville.
Extensive variety of protozoans, aquatic invertebrates, insects, birds, fish, amphibians and reptiles. Excellent algal flora and grassland species. Island in center of pond used by waterfowl for breeding. Area based on extensive tracts of Fordham gneiss. Woodland trails available. Scenic with examples of deciduous and coniferous woods, meadows, and ecotone areas. Excellent breeding areas for many small animals, perfect for illustrating animal habitats.

Suggested Activities: Lectures available on life cycles, types of environments, trail walks, collecting techniques, water and soil testings and habitat studies.
Guides, maps and lecture notes available.

Preparation: Introductions to pond and woodland habitats. Bring boots, hand lens, nets, collecting bottles, tweezers, etc.

WARNINGS: VERY MUCKY BOTTOM TO POND - NO SWIMMING ALLOWED

Author-Educator: Angelo Spillo
                  Pace University Environmental Center
                  Bedford Road
                  Pleasantville, New York 10570
Prof. Frank Comisso
Pace University
Bedford Road
Pleasantville, New York 10570
(914) 769-3200 Ext. 230

Suggested Publications: (GE) 2, 21, 30; (P) 60; (FL) 72
NAME: Lamont-Doherty Geological Observatory

TYPE: Visitation

LEVEL: Intermediate and Secondary

AREA: New York Metropolitan Area

Arrangements: On or about April 1st of every year a letter should be sent to:

Office of the Director
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Telephone 914-359-2900

In the letter, request the date for their OPEN HOUSE. This is generally the first Saturday in May.
You will receive a return letter giving the date of the OPEN HOUSE. Included will be directions and the available facilities to be viewed.

Directions: Cross George Washington Bridge and stay in right lane so as to make right turn at west end of bridge onto PALISADES INTERSTATE PARKWAY NORTH. Proceed north to Exit 4 (approximately 10 miles from toll booth). Turn left (North) on Route 9W and proceed about 500 ft. to Observatory road on right, and on to parking lot.

Facilities: There is ample parking for cars or busses in the upper parking lot. Restrooms are available in most of the buildings. Many exhibits are indoors thereby reducing the problems associated with foul weather. Vendors are scattered about the facility; however a picnic lunch would be best particularly if the weather is nice. There is plenty of lawn space as well as refuse collectors.

Water Facilities: There is a wildlife sanctuary as well as a pond located on the grounds. A trip to the base of the Palisades will bring you to the edge of the Hudson River. If the Oceanographic Research vessel VEGA is in port at the time you will be greatly rewarded as will your students.

Best Usage: These areas include deep-sea drilling, ocean-bottom topography, plate tectonics, water sampling equipment, Long Island coastal formations, underwater photography and a variety of other displays, especially those oriented toward Earth Science.

Environment: Many exhibits both indoor and outdoor are available. There are areas for collecting specimens as well as plenty of handouts from the different specialists. This is truly a most enjoyable trip which students will never forget.
Suggested Activities: Prior to the trip students are given a list of what they will be able to see. Each student then is asked to prepare a list of questions about one specific area of his/her choice. Make sure that some questions leading to career information are part of this list of questions. Students must then find the answers to these questions while visiting in the particular place of their choice. If the exhibit or lecture-demonstration does not answer these questions, then students must interview the person at the exhibit or demonstration.

Part 2 of the preparation is a teacher-made "Bus Tape". Once the students have boarded the bus, play a tape cassette to the students. (My tape may be borrowed and copied; however, it would be better if each instructor made his/her own.) The tape should include an introduction as to what they are going to see. It also includes final instructions. After the tape has been played begin pointing out geological features. When you arrive at the site allow the students to move freely on their own. Establish a meeting time for lunch where experiences can be shared. After lunch students should move about freely again. You will find that most students will be unable to see everything. Any collecting or sampling that they do should be done as a group.

On the return trip, make use of a "Bus Tape". This tape should be short and summarize some of the highlights of the trip. On return to class students will be asked to prepare both a written report and an oral report. These are presented to the class so that each area of demonstration is covered. The rest of the class is then allowed to either ask questions of the presenter or contribute to what has already been said. Again there is an emphasis on my part about the career aspect.

Warnings: Students should be aware of the Palisades. They should be instructed not to leave marked paths or trails. Insist that they travel in twos or threes. It generally ends up as fours and fives. There are people from the Observatory strategically placed through the entire grounds.

