

# ESTUARY EARTHCACHES:

## 1 ECOLOGY CENTER

WATER IS AN IMPORTANT NATURAL RESOURCE. THE HARLEM SHIP CANAL/ SPUYTEN DUYVIL CREEK IS USED FOR NAVIGATION. NAME TWO OTHER USES OF THE WATERWAYS.

## 2 WIGWAM

WHAT DID THE LENAPE USE INSTEAD OF NAILS AND SCREWS TO KEEP THEIR WIGWAMS TOGETHER?

## 3 ESTUARY

NAME A MIGRATORY BIRD YOU SEE HERE. IMAGINE YOU ARE A BIRD FLYING OVER INWOOD HILL PARK. DRAW A SIMPLE BIRD'S EYE VIEW MAP THAT INCLUDES A FEW LANDFORMS AND FEATURES THAT WILL HELP YOU NAVIGATE YOUR TRIP (WATER BODIES, BRIDGES, ETC). INCLUDE YOURSELF AND A NORTH ARROW.

## 4 SALT MARSH

IS IT HIGH OR LOW TIDE? HOW CAN YOU TELL? HOW DID THIS LANDSCAPE LOOK 1000 YEARS AGO?

3

## 5 SHORAKKOPCH

NAME 3 CHARACTERISTICS OF THE ROCK. HOW DID IT GET TO INWOOD HILL PARK?

## 6 ROCK SHELTERS

WHAT TYPE OF ROCK FORMS THE SHELTERS? HOW DOES THIS LANDSCAPE DIFFER FROM THE SALT MARSH?

## 7 BIRD ALLEY

WHAT DOES A TREE USE ITS LEAVES FOR? HOW DO YOU TELL DIFFERENT TREES APART?

## 8 POT HOLE

WHAT GEOLOGICAL PROCESSES ARE RESPONSIBLE FOR POT HOLE ROCK? WHAT IS STRONGER, WATER OR ROCK?

## 9 WHALEBACK

WHEN ROCKS BREAK DOWN THEY EVENTUALLY TURN TO SAND OR SEDIMENT. WHERE DOES THE SEDIMENT GO?

## 10 HUDSON RIVER

WHAT DIRECTION IS THE CURRENT FLOWING? HOW DO YOU USE THE NY-NJ HARBOR ESTUARY?



NAME \_\_\_\_\_

DATE \_\_\_\_\_ Start Time \_\_\_\_\_

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

4 \_\_\_\_\_

5 \_\_\_\_\_

6 \_\_\_\_\_

7 \_\_\_\_\_

8 \_\_\_\_\_

9 \_\_\_\_\_

10 \_\_\_\_\_

### GET CREDIT FOR YOUR FINDS!

- To get credit for your finds, email your answers to the questions to [estuarycache@gmail.com](mailto:estuarycache@gmail.com).
- Receive an Estuary Discovery Trail Certificate by email. Visit [goingcoastal.org](http://goingcoastal.org) to learn more.
- Set up a free membership on [earthcache.org](http://earthcache.org).
- Log your finds at [earthcache.org](http://earthcache.org). Begin at GC2RWW2, learn more about the Inwood Hill Park caches and upload your photos.



# NY-NJ HARBOR ESTUARY EARTHCACHE DISCOVERY TRAIL

INWOOD HILL PARK NATURE CENTER W 218TH ST, MANHATTAN (212) 304-2365 [WWW.NYC.GOV/PARKS](http://WWW.NYC.GOV/PARKS)  
 YOU CAN ALSO EXPLORE THE HARBOR ESTUARY EARTHCACHE DISCOVERY TRAIL AT LIBERTY STATE PARK

a virtual treasure hunt educating visitors on the richness of harbor estuary resources at Inwood Hill Park

## HOW TO USE THE GEOMATE JR.

**Other display items**

- A Find difficulty (1 - 5)
- B Terrain difficulty (1 - 5)
- C GPS status
- D Distance units
- E Closeness order (1, 2, 3...)
- F Size of geocache (1 - 4)

