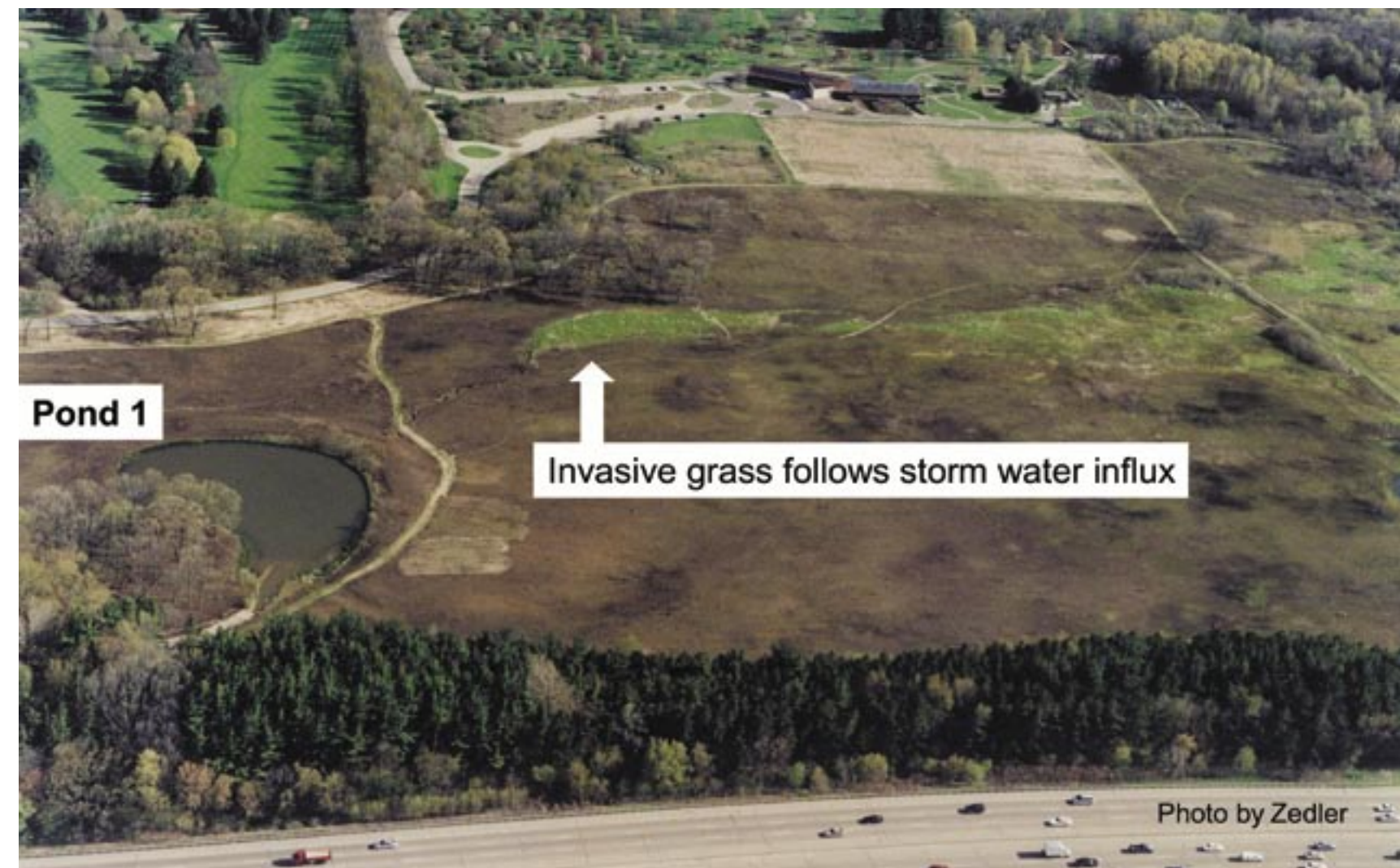


Combating Storm Water Impacts on Restored Ecological Communities Nested in an Urban Landscape

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Sediment Delta in Ho–Nee–Um Pond caused by upland erosion and street sand



Curtis Prairie after a Prescribed Burn showing green vegetation that did not burn, mostly invasive reed canary grass (*Phalaris arundinacea*)