General Comments: I would suggest that any instructor planning to use this trip visit the site the first time on his/her own. Maybe bring 4 or 5 students in his/her own car. There is so much at this site that teachers would have to pick out those areas or topics that they wanted their students to see.

Author-Educator: Robert Parrel, Science Chairman Stanforth Junior High School 700 Hempstead Turnpike Elmont, N.Y. 11003 tel: 516 328-4839

Suggested Publications and References: (GE) 18, 25.
NAME: Lake Welsh

TYPE: Field Work

LEVEL: Secondary and Above

AREA: Rockland/Orange County

Arrangements: None.
   No motorized vessels allowed on the lake.

Directions: Take Palisades Parkway to Lake Welsh exit. Park at the designated parking spaces.

Facilities: None in the fall and winter; bathrooms open in the spring.

Water Facilities: Boats allowed on the lake; see arrangements. No swimming.

Best Usage: We have done earth science oriented field work on the lake. Measuring the size, determining a bottom profile, measuring for a thermocline. We have also collected flora and fauna specimens from near the lake and cataloged some of the specimens. This is a man-made body of water and recently has come under close scrutiny for fear that the dam holding back the lake may collapse.

Type of Environment: A large fresh water lake only 35 miles from New York City.

Suggested Activities:
1. Immediately at the lake we have students map the lake front, also indicating air speed and cloud cover and wind direction.
2. An evaporation apparatus is set up and total evaporation from this fresh water body is calculated.
3. Bottom and near-shore sediments are collected for future class work.
4. Different sampling zones are determined and specimens are sought. Surface and deepwater samples are taken for microscopic examination.
5. Water samples are collected for chemical analysis in the field and at the school. Compare results from field analysis and class laboratory analysis. Do the results fall within acceptable values of each other? If not what could have caused the difference?
6. Determine chlorinity and salinity.
7. Test for pH at shore and lake locations.
8. We have found it very useful to graph as much of our results as possible.
9. Photograph as much of the activity as possible and also as much of the Lake as possible. Compare results from earlier visits. Are there any immediate visual differences? Explain.

**Preparation:** Use of field test kits and small boat handling should be described beforehand. Sampling jars should be prepared before leaving the classroom. We have our students collect and bring to class a wide assortment of jars which are then labeled with their names.

**Possible Cautions:** Do not have your students wander too far in search of specimens. This is a wooded area and walkers have been known to fall and hurt themselves. This is also unsuitable for an all-day field trip. We have found that half days are fine.

**Post-Trip Questions:**

1. Was there regularity in your temperature, salinity, chlorinity, and pH readings, also density? Can you explain these regularities or the lack of same?

2. Make a list of the aquatic flora and fauna found.

3. Did the density increase, decrease or remain the same? Any reason for this?

4. Make a diagram of the temperature, salinity and pH of the lakefront.

5. What is the water source for Lake Welch?

6. How would temperature, pH, and salinity affect aquatic life in this lake?

7. How can man control excessive evaporation from small bodies of water?

8. How can evaporation of water from small bodies of water affect aquatic populations?

9. Have you noticed any patterns in sediment samples?

10. Did water temperature measurably change? Explain your answer.

11. Name some of the pigments you may find in aquatic waters.

12. Why is there a measurable change in light penetration?

**Contact person:** Superintendent of Parks, Harriman Park Bear Mt., New York

**Author-Educator:** Roger Rodriguez
North Rockland High School
Theills, New York 10984

**Suggested References:** (GE) 2, 21, 30; (PL) 64, 69, 71, 73.
NAME: Tifft Farm Nature Preserve

TYPE: Fieldwork and/or visitation

LEVEL: All

AREA: Buffalo, New York

Arrangements: Make reservations at least three weeks in advance. Teachers asked to attend an orientation meeting at Tifft Farm two weeks prior to the student field trip. Call Tifft Farm (716) 847-1323.

Mailing address: Tifft Farm, Inc.
1133 Ranch Building
Buffalo, NY 14203

Fee: for pre-planned programs - $0.50 per student

Directions: From East or North of Buffalo - Take easiest route to Niagara Extension of NYS thruway (Rt. 190), to Rt. 5 (west), exit Fuhrmann Blvd. (south), at 1st light - turn left under bridge to Tifft Farm. From South of Buffalo - Take easiest route to Rt. 5 (north), exit Fuhrmann Blvd. (north) near Tifft Street, continue straight to Tifft Farm.

