Pieces of the Puzzle: From Backyard Habitat to Landscape Scale

Session I – Backyard and Beyond

Session II – Looking to the Landscape

Session IV – Restoration at Every Scale

One Good Garden Changes Everything: Building Public and Ecological Resiliency

Karen Kelly Mullin, Willow Oak Group

Millions of Americans self identify as gardeners. Homeowners spend hours planting, pruning and weeding. Community gardening and urban food production are increasingly popular. Yet homeowners and urban and suburban developments are still largely an ecological liability. How we can incorporate people's growing interest in cultivating plants into an interest in restoring and sustaining our ecosystem? How can we energize these masses of people to do great things that build ecological resiliency?

Since 2009, the District Department of the Environment, Division of Wildlife and Audubon Maryland-DC have partnered to deliver over 30 wildlife habitat demonstration gardens and workshops. As one of the many backyard wildlife programs throughout the Mid-Atlantic region that has done their part to reach out to homeowners, this effort has had its successes and challenges. This homeowner outreach program was originally designed to enhance the wildlife value of the city's parks. The program evolved into a community building effort that engages new groups into ecological restoration one garden at a time.

The many lessons learned from this program include keys to successful site selection, workshop timing and messages that resonate with people. These similar lessons are echoed in other community and backyard wildlife habitat projects from schoolyard habitats to community rain-gardens and can be applied to other community and volunteer projects. Engaging people in meaningful projects is a powerful tool for enhancing the ecological resiliency of a region.

Karen Mullin is a founding partner of the Willow Oak Group, an environmental consulting firm. For the last 15 years she has worked extensively with conservation landscaping, schoolyard habitat, adult training and environmental education for the U.S. Fish and Wildlife Service, National Conservation Training Center, Audubon Maryland-DC, Maryland Association for Environmental and Outdoor Education, Chesapeake Bay Foundation and the Maryland Department of Natural Resources. Karen holds a masters degree in education from University of Maryland, Baltimore County. Karen works both on the design and implementation of on the ground projects as well as the strategic planning and coordination for comprehensive efforts, such as the guiding documents for the Mid-Atlantic Environmental Literacy Working Group and the Maryland Partnership for Children in Nature. Most recently she is the co-author of the US Fish and Wildlife Schoolyard Habitat Guide, Second Edition. When not working for the environment Karen enjoys spending time exploring nature with her husband, two daughters and their border collie.

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Rehabilitation of Drastically Disturbed Soils

W. Lee Daniels, Virginia Tech

Soils and landscapes that have been drastically disturbed by mining, right-of-way development and construction activities frequently share one or more common properties that limit soil quality and adversely affect their local environment. It is essential that these limitations be recognized before or during the site development process and that appropriate mitigation measures be incorporated into site-specific soil reconstruction protocols. Following is the sequence (from most to least challenging) of soil/site properties that should drive the development of remediation protocols. First of all, the presence of significant (>0.2%) pyritic-S can completely dominate local soil and water quality due to acid-sulfate oxidation reactions. While the presence of sulfidic materials is clearly the most daunting site-specific problem to deal with, it is relatively rare in occurrence. On the other hand, soil compaction is an almost ubiquitous limitation on disturbed sites and can completely limit the productivity of otherwise suitable soil materials. Coarse-textured and/or rocky soil materials with limited water holding capacity are the next most important limitation to consider. On certain sites and materials, steep slopes coupled with low albedo (e.g. dark surfaces) pose multiple challenges for plant growth including drought/heat stress and greatly complicate application of amendments and soil reconstruction practices. Soluble salts and heavy metals may also limit soil quality on many sites, but are largely eliminated in the eastern USA via identification and avoidance of sulfidic materials. Elevated salts and metals may also be associated with industrial contamination and waste disposal practices, however. Finally, soil fertility parameters such as pH, plant-available N, P and other nutrients should be addressed. These latter limitations are the most simple and straightforward to remedy.

