VII. CONCLUSION: EXPECTED RESULTS

Reaching goals, and achieving biodiversity outcomes requires evaluating what natural systems can do to sustain and improve environmental quality, and establishing criteria which need to be met to reach them, as well as specific conservation and restoration steps to get from here to there. Both expected positive results as well as potential negative impacts need to be authentically considered and evaluated. This being said, there is near universal accord on a major problem with urban centers and developments generally: they do not "hold water".

If the impervious landscape is an enemy of natural system development, to reverse such impacts it will be necessary to create terraces, meadows, and upslope hollows to catch water, and clean it through earthen filters. It is necessary to recognize at the onset, however, that in the dense population center of New York City, parks are and should be attractors of the people, and the education of park users as to the value of native plant communities, soils, natural systems, and proper maintenance to ensure that these green and earthern filters continue to meet performance goals, is necessary to bring a broad based sociology and community ecology together. To nurture these acres of Nature in the City, we must somehow all learn to be caretakers, stewards, even whistleblowers, to make sure that we protect what sustains us all. Only in such a context can the environment come to improve.

Conserving, enhancing, restoring and creating soil and wetland buffers around the twin lakes is expected to decrease pollutant inputs by a factor of ten, and similarly increase plant biodiversity ten fold. While invasive, wind distributed plant species are likely to find their way to the Flushing Meadows area at any time, many native plant population are repressed by the lack of water, nutrients, soils, and seed sources which presently characterize much of the area around the twin lakes.

Water quality improved to swimmable/fishable level

Water quality will improve when pollutants from runoff are diminished, and when the superabundant nutrients supporting algal blooms presently entering lake waters from sediments are eliminated.

Projected increase in habitat diversity and plant diversity

Nutrient-poor and eutrophic environments each diminish biodiversity. Dry environments have many fewer species than temperate landscapes. By adding the primary nutrient regulator in the biosphere, i.e., humic materials in the form of compost, it is expected that habitats can be restored, and thus become capable of sustaining a ten-fold increase in native plant species. This same humic matter is a fundamental regulator of water holding capacity in the terrestrial biosphere. The addition of humus will, in one step, address two of the conditions presently limiting biodiversity in Flushing Meadows: water and nutrients.

Most of the ground coverage around Willow Lake is dominated by three species of invasive plants: common reed, ragweed, and porcelain berry. Approximately 30 species of trees, shrubs, and herbaceous plants make up the rest of the flora, but a number of these are disappearing under pressures from the invasives, especially *Phragmites* and porcelain berry. Native trees, shrubs, and herbaceous plantings will add the individuals and seed sources necessary to sustain biodiversity increases of up to 400 species, or more.

Reduction in runoff added to the city sewer system will complement clean-up efforts underway in Flushing Bay

Lack of water limits plant growth and development in every environment in the terrestrial biosphere at some part of the day or year. In urban environments, water availability follows in short bursts immediately after storm events. Wet areas can be sustained for days to weeks in rainy periods, creating mosquito-breeding habitat in the process. Such periods are inevitably followed by dry, droughty conditions for many parts of the growing season. The addition of water is essential to increase plant and ecosystem growth, and the capture of stormwater in Flushing Meadows could both increase ecological productivity and biodiversity, as well as environmental quality. The creation of permanent water features would also provide habitat for mosquito predators, such as fish, frogs, and dragonflies, amongst others, creating a 'sink' for mosquitoes and their larvae. By holding water on the land, stormwater runoff can also be diminished, thus eliminating some discharge into the combined sewer system, which compromises water quality in Flushing Bay.[1]

Topsoil improvements will enhance plant diversity and increase the health of turf grasses on playing fields, stormwater capture, and biogeochemical filtration

By restoring thick organic soils with native plantings, air and water purification zones would be enlarged and increased in capacity. Humus itself inhibits the growth of fungal infections of turf grass. The addition of humic matter in the form of compost in soils can increase the rate of growth and development of below and above ground ecological systems in and around Flushing Meadows, and could be utilized in more active filtration if recycle water pumps are used to keep playing fields green.

Protecting existing wetland resources

Willow Lake is fringed with wetlands, though they are dominated by the growth of common reed around the lake perimeter. There are, however, patches and edges of native iris, cattails, arrowheads, water lilies, and other native wetland plants. To deepen the lakes for the rowing course will require careful removal of these edge communities in a number of areas, and their replanting elsewhere on the site. Transplanting these organisms will inevitably cause some wetland disruption and damage, but most of the plants should not only survive, but also increase in coverage and biomass in extensive habitat created to meet the depth, light, and soil requirements of each species.

The final lake edge and watershed will, by following these protocols, contain much more wetland area of higher diversity than is presently in and around the twin lakes. Preliminary estimates indicate an increase of wetland area by about a factor of five, i.e., at least five times the existing wetland area. Spreadsheet models are presently under development to estimate expected water quality outputs from differing wetland configurations and sizes. Predicted water quality enhancements based on increases in wetland scale will be used together with topographic considerations to optimize wetland configuration around Flushing Meadows.

To minimize damage to existing habitat, movement of any existing wetland plant communities can be staged for windows in winter months. This could make it possible to transplant existing plants and peat systems during their quiescent phase in large sections with front end loaders and other machinery capable of moving large chunks or modules of the wetland system. In this way,

whole communities, including insects, crustaceans, annelids, and other invertebrates, roots and seeds can be "transplanted" as a unit when they are least prone to trauma. Such an approach should act to maintain populations, communities, and even a major fraction of biogeochemical filtration capacity, since a module of the active "system" could be moved and relocated in functional groups.

Connecting a greenbelt-bluebelt of parks and greenspaces

An unprecedented biogeographic opportunity exists in Flushing Meadows and its surroundings to create an extensive, integrated greenway and blue belt, from Alley Pond, Kissena Park, Mt. Hebron and Cedar Grove Cemeteries, Queens Botanical Garden and the Kissena corridor to the northeast and east, Cemetery of the Evergreens and Forest Park to the west and southwest, and Maple Grove Cemetery to the South. If these landscapes became special conservation planting areas with groves and copses of native vegetation, it would be possible to restore centers and corridors of biodiversity in and amongst the parklands and green spaces of Queens and Brooklyn, so that native plant and animal populations would have closer connections between neighboring habitats which could mutually support one another. Thus, the goal of an interconnected Queens-wide and Western Long Island park system could be achieved, to the mutual benefit of those who live in or pass through this landscape.

Conclusion

Based on an investigation and evaluation of existing conditions, the structural requirements for Olympic rowing events, and an extensive redesign of the original plan, we conclude that the present NYC2012 planned rowing course, constructed according to strict performance criteria, would establish demonstrably superior ecological conditions than the no-build alternative. Given the relatively small scale and limited budgets of restoration and enhancement programs in the New York/New Jersey Harbor Estuary at present, it is unlikely that any similarly scaled investment in ecosystem services to enhance environmental quality and biodiversity is on the immediate horizon.

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[1] Even with the new tank on line, limiting the amount of stormwater that "dilutes" the raw sewage discharge will increase the efficiency of this CSO catchment and treatment system.