Facilities: Parking area, picnic area, out-houses, tents in case of rain, log cabin meeting house under construction.

Water Facilities: Close proximity to the Buffalo small-boat harbor on Lake Erie. The boating at Tifft Farm is not presently in operation. No swimming allowed. In winter - ice skating.

Best Usage: Excellent for studying and developing concepts of ecosystems, interrelationships, food webs, population studies, ecology, collecting specimens, and utilizing measuring techniques.

Type of Environment:
Over 270 acres of preserve near the shore of Lake Erie which is surrounded by Buffalo's steel plants and other heavy industrial facilities.
The preserve includes 40 acres of rolling hills built on top of the city's collected refuse.
The largest fresh water marsh in Erie County.
Several fresh water ponds and streams developed from abandoned canal systems.
Many animals have naturally come to inhabit the preserve, especially many water fowl in the fresh water marsh.
Suggested Activities:

Tifft Farms welcomes and encourages individual ideas in using the area—anything to create a meaningful and relevant experience to each class. Some programs are specially prepared by the staff at Tifft Farm and seem to work well. Some of these pertaining to marine studies would include:

Habitat Analysis - Marsh, Pond, Stream, Lake
   including collecting and identifying various living things
   A contest among groups - find the most kinds of animals
   A scavenger hunt for marine animals and plants

Basic Survey Skills -
   Map studies, Plane Table, Contour Maps, Topographic Maps
   Introduction to the Compass
   Census Techniques - (plant and animal) cover maps, grid method

Motivate Creative Expression -
   This includes creative writing, poetry, essays, short stories,
   sketching skills, Nature's symphony-musical creativity,
   photography.

Preparation:  The teacher and a representative from the preserve plan
   the class visit prior to the actual field trip. Groups of any number can
   be accommodated. Small groups (25 or less) are preferred. Larger
   groups will be broken down into smaller groups and the teacher will
   be expected to take an active part in the program.
   Prior classroom preparation depends on what is to be done at the
   preserve. All equipment and even some pre-trip classroom ideas are
   provided by Tifft Farm.

Warnings:  The usual safety precautions for an out-of-door field trip.

General Comments:  Visits can last anywhere from 2 hrs. to all day. Teachers
   are expected to take an active part in all programs, even programs
   prepared by Tifft Farms.

   Tifft Farms is a privately funded - non profit organization.

   Many public programs are also planned and it is open to the general
   public at no entrance fee.

Author-Educator:
Lori Bauers
15 Olcott Pl.
Cheektowaga, N.Y. 14225

Suggested References:  (GE) 2, 21, 30; (PL) 72.
NAME: Aquarium of Niagara Falls, USA

LEVEL: Elementary through secondary

AREA: Buffalo and Niagara Falls

Arrangements: Contact the Aquarium of Niagara Falls, USA, 701 Whirlpool Street, Niagara Falls, NY 14301 716/285-3575 (in Niagara Falls) or 692-2665 (in Buffalo). Rates include students (preschool through college, 10 or more in a group) $1.65, adult supervisors free (one for every ten students), adults $1.75. Bagged lunches not permitted in the Aquarium building but groups may eat lunch on grounds, weather permitting. Snack Shop open every day. Make reservations about one week prior to visit.

Directions: From Buffalo, take exit N21, the Robert Moses Parkway, as you get off the north Grand Island Bridge. Follow the leaping blue dolphin signs off the parkway exit downtown.

Facilities: The Aquarium has ample parking and restrooms. A ramp and elevator are available for handicapped groups.

Best Usage: The education staff of the Aquarium will help you teach the many phases of aquatic life. There is an open marine tank in the Aquarium classroom which houses seastars, horseshoe crabs, and a variety of other invertebrates from the sea. Groups of 20 or fewer children may handle the animals after a short orientation lesson. The sessions can be repeated to accommodate larger groups.

A number of in-school programs are offered by the education staff of the aquarium: a fishy story, fins and flippers, and marine mammal training. The grade level is generally elementary, although programs can be adapted to meet the needs of secondary students.

Preparation: The film strip, 'Explore Our Ocean', is sent to elementary classes before they visit the Aquarium. It describes how the animals are cared for, who works in the Aquarium, and what the children can expect to see.

A guide book describing the animals in the exhibits is available to teachers. It has suggestions for things to do before and after your class visits the Aquarium.