Sulfidic soils and geologic materials should be tested via an appropriate acid-base-accounting or potential acidity procedure. Materials needing up to 25 or more tons of $CaCO_3$ lime per acre (T CCE per 1000 T material) can be successfully remediated, but in general, those with acidities > 5 tons CCE lime demand should be avoided. Severe compaction should be remediated via appropriate tillage and/or ripping, but this is frequently complicated by pre-existing plantings, infrastructure, site access and equipment availability issues. Simple surface soil amendment with gypsum and/or other “soil aggregators” will not remediate deeper root zone compaction issues. Utilization of incorporated organic amendments (e.g. composts and biosolids) at relatively high rates (25 to 50 tons/acre) can be quite effective at improving water holding and albedo/heat related soil limitations, but the logistics of application/incorporation on many sites can be quite challenging. The bioavailability of most metals can be readily reduced to acceptable levels via addition of lime and organic amendments, but certain metals (e.g. As and Mo) will actually increase in availability with liming. The choice of soil amendments must be carefully tailored to a combination of site/soil conditions and the rehabilitation/restoration target. In general, we have been quite successful in reconstructing and rehabilitating a wide range of drastically disturbed materials via the combined application of lime and heavy rates of organics (composts and biosolids) coupled with deep tillage and incorporation. In certain instances, however, certain sets of combined problems (e.g. extremely high soluble salts + Zn and Cd) have mandated the use of thick soil covers and lime barriers at the soil/waste contact zone.

W. Lee Daniels is the Thomas B. Hutcheson Professor of Environmental Soil Science at Virginia Tech in Blacksburg, Virginia. He received his Ph.D. in Soil Science from VPI & SU in 1985. Dr. Daniels areas of specialization include stabilization and restoration of disturbed lands including areas disturbed by

mining, road building, waste disposal, urbanization and erosion. In particular, he has focused his research and consulting experience in mine reclamation, wetland impact mitigation and soil-waste management systems. His teaching programs at Virginia Tech focus on soil geomorphology and landscape analysis with particular emphasis on the relationships among surficial geology, hydrology, soil patterns and long-term landscape evolution processes. Major awards include the *Reclamation Researcher of the Year* by the American Society for Surface Mining and Reclamation in 1993, USEPA's *National Biosolids Utilization Research Award* in 2000 and the Lifetime Achievement in Research Award by ASMR in 2012.

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Novel Ecosystems: Backyard to Landscape

Marilyn Jordan, Ph.D., The Nature Conservancy on Long Island

Novel ecosystems — new, historically unprecedented combinations of species caused by environmental change, human actions, introduction of new species and loss of native species — now collectively occupy ~40% of the terrestrial ice-free globe. Accelerating climate change, human population growth and urbanization will likely increase the extent of novel ecosystems in the future. In order to maintain genetic and species diversity, food web linkages, and ecosystem function and services for people we need to understand both the benefits and deficiencies of novel ecosystems and learn how to manage them at all scales.

As the proportion of nonnative plant species increases there typically is a decrease in native plant species diversity, native plant biomass and nutrient uptake, and altered ecosystem processes in both terrestrial and aquatic ecosystems. In terrestrial systems animal/insect biodiversity, growth rates and biomass may plummet. As insect biomass and diversity are lost species that depend on them may disappear and complex food webs may become simplified and unstable.

Most insect species are specialists, and their loss is one example of a widespread "replacement" of specialist species by generalists in many taxa as a result of disturbance and global change. As diverse species capable of differential responses to environmental change are lost, ecosystem resilience and adaptability to climate change and anthropogenic disturbance may decrease. Ecosystem services to people – including human health – may also be impacted. Certainly as species become increasingly rare, dispersed or extirpated the diverse genetic material needed for evolution and adaptation to change are lost.

So what do we do about novel ecosystems? I think that sometimes (most times?) we should accept novel ecosystems, learn how they function and manage them to maximize their conservation value and ecosystem services. We shouldn't waste scare resources fighting inevitable change, so we need to apply triage based on desired outcomes and goals. Management strategies should be developed using a "whole ecosystem" approach tailored to suit different ecoregions, microclimates, land uses and socioeconomic settings. Results should be adequately monitored to allow learning and adapting management strategies accordingly.

We need to think and work at all scales including the matrix in which natural areas are embedded, and engage people in our strategies. For example, encourage private and public land owners to plant more native plant species, reduce lawns and preserve wildlife habitat in their backyards and landscaping. At landscape scales work to prevent mindless sprawl and reduce human caused degradation of physical habitat quality (e.g. altered nutrient and water flow regimes, erosion, soil and water pollution, habitat fragmentation, excessive deer browse). On national and global scales we can fight for reductions in emissions of greenhouse gases and other air pollutants, and for improved pre-importation screening of plant and animal species with adequate enforcement.

Finally be hopeful. Yes humans have reshaped the global environment but the earth is not ruined. We can manage, restore and enjoy nature in novel and human-designed ecosystems while we continue to cherish, protect and restore wild ecosystems. We have a responsibility as a species to care for and protect the earth and all of the life it supports.

