III. THE PAST AND FUTURE LANDSCAPE OF FLUSHING MEADOWS

Extending more than a hundred miles from the western edge of Brooklyn to the eastern tip of Montauk, the gritty, gravelly fragments of the continent to the north provide the structural basis of Long Island. Now a metropolitan center never far from the beach, this same glacial landmass was, a geologically short time ago, a richly forested and vegetated landscape.

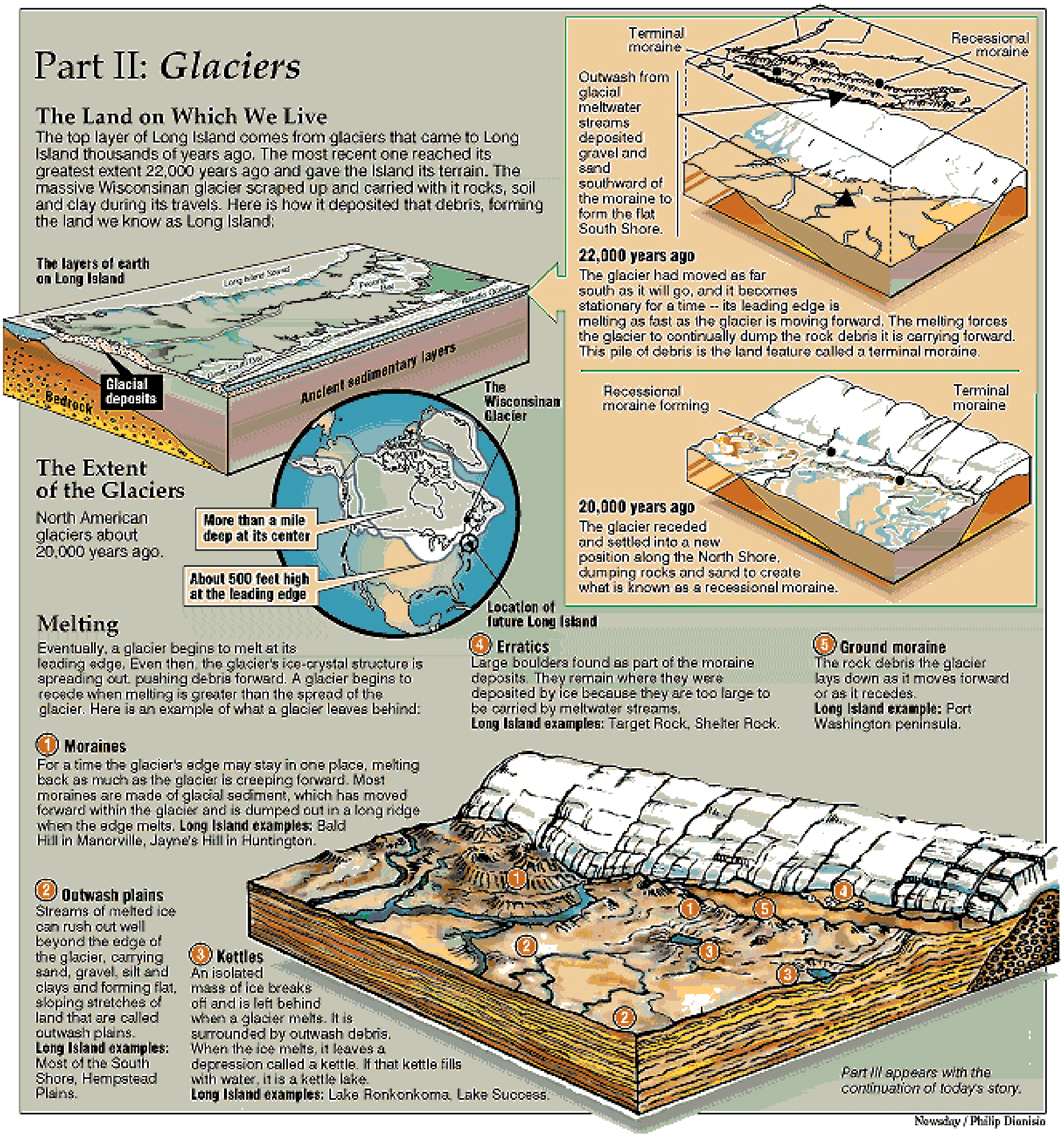
Far geologic past

Hundreds of millions of years ago, the North American and African plates collided with the tectonic body that now carries Western Europe. In some of the remnants of this collision, the Silurian origins of land plants may be found, in rock more than 400 million years old. One product of such impacts, the Manhattan formation, literally set in stone the bedrock features which form the western and northern horizon around Flushing Meadows. While bedrock more than a half billion years old guides the flow of the Hudson and Connecticut rivers towards the Atlantic and Long Island Sound from the north, a much more recent geologic event occurring only thousands, not millions, of years ago, formed Flushing Meadows from ice and the water which flowed from it as it melted away.