General Comments: A quarterly newsletter is sent during the year to all schools making reservations to visit the Aquarium. 'Schooling' investigates a different subject each issue and offers suggestions for classroom activities.

There is a dolphin and sea lion performance every hour beginning at 10 AM. A demonstration of the electric eel's shocking ability is given hourly beginning at 10:45 AM. Instruct your students not to drop anything into any of the tanks, since a fish or other organism can die as a result of swallowing foreign objects. Also, please instruct small children not to scream or tap on aquarium glass tanks.

Suggested References: (F) 43.
NAME: Schoellkopf Geological Museum

LEVEL: Elementary through Secondary

AREA: Niagara Falls

Arrangements: Tours are usually 2-3 hours long. Interpretive tours of the following state park areas are offered to school classes and interested groups:
- Niagara Reservation (Prospect Point and Goat Island)
- Schoellkopf Museum
- Whirlpool and Devil's Hole parks (Gorge and rim routes)
- Earl W. Brydges Artpark (into Gorge)
For tour information and reservations contact: The Schoellkopf Geological Museum, Niagara Reservation, Niagara Falls, New York 14303.
Phone: 716/278-1780.

Directions: Park sites rim the city of Niagara Falls, running along the Niagara River. Follow map.

Facilities and Best Usage: Topics at park sites are designed especially for the site. The Museum would be happy to accommodate individual teachers or special interest groups with modifications of the tours below, or with other programs designed for your needs.

1. Niagara Reservation: Start at Schoellkopf Museum and proceed to Prospect Point, Goat Island. The tour may include Luna Island, Terrapin Point, and Three Sisters areas. Facilities are available at Three Sisters area for picnicking after tour. It is a one-way walk with free parking at each end for buses and cars. The topics include: geologic history of the area, recession of Niagara and formation of the gorge, early industrial development power diversions, Schoellkopf Power Station collapse, and natural history and human history of this unique area.
2. Upper Great Gorge: Start at Schoellkopf Museum and proceed north along the abandoned gorge railway grade to the bottom of the gorge at the Whirlpool Rapids Bridges. Retrace path upon return. The topics discussed include: Lockport formation and fossil algal reefs, geologic time, gorge formation and reasons for differences between Whirlpool Rapids and Upper Great Gorge, the rail line, attitudes to environment and changing use patterns, flora and fauna of the area.

3. Devil's Hole and Whirlpool: Start at Devil's Hole, down stairs into gorge; proceed upstream to Ongiara stairway, climb stairs to rim, and return to Devil's Hole (or end at Whirlpool Park). Please note that this is a moderately strenuous, uneven trail, with access from stairways. The topics discussed include rock strata and geologic time, recession of falls, formation of Devil's Hole and Niagara Glen, and soil formation.

4. Earl W. Brydges Artpark: Start at lower parking lot, proceed into gorge and return. The use of spur paths varies with desired subject emphasis. The topics discussed include pre- and post-glacial drainage, Niagara at Lewiston, Lake Iroquois, local history and prehistory, Indian mound, geologic history, sedimentary environments, paleontology, and escarpment formation.

5. Buckhorn Island: There are no facilities on site; arrangements can be made at Beaver Island State Park, 5 miles south. The topics discussed include wetland and woodland life, plant succession from marsh to climax forest, migration, hibernation, and a wide variety of vegetation and fresh water studies are available.

Warnings: Tours may become strenuous. Sneakers and/or appropriate footwear should be worn at all times. Classes should be instructed to stay together at all times.

General Comments: The tours are sponsored by the Niagara Frontier State Park and Recreation Commission. They emphasize a wholistic approach to man and his environment, and pose questions of resource use and management within the park. The field experience blends knowledge of the sciences into an ecological understanding of what is seen. Natural processes, such as the formation of Niagara Falls, the gorge, and rock layers are interwoven with the history and development of the area, so that the tour can meet the specific needs of your curriculum and age level.

Author-Educator: Mario J. Pirastru, Regional Administrator, Niagara Frontier State Park and Recreation Commission, Prospect Park-Niagara Reservation, Niagara Falls, New York 14303. (716) 278-1780
Jack Krajewski, Senior Scientist, Schoellkopf Geological Museum, Niagara Reservation, Niagara Falls, New York 14303 (716) 278-1780

Suggested References: (GE) 2, 18.