

1. **This afternoon we will collectively address ways to think about ecological restoration, its applicability to urban settings, and its relationship to ecological design.** As a preface to our post-presentation discussion, we will speak of principles gleaned from personal experience, from a close review of the literature, and through conversations with practitioners and academics whose goal it is to reclaim, rehabilitate, and restore damaged ecosystems *and* re-initiate viable ecological processes through thoughtful landscape planning, design, and management. Our desire is that you will reflect upon the lessons you have learned from your personal explorations and experiences, and share these with the rest of us. *We hope our presentations will prime the pump.*

2. After I discuss **over-arching principles related to ecological restoration in urban and suburban settings** and highlight a number of indicators of “restoration success,” Allegra Bukojemsky describes work accomplished in Pittsburgh’s Nine Mile Run Watershed – specifically referring to the nine steps in restoration design, discussed in ASLA’s Ecological Restoration LATIS – <http://www.asla.org/Store.aspx>. Andi Cooper then highlights how ideas related to restoration influenced the design of the Kresge Foundation Headquarters in Troy, Michigan.

3. First, a brief list of **why restoration ecology science and the practice of ecological restoration** matters to planners/designers. In short, the ideas of ecological restoration relate directly to core values in Landscape Architecture and to the pressing needs of society to maintain well-functioning places for people and other organisms to live.

4. **So how do we interweave ecological restoration and ecological design in urban settings?**

Since plants and animals grow and thrive in habitats to which they are adapted (Wilhelm 1996) we must adapt our restoration and regenerative design ideals to the forces at work within urban settings – including bio-physical & socio-cultural forces.

We believe that landscape architects can and ought to consider ecological restoration and land reclamation in relation to every project they work on – for virtually every landscape in the world has been seriously altered or negatively impacted in some way and recovery and bio-integration are needed.

5. Pickett and Cadenasso (2008) ask designers to work closely with plant ecologists and other scientists to better understand how design influences ecological functions in urban settings. They also call upon planners, designers, and engineers to recognize the dynamic nature of interwoven ecological and cultural landscapes and to engage in a design process that adequately account for uncertainty and complexity.

6. So how can landscape architects and designers contribute? Clear communication, integrative thinking and action, visualization, stakeholder and community facilitation, and ground-truthed plans, designs and construction efforts are essential. The creative integration of planning and design ideas with actions that restore or reclaim specific sites and landscapes to **functioning ecological systems** can happen as landscape architects work closely with biologists, ecologists, other scientists, and local community members to understand the historic trajectory of these living, dynamic, multi-dimensional places (past, present, and future).

7. To achieve our restoration goals in urban settings we need to remember and act upon a number of critical needs and perspectives: understanding ecological processes and site context, considering possible futures for the area, and recognizing the dynamic nature of landscapes and the forces that influence them.

8. As we seek to achieve restoration success in the projects we undertake we should recognize the vital and interrelated roles of integration, understanding and communication, and application.

9. First, we should seek to meet specific project goals related to **stakeholders** in regards to aesthetics, economics, recreation, and other cultural and educational values, **ecological and bio-physical needs and requirements**, and **learning needs**.

10. Second, we should develop specific goals, objectives, and performance criteria by which we will be able to measure success, including goals related to desired ecosystem functions, conditions, and attributes.

11. Principles we need to employ in our project efforts include specifically defining what we mean when we use the term “ecological restoration” *as well as* terms such as rehabilitation, reclamation, ecological design, water-sensitive design, and low impact development. We do this by **clearly and realistically stating what we are aiming to do.**

Second, we need to **state our goals in a manner that can be evaluated by others** (particularly by ecologists and other scientists) – **with a clear explanation of the changes we expect to see in ecosystem patterns, processes, and dynamics.** Of course, our goals related to expected human interactions with the restored ecosystem also need to be specifically articulated. As examples, we should ask: what levels of physical, mental, psychological, and spiritual involvement do we expect to see? What types of leadership and participant training are needed to achieve our desired ecological and social goals? And, how can we most effectively engage people in really caring about this place, enough that they will take the time to contribute to ongoing, long-term monitoring and management? According to Geist & Galatowitsch (1999) helping people feel personally rewarded and part of an actively-contributing community helps engender attachment to place and creates the long-term commitments necessary to restore ecological systems.