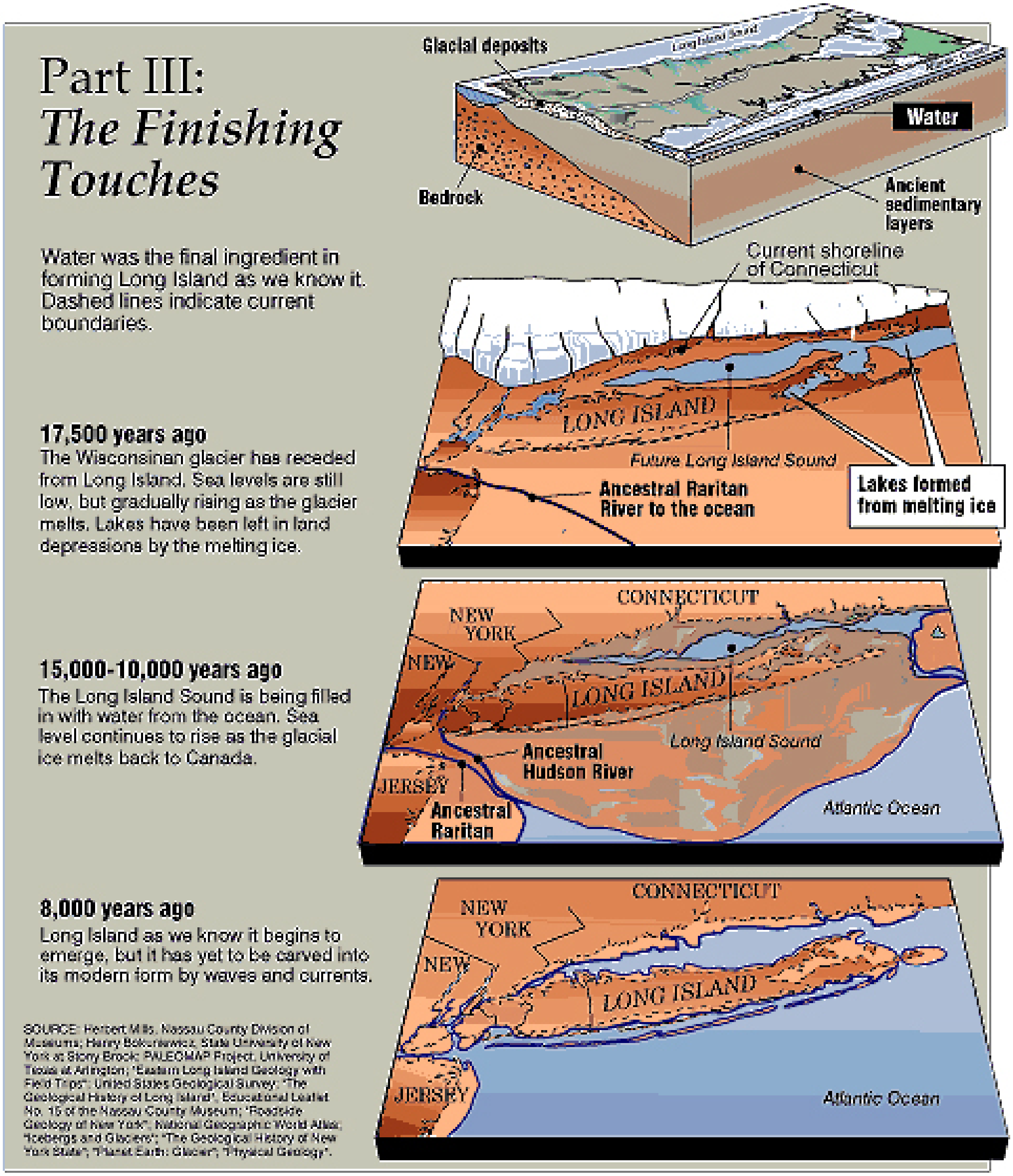
Glacial history

A number of glaciers advanced and retreated over the past million years until finally, about 12,000 years ago, the last of these mountains of ice retreated, leaving an effective hundred mile dam and berm, known as the terminal moraine- the ridge of sand and gravel that marks the backbone of Long Island. As the glacier receded to the north, a large lake filled the hollow south of the rocky Connecticut and Westchester coastlines, well situated to receive melt water rivers running off the continental shelf. The landscape of this period had a form similar to what we would recognize today, but the earliest plant communities were northern bog and sedge. As the glacier retreated and opened up the land, the terrestrial landscape became covered with plants – spruce, fir, and tamarack forests. Over millennia, these generated peats and soils that increased the rates of weathering of rock, adding more minerals to the thickening organic layers in the river valleys, from the Hudson to the Housatonic to the Connecticut.

The "clean slate" left 12,000 years ago after the Wisconsin glacier swept away all vegetation north of the terminal moraine is analogous to certain aspects of modern development. Just as the glacier scoured the landscape clean of plant life, clear cutting, industrialization, ash dumping, highways and urban infrastructure have had similar effects in reducing both biodiversity as well as ecological productivity. These two indices of integrity reached minima immediately following the glaciers as they have again under human influence. The analogy stops there, however, since glaciers supply nutrients in the form of powdered and dissolving minerals, as well as water, while urban development with its pavement, storm drains and pipes, eliminates these.



This illustration depicts the process which formed the "terminal moraine" of Long Island. As the glacier stopped its southern advance and began to melt, its debris-filled edge left the slopes of the north shore, and the finer-grained materials washed out to form the flat, smooth south shore. The last glacier in this region reached its most southern extent 22,000 years ago. Thereafter, it receded northwards, towards its present coverage of the artic north today.