**Selecting a different geocache**

Press to go to 'NEXT' closest geocache in list

Press & hold to go to the 'START' of list

**Scrolling through pages**

Press to see other 'PAGES'

- Geocaching
- GC Geocache code
- N Compass & position
- List of found geocaches

**Page functions**

Press for action on each 'PAGE'

- Go to next closest geocache
- Go to next closest geocache code
- N View heading, latitude, longitude, & satellites
- List of found cache list

**PLEASE WATCH YOUR STEP!**



**1 START** YOUR EXPLORATION OF THE NY-NJ HARBOR ESTUARY AT THE INWOOD HILL PARK URBAN ECOLOGY CENTER. THE CENTER AND THE PARK'S NUMEROUS HABITATS PROVIDE CLOSE UP OBSERVATION OF THE GEOLOGY, ECOLOGY AND CULTURAL HISTORY OF THE PARKLAND. IT IS ALSO A PLACE TO EXPLORE THE LONG HISTORY OF THE NATIVE AMERICAN INHABITANTS.



**2 NATIVE AMERICANS** BUILT CAMPS OF **WIGWAMS** ON THE SHORE WHERE SPUYTEN DUYVIL CREEK, THE HUDSON RIVER AND HARLEM RIVER MEET IN A VILLAGE THEY NAMED SHORAKAPOK. THE INHABITANTS OF THIS VILLAGE WERE LENAPE (LEN-AH-PAY), ALSO KNOWN AS THE DELAWARE TRIBE. THE WIGWAM WAS A FAMILY'S HOUSE, BUILT BY FIRST PUTTING LONG POLES INTO THE GROUND, THEN BENDING THE POLES TO MAKE A DOMED FRAME. THE FRAME WAS COVERED WITH SHEETS OF BARK. THE OPENING IN THE ROOF LET SMOKE OUT FROM THE FIRE.



**3 ESTUARIES** ARE PLACES WHERE RIVERS MEET THE SEA. ESTUARY WATERS ARE A NUTRIENT RICH MIX THAT ARE VITAL TO PLANTS AND ANIMALS. MANY MIGRATORY BIRDS REST AND FEED AT INWOOD HILL PARK, WHICH IS ON THE ATLANTIC FLYWAY, A MAJOR ROUTE BIRDS USE FLYING NORTH IN THE SPRING TO BREED AND HATCH THEIR YOUNG, AND THEN FLYING SOUTH IN THE FALL TO OVERWINTER. BESIDES BIRDS, SOME OTHER LONG-DISTANCE TRAVELERS ARE FISH, SEA TURTLES, SEALS, BUTTERFLIES, AND WHALES.



**4 SALT MARSHES** ARE THE KIDNEYS OF THE ESTUARY FILTERING RAIN WATER RUNOFF AND HELPING TO KEEP THE WATER CLEAN. THE WATER IS A BRACKISH MIX OF SALTY SEAWATER FROM THE ATLANTIC AND FRESHWATER FROM THE HUDSON RIVER. THE TIDES RISE AND FALL TWICE A DAY, FILLING AND EMPTYING THE SALT MARSH ABOUT EVERY SIX HOURS. THE PULL OF THE MOON'S GRAVITY AND SUN'S GRAVITY ON THE OCEAN CAUSES THE TIDE. THE SALT MARSH SUPPORTS A COMPLEX FOOD WEB THAT BEGINS WITH CORDGRASS AND PHYTOPLANKTON.



**5 SHORAKKPOCH ROCK** COMMEMORATES THE SITE OF A TULIP TREE WHERE LEGEND HAS IT PETER MINUIT, THE LEADER OF THE DUTCH COLONY OF NEW AMSTERDAM, BOUGHT MANHATTAN FROM THE LENAPE IN 1626 IN EXCHANGE FOR 24 DOLLARS WORTH OF BEADS. THE ORIGINAL SHORELINE OF SPUYTEN DUYVIL CREEK WAS HERE. OYSTER BEDS ONCE COVERED THESE WETLANDS. GARBAGE HEAPS OF SHELLS, CALLED MIDDENS, CAN STILL BE FOUND IN THE HILLS.