Dr. Marilyn Jordan has worked for The Nature Conservancy on Long Island for 20 years and is now is a Senior Conservation Scientist. Her work for The Nature Conservancy has included invasive plant science, novel ecosystems, fire ecology, ecological monitoring, atmospheric deposition and conservation planning. She has assisted The Nature Conservancy and partner agencies in carrying out ecologically sound management of lands and fresh waters on Long Island and beyond. One of her accomplishments has been working with the Brooklyn Botanic Garden and a committee of stakeholders to rank 184 nonnative plant species for invasiveness in both New York State and the Long Island Invasive Species Management Area. Species ranked invasive are now prohibited from sale in Nassau and Suffolk Counties on Long Island.

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Making Urban Landscapes Work for Local Waterbodies and Wildlife

Peter Hill, District Department of the Environment, Washington DC

Urban watersheds are characterized by both a highly altered hydrology and stormwater carried pollution that result in diminished ecological function of the remaining streams and rivers. The District of Columbia has completed several first order stream restoration projects that hold the promise of improving water quality, slowing stormwater flows, raising groundwater levels, and providing much-needed habitat. These projects have met numerous permitting hurdles in part due to a conversion of incised stream channels to seepage wetland systems. The uncertainties surrounding the permitting reflect a need to reevaluate urban streams and their restoration potential. A big component of this potential is the viability of upstream stormwater controls. For the past four years, DDOE has offered a popular stormwater incentive program that has reached over 3,700 homes and through this experience has some indication of what levels of control on private property can be achieved.

Pete Hill manages the watershed planning and restoration activities for the District Department of the Environment. The programs in his group include the suite of stormwater retrofit incentive programs collectively called the RiverSmart programs, environmental education programs for District students, and numerous stream and wetland restoration projects. He has worked in DC for eleven years and prior to this worked on forest health monitoring and stream characterization for the USDA Forest Service. He has a Masters in Environmental Management from the Yale School of Forestry and Environmental Studies where he studied forest ecology and restoration ecology.

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Daylighting the Dell: Making a Working Landscape a Beautiful Landscape

Warren T. Byrd, Jr., Nelson Byrd Woltz Landscape Architects

This illustrated talk will present several award-winning small to larger sustainable stormwater projects designed by Nelson Byrd Woltz Landscape Architects. The primary focus will be on the stream daylighting and pond creation at the Dell at the University of Virginia, an 11-acre restoration project that has been in place for eight years and has become a model for beautifully designed strategies that dramatically improve water quality and biodiversity within a small public park-like setting.

Like numerous other NBW landscape designs, the success of the Dell underscores the fact that working, functional landscapes can not only be efficient and restorative, but can be beautiful, compelling, and inspirational additions to existing compromised or under-utilized sites.

The slide presentation will describe multiple strategies for creating rain gardens as well as demonstrating how innovative designs can celebrate the ebb and flow of storm events.

Central to the discussion of these sustainable, hydrological interventions will be the importance of incorporating a region- and site-appropriate palette of native wildlife-attracting plants.

Warren T. Byrd, Jr., FASLA is Founding Principal of Nelson Byrd Woltz Landscape Architects, a 35-person firm practicing out of offices in Charlottesville VA, New York City, and San Francisco. In concert with current owner and Principal Thomas Woltz, FASLA, the firm has received over 80 national and regional design and planning awards within the past ten years for its work throughout the United States and worldwide. The Dell at the University of Virginia, which will be featured in this talk, received four of those awards – two national and two regional. More recent notable projects include the Flight 93 National Memorial in Pennsylvania (with Paul Murdoch Architects) and the three-acre urban sculpture park – Citygarden in St. Louis – the 2011 recipient of ULI's Amanda Burden Urban Open Space Award.

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Environmental Restoration for People and Nature: Coastal Restoration in Cape May NJ

Robert Allen, The Nature Conservancy, New Jersey

Situated at the very southern end of New Jersey, Cape May is replete with dunes, freshwater wetlands, meadows, ponds, and acts as a funnel for birds migrating along the Atlantic Flyway. Over the past 75 years, the area has experience significant erosion and storm damage, including coastal flooding. In the 1990s, the towns in the area approached The Nature Conservancy, U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection to find solutions. The partners worked to find a way to wed the ways of protecting nature with protecting communities. The result was a comprehensive project to restore the freshwater wetland and beach ecosystems of the Cape May Meadows. Since the project's completion in 2006, the area has withstood a series of severe storms – most notably Hurricane Irene in August 2011 and Hurricane Sandy in October 2012 – providing an excellent example of how natural infrastructure can play an integral role in reducing risk to communities from natural disasters.