As the glacier melted, it not only created the flat outwash plain of the south shore, but it provided an abundant source of fresh water to support plant and animal communities.

In sum, the landmass configuration in Flushing Meadows was set by the last glacier and fine-tuned by water and wind. Thereafter, the long east-west running terminal moraine became the divide for watersheds of the north and south shores of Long Island. Every square mile of watershed could produce flow in streams and creeks of about a cubic foot per second (and such estimates from historic behavior will be used below to develop aims for water capture in the watershed of the present). Cool north facing slopes were sculpted by water, as precipitation eroded and smoothed down the steep grades, and then seeped into the moraine, bursting out to the surface as streams and creeks in bottomlands near the shore. Tidal activity modified the edge of the meadow twice daily, once sea level had risen to replace the lake level behind the glacially deposited moraine, 8,000 to 10,000 years ago.

The future of the Flushing Meadows landscape now depends on how the land and water features will be structured to provide for ecosystem development. Simply stated, what we see in and around the twin lakes of Flushing Meadows is largely the result of human impact on water, seed sources, soils, and sediments organized into the ecological communities that cover the landscape and water bodies. Spare or missing soils, erosion, seed sources of invasive weeds, stormwater infrastructure piping water off the land – each of these limit the biodiversity of the region, and the lack of humus, water and plant diversity together inhibit ecosystem development, measured by the total amount of carbon captured by plants, as well as the length and diversity of food chains and food webs.