Abstract

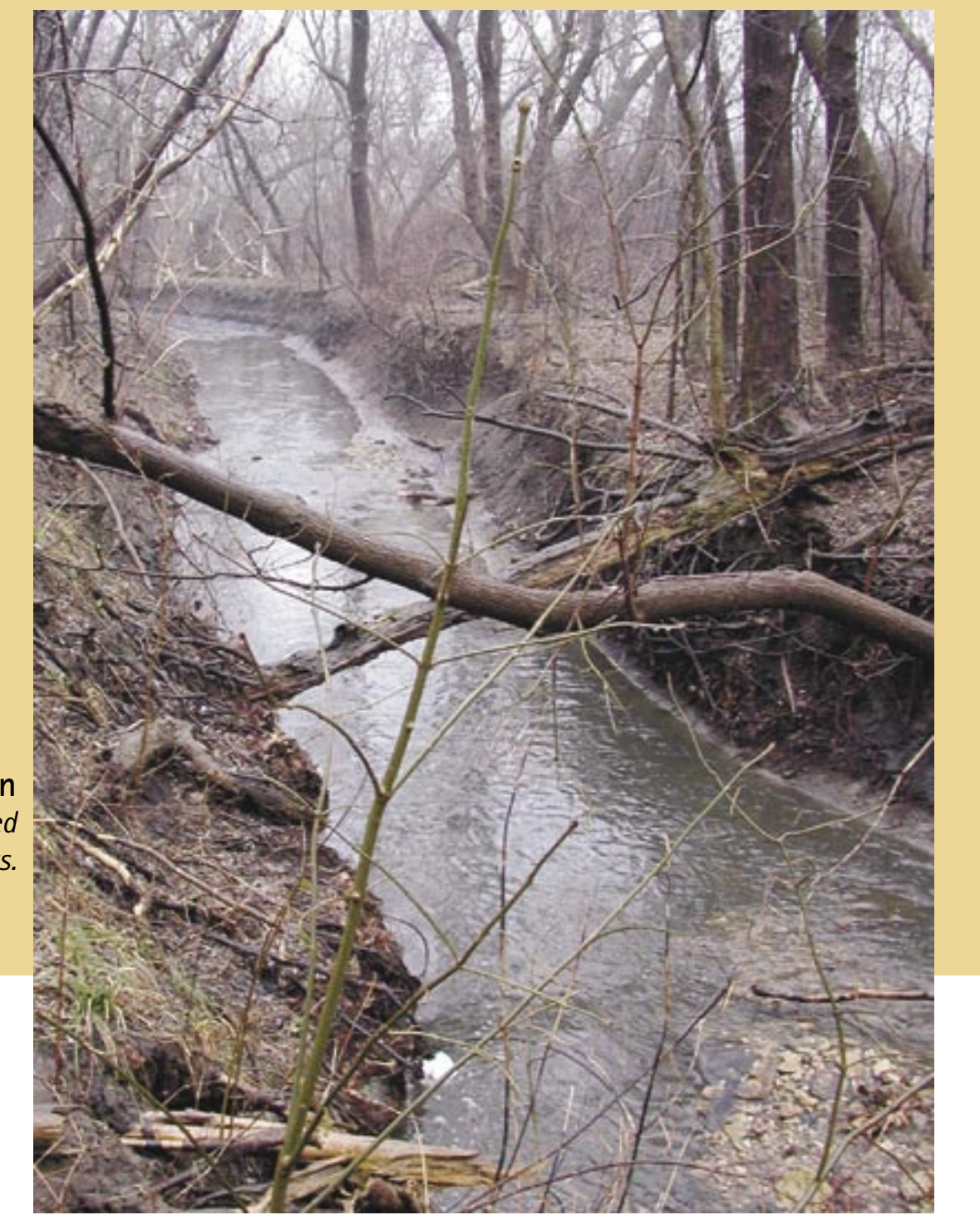
1,800 million liters per year of urban storm water runoff passes through the University of Wisconsin–Madison Arboretum. The Arboretum is a 510 hectare collection of restored ecological communities completely surrounded by an urbanized landscape.