**6 A LANDSLIDE** OF GIANT METAMORPHIC BOULDERS FORMED NATURAL **ROCK SHELTERS** THAT NATIVE AMERICANS USED AS A BASE CAMP WHEN THEY FISHED IN THE HUDSON RIVER. THE ROCK IS BEDROCK, IT CONTINUES ALL THE WAY DOWN TO THE FOUNDATION OF THE EARTH'S CRUST. THERE ARE THREE MAIN CLASSES OF ROCKS - (1) SEDIMENTARY MADE FROM SAND AND SEDIMENT, (2) IGNEOUS OF SOLID MOLTEN ROCK, AND (3) METAMORPHIC - PREEXISTING ROCKS RECRYSTALLIZED UNDER HIGH HEAT AND PRESSURE DEEP INSIDE THE EARTH.



**7 BIRD ALLEY**, ALSO CALLED THE CLOVE, IS AN URBAN FOREST INSIDE THE RAVINE BETWEEN THE TWO RIDGES OF INWOOD HILL. IT IS FILLED WITH SONGBIRDS. THE FOREST IS DECIDUOUS MEANING THE TREES SHED THEIR LEAVES IN THE FALL. EACH LEAF IS A SMALL FACTORY THAT CONVERTS SUNLIGHT INTO FOOD FOR THE TREE. THE CHEMICAL PROCESS IS CALLED PHOTOSYNTHESIS. TREES PRODUCE THE OXYGEN THAT WE BREATHE, PROVIDE HABITAT, CLEAN WATER, AND ABSORB CARBON. THE EASIEST WAY TO IDENTIFY TREES IS BY LOOKING AT THEIR LEAVES.



**8 THE GLACIAL POT HOLE** FORMED DURING THE LAST ICE AGE FROM THE COMBINED ACTIONS OF GLACIAL MELT, RAPIDLY FLOWING WATER THROUGH CRACKS IN THE ICE AND SMALL ROCKS THAT ACTED LIKE A DRILL SLOWLY BORING A HOLE THROUGH THE UNDERLYING BEDROCK. WHEN IT RAINS, THE POT HOLE COLLECTS FRESHWATER AND BECOMES ITS OWN MINIATURE ECOSYSTEM WITH LEAVES AND BUGS. LICHEN GROWS ON THE NEARBY ROCKS WHEN FUNGUS JOINS ALGAE TO FORM THE GREEN PATCHES.



**9 WHALEBACK ROCK** TELLS THE STORY OF GLACIATION. THE ICE SHEET ACTED LIKE A BULLDOZER PLOWING DIRT, PICKING UP BOULDERS, AND WEARING DOWN OBJECTS IN ITS PATH. WHALEBACK ROCK HAS BEEN SMOOTHED BY A GLACIER SLIDING OVER IT. ALL ROCKS ARE MADE OF MINERALS, NONLIVING CRYSTALS. BUT, NOT ALL ROCKS ARE THE SAME. WHALEBACK IS MANHATTAN SCHIST MADE OF SHINY FLAKES OF MICA, RED GARNET AND OTHER MINERALS. LOOK CLOSELY TO SEE THE SPARKLE. AS ROCKS ERODE THEY TURN BACK TO SAND AND SEDIMENT.



**10 THE HUDSON RIVER** IS NAMED AFTER HENRY HUDSON, WHO EXPLORED THE RIVER WHILE HE WAS LOOKING FOR A SHORTCUT TO ASIA. THE LENAPE CALLED THE RIVER MUHHEAKANTUCK, TRANSLATED AS "THE RIVER THAT FLOWS BOTH WAYS." IT HIGHLIGHTS THE FACT THAT THE RIVER IS A TIDAL ESTUARY, WHERE THE TIDES DIRECT THE FLOW OF THE CURRENTS. A RISING TIDE CAUSES A FLOOD CURRENT PUSHING SEAWATER UPSTREAM AND A RETREATING TIDE BRINGS AN EBB CURRENT PULLING THE WATER TOWARD THE OCEAN.



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