To bring life back to urban deserts, water, minerals, humus, and diverse communities must be restored by integrating water sources, plant species, soil depth and richness, and the shape, scale, area and volume of wetlands and lake environments. In this way, the future of the area around Flushing Meadows could be made more like the past in terms of biological diversity and environmental quality. This cannot and will not happen without commitment to a major effort, as described below.

Post-glacial settlement

As glaciers retreated northward, warming climates became locally hospitable for northern hardwoods, beeches and maples, oaks and hickories. These forests then became home to Native American peoples who had made their way from the west. By their practices, these peoples apparently came to live in a manner that sustained and even increased biological diversity, by opening the forest understory with fire, shifting agriculture, and hunting practices[1]. These immense stands of wood became one of the first resources for export when discovered by the colonists, more than three hundred years ago.

Farming and landfill impacts

The clearing of the land reversed the soil creation process, opening up land to farming, but also to erosion from water and wind. As the settlement in Manhattan grew, more extensive lands were cleared for farming in the hinterlands to support the growing villages and towns. While the Dutch began filling wetlands from their arrival early in the sixteen hundreds, as they had in their homeland for millennia, the large open marsh at Flushing Meadows appears to have escaped this fate. Not until the waste products of the industrializing landscape rolled out of Brooklyn in the early 20th century in the form of a vast ash dump were the meadows permanently altered[2].

Landfill for a higher purpose – transportation infrastructure and two World's Fairs

By the time the Grand Central Parkway was under construction in the 1930's, landfill on and around the thousands of acres of Flushing Meadows had created hillocks reaching heights of nearly a hundred feet, creating a landscape topography of city garbage and trash (as seen on page 1), covered with layers of ash and cinders. As the Parkway was in the planning stages, however, the idea of a World's Fair provided the interest – and resources – necessary to acquire and rebuild the whole area. As Robert Moses relates in his own history of the area, the layers of fill over the old marsh were themselves covered by:

> *"... the manufacture of topsoil out of earth, peat moss and mulch, planting of large trees, grass and shrubs on the basis of final landscape design..."*[3]

The northern part of the meadow was filled, and on the southern portion, two lakes were constructed. Still more infrastructure was added starting in 1960 (including the Van Wyck Expressway), for the second World's Fair in 1964. This fixed the present day circumference of Flushing Meadows and the twin lakes.

Future enhancement requires intervention

While this fill and construction has left an invaluable urban parkland in the geographic center of the City, plant and animal communities have developed about as far as the soil, water, size, shape and aspect of the waterways, seed sources and biogeochemical resources of the former dump site will allow. The future landscape will not improve, i.e., it will not differ significantly in terms of biodiversity or ecological productivity in coming generations[4], unless additional resources are brought in specifically for the purpose of the creation of more diversified habitat. The quality of the future landscape will thus depend on human investment in the creation of aquatic, wetland, and terrestrial habitat. This will require plant material, seed sources, and biomass additions in the form of humus.

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[1] Changes in the Land- Get Citation

[2] Moses, Robert. April 11, 1966. "The Saga of Flushing Meadow" describes the history of Flushing Meadows and the building of the infrastructure for the Worlds Fairs. This article can be found at: http://ww.nywf64.com/saga01.html.

[3] Moses, Robert. April 11, 1966. "The Saga of Flushing Meadow" describes the history of Flushing Meadows and the building of the infrastructure for the Worlds Fairs. This article can be found at: http://ww.nywf64.com/saga01.html.

[4] The likely timeframe for any significant change by natural means is on the order of hundreds of years. As we write,fields of hops with a few sweet gums are being covered by porcelain berry, and *Phragmites* is continuing its spread to remaining moist edges, but there are no great immigrations of native plants, and humus is building up relatively slowly in most portions of the park. These two "missing ingredients", biomass in the form of humus, and biodiversity in the form of plants and propagules, cannot come back in the near term without human intervention in the form of ecological restoration.