Impacts upon the communities include:

- High levels of phosphorus in surface water
- Sedimentation of wetlands and mesic prairies
- Erosion of upland terrain
- Establishment and spread of invasive species.
- Impaired ability for restoration management

Comprehensive watershed-based storm water management planning, combined with innovative storm water management practices and outreach education, have provided valuable tools for restoration of damaged landscapes, and the prevention of future degradation.

The approach engages the scientific and educational expertise of the university in partnership with community groups, municipalities and the business community.

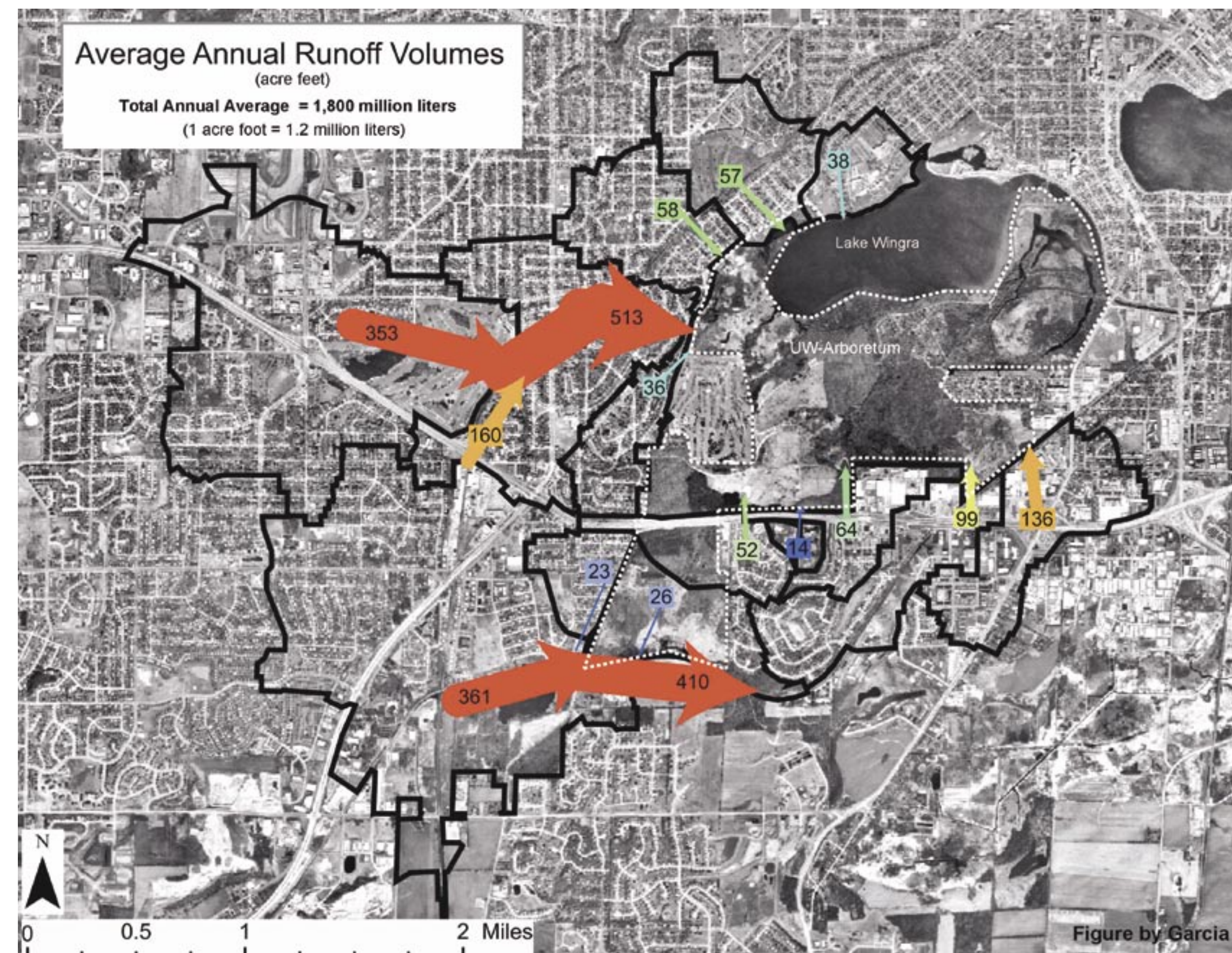


Woodland Erosion caused by uncontrolled runoff flows.