Bob Allen brings sixteen years of managerial experience and nineteen years of conservation science and field work to his position with the New Jersey Chapter. He joined the Conservancy in January 2004 as Director of Conservation Science in which role he directed a variety of biological monitoring projects and restoration efforts on preserves, including the award-winning restoration of the South Cape May Meadows Preserve, and played a leading role in two Chapter strategic conservation plans. Promoted to Director of Conservation Programs in 2009, he is responsible for all Conservancy conservation activity statewide. Prior to joining the Conservancy, he was for seven years a Terrestrial Resource Assessment Coordinator for the California Department of Fish & Game. In this capacity, he was program manager for a broad variety of non-game, game and biological monitoring projects on state and private lands and served on the Executive Steering Committee of California Partners in Flight. He has significant experience in designing studies, creating protocols and performing data analysis, as well as in conservation planning and wetland restoration projects. He has a degree in Biology from Rutgers University and an M.S. in Wildlife Management from Humboldt State University (CA).

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Enhancing and Harnessing Nature for Climate Resilience in the Delaware Estuary

Danielle Kreeger, Ph.D., Partnership for the Delaware Estuary

Like most American estuaries, the consequences of climate change in the Delaware Estuary will be multi-faceted and will interact with ongoing landscape change. Global climate projections were downscaled and shown to local resource experts who then worked to assess future vulnerabilities of key habitats such as coastal wetlands and bivalve shellfish beds. Our findings revealed that there are likely to be far more losers than winners, especially when considered in the context of life-sustaining ecosystem services such as water quality maintenance and ecological productivity. Many changes are already underway, such as rising salinity that impairs oysters and rising sea levels that contribute to wetland losses. Increased storminess amplifies these threats, as evidenced most recently by Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy. Initial damage assessments following Sandy demonstrated that properties buffered by coastal wetlands fared much better than those "protected" by traditional hard infrastructure.

Fortunately, there are numerous climate adaptation tactics that can help offset projected losses and impart resilience, such as living shorelines, sediment management, and restoration of oyster reefs and freshwater mussel beds. Two examples will be discussed in the presentation: a living shoreline that stems salt marsh erosion and a freshwater mussel bed that helps sustain water quality. Regional restoration tools have also been developed to prioritize which of these tactics are most likely to provide greatest uplift to natural capital in a geospatial context. Currently, many scientifically vetted projects are "shovel ready" but implementation is hampered by lack of funding. To attract funding, stronger economic analyses may be needed to demonstrate returns on investments in natural infrastructure.

Danielle Kreeger is a wetland and shellfish ecologist with 30 years of experience as a research scientist. She is science director for the Partnership for the Delaware Estuary, where she represents the National Estuary Program's scientific interests. She leads technical advisory teams, organizes conferences and workshops, and performs research to address key science, management and restoration needs. She also serves as associate research professor at Drexel University. Danielle's academic training was at Plymouth Marine Lab, U.K. (post-doc), Oregon State (PhD), University of Delaware (MS), Penn State (BS). Danielle has authored more than 30 journal papers, edited a book on marsh ecology, and has mentored about a dozen graduate students. Having worked in tidal and non-tidal ecosystems of the Pacific Northwest, Gulf of Mexico, Mid-Atlantic, and Europe, Kreeger strives to identify broad ecosystem patterns and apply the lessons learned to regional and local decision-making to help address climate change and other ecosystem management challenges.

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Developing Synergy by Combining Mitigation with Stewardship

Robert E. Shreeve, State Highway Administration, Maryland

The Intercounty Connector (ICC) project is an 18-mile long, 6-lane highway in the Washington, D.C. suburbs of Montgomery and Prince Georges counties in Maryland. Various forms of the project have been in planning for decades, but could not progress due to environmental concerns. When the 2003 planning study began, the Purpose and Need of the project included "environmental stewardship." Environmental stewardship was defined as "above and beyond" avoidance, minimization and mitigation. As the planning for the ICC began, ICC staff worked with county, state and federal agencies to identify needs in the watershed affected by the highway. ICC staff developed a process to classify and filter these needs, converting them into mitigation and stewardship projects to achieve goals that supported the watershed needs assessment. The mitigation and stewardship projects were further evaluated so that the beneficial effects were aggregated to develop supporting relationships between projects. Don't worry – there's still plenty of work left to be done.

Rob Shreeve is the Deputy Director of the Intercounty Connector Project. With a BS in Biology from Towson University and 28 years with the Maryland State Highway Administration (SHA), Rob brings an environmental view point to engineering solutions. At SHA, Rob has worked in the Structures, Maintenance and Environmental offices. He has focused on highway influences on wetlands, streams, wildlife, and water quality.

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