Storm Water Planning Values

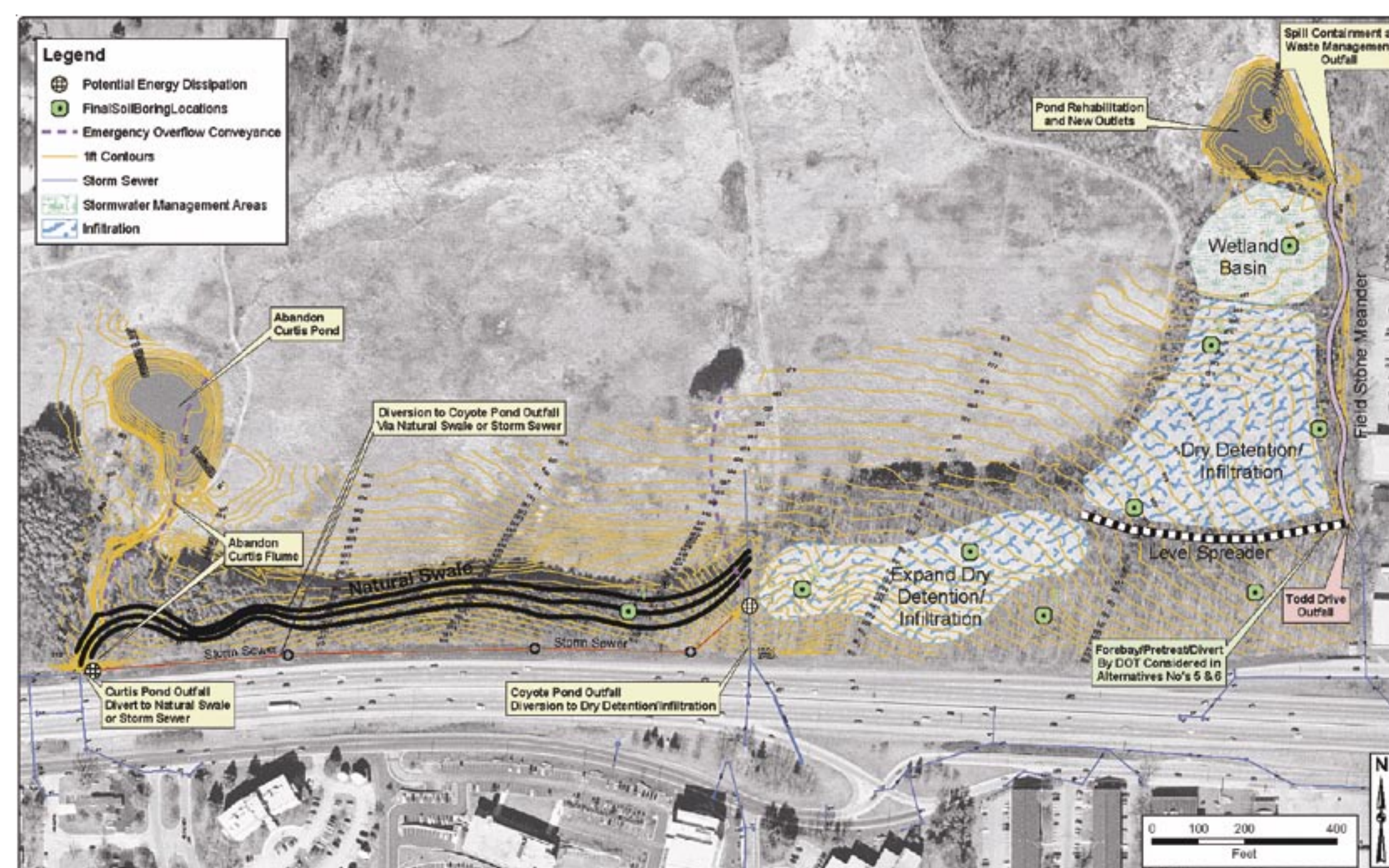
To better guide the storm water planning process, and to provide criteria for making decisions about storm water management options in the future, the UW Arboretum Committee adopted the following management values, which represent ideals to be achieved:

- Managing storm water on UW–Arboretum property should attempt to maintain (or restore) conditions of storm water transport and infiltration, that best serve Arboretum restoration objectives, while protecting the environment.
- Flows of storm water runoff onto Arboretum property resulting from the surrounding urban areas should be controlled to pre-settlement levels to the extent possible, and managed for minimum impact upon Arboretum ecosystems.
- The quality of storm water runoff (e.g. nutrients, solids, temperature) entering Arboretum ecosystems and draining to surface waters, should be consistent with pre-settlement quality.
- Any construction of storm water management infrastructure (e.g. detention ponds and dikes) on Arboretum property should serve and enhance Arboretum restoration, teaching, research and outreach objectives.
- UW–Arboretum should encourage wise storm water management practices throughout the surrounding watershed community by example and through education.



Options for Storm Water Management in the University of Wisconsin–Madison Arboretum

- Employ adaptive management of degraded natural areas.
- Equip outfalls discharging into Lake Wingra to trap heavy particles and trash before they are carried into the Lake.
- Control outflows from surrounding runoff sources to minimize peak flows through the system
- Determine the most appropriate means of conveying runoff across Arboretum Lands.
- Create dry infiltration basins to intercept runoff flows and recharge groundwater.
- Restore the natural understory to reduce erosion contributing sediment to runoff.
- Teach innovative storm water management techniques.



Curtis Prairie Conveyance and Infiltration Plan eliminate runoff to Curtis Prairie and recharge groundwater.



Pond 4 Reconstruction trapping sediment and diffusing flows into wetlands

Options for Storm Water Management in the Arboretum Watershed

These watershed-wide storm water management options apply to the entire 1,600 hectare UW–Arboretum watershed

- Watershed residents with suitable sites disconnect their down spouts from paved surfaces, and construct rain gardens to infiltrate water from impervious surfaces on their property.
- Commercial properties employ rain gardens, pervious surfaces, and other strategies, to detain and infiltrate runoff on-site.

- The surrounding municipalities install pervious surfaces to intercept and infiltrate street runoff before it can enter the conveyance system.
- The surrounding municipalities utilize open land to collect and infiltrate runoff, rather than discharge it to surface conveyances and storm drains.

- The surrounding municipalities control the rate of discharge of storm water runoff onto Arboretum lands, minimizing the impact of peak runoff flows.
- The surrounding municipalities institute policies regarding salt application, street sweeping, leaf pickup, erosion control, etc., to reduce the level of solids, nutrients, chloride and other urban pollutants in runoff entering the Arboretum.
- Reed canary grass, hybrid cattail and giant reed are regulated as noxious weeds associated with storm water runoff.
- Residents and businesses are educated about the appropriate use of lawn fertilizers, and the need to keep leaves, animal feces and other debris out of the storm drains.



Residential Rain Garden – infiltrating roof runoff at the sources

Street Side Infiltration – reducing flows and removing solids



City of Spangau



Commercial Bioinfiltration – parking lot detention and infiltration

Larry Coffman

Anticipated Outcomes of Improved Storm Water Management

While outcomes at specific sites are dependent upon the final choice of management options, the measures described in the storm water management plan are expected to result in the following overall outcomes:

- Established watershed-wide goals for reducing runoff flows and improving runoff water quality, and for the adoption of rain gardens, pervious surfaces and other beneficial management practices.
- Reduced degradation of Arboretum ecosystems by storm water runoff and associated invasive species.
- Measurable improvement in the quality of surface and subsurface hydrology, resulting from storm water treatment and infiltration.
- Knowledgeable municipal and business partners, and watershed residents, taking action to improve storm water management practices in the surrounding watershed.
- Advances in understanding of the performance of innovative storm water management techniques.
- Demonstrate the applicability of adaptive management approaches to ecological restoration.



Curtis Prairie at the University of Wisconsin–Madison Arboretum.

The University of Wisconsin–Madison Arboretum features the restored prairies, forests and wetlands of pre-settlement Wisconsin.

While the Arboretum serves as an outdoor research site primarily for the University's faculty and students, it is also used by researchers and students from around the world. The plants and animals and their habitats are the subject of constant study by plant pathologists, limnologists, wildlife ecologists, soil scientists, horticulturists, engineers, landscape architects and other professionals.