12. Recognizing restoration myths is a good way to overcome the limitations of simply espousing abstract ideals and remaining in the realm of fuzzy thinking. Not adequately addressing uncertainty in relation to landscape change and system dynamics, and oversimplification of restoration approaches can each thwart our ideals for restoring ecological systems. Many people seem to think that ecological restoration can do in a matter of years what takes decades or centuries under natural conditions. A number of our underlying beliefs tacitly assume that systems will return to a “natural” state in fairly short order if they are just nudged in the right direction through adjustments to physical attributes or by regulating species composition. Expecting complete restoration on human time scales is unreasonable, even where full recovery may eventually occur. In order to address uncertainty and surprises related to complex system dynamics restoration efforts require periodic intervention and adaptive management to increase the chances for the creation of responsive and successful projects.

13. As an example of the relationship between the need to really understand a site and its larger landscape context *and* the accompanying need to set appropriate goals, I turn to a “stream restoration” project that was based on an inaccurate understanding of local and regional geomorphic and hydrologic processes. At Uvas Creek, the designer’s idealized goal of creating a gently meandering stream did not fit the flashy canyon and urban-fed watershed conditions that continuously re-shaped this braided stream corridor. The goal of creating a stable stream in an intense and dynamic corridor created a recipe for failure, although the removal of debris piles was certainly important and led to a partial albeit less recognizable type of restoration success. A real understanding of geomorphic and ecological processes (based on adequate study of the channel history, catchment level influences for the site, and analysis of flow records) was needed, rather than application of ‘cookbook’ approaches based on mimicry of form (Kondolf 1998, 50). Had the designer worked closely with a geomorphologist who understood this landscape, appropriate design goals could have been established and public embarrassment avoided.

14. Encouragingly, the Society for Ecological Restoration International and others are seeking to broaden and deepen the sharing of “restoration lessons learned” via their website (www.ser.org) and journal articles in *Ecological Restoration* and *Restoration Ecology*. These five ideas can help us along the way: collaborate; set reasonable goals; consider implementation and management as integrated aspects of restoration planning/design; establish protocols and procedures for monitoring restoration designs; and make time to evaluate, reflect upon, and share lessons learned.

15. As we seek to move beyond restoration myths let us remember the following advice: Restoration projects with decision points along the way allow for **critical assessment and possible intervention with contingency plans** if things are not proceeding appropriately. Although maximizing species diversity is thought of as vital for the creation of well-functioning and adaptable ecological systems, we need to be careful about making claims in absolutes.

16. **Goals should include multiple scientifically defensible end points of functional or structural equivalence – with invasive species playing a role where they are simply too entrenched.**

17. **Multiple end points implicitly increases resilience by increasing the adaptive capacity and response diversity of the system** and are typically far more realistic and attainable than plans and designs based on carbon copy or field of dreams approaches to ecological restoration.

18. Restoration projects should **expand goals and expectations beyond quantitative targets or ranges for ecological attributes** by considering ecological services and capital, connectivity, and variability. Modest and explicit goals (including land acquisition and conservation of selected species) may be best understood by the public, be achievable, and offer measurable planning/design metrics and outcomes.

19. Mary Palmer and other authors (2005, summary) discuss five criteria for measuring success in river restoration, and emphasize the importance of an ecological perspective to restoration efforts. First, the design of a river restoration project should be based on a specified guiding image of a more dynamic, healthy river that could feasibly exist at the site. Second, the river's ecological condition must be measurably improved. Third, the river system must be more self-sustaining so that only minimal follow-up maintenance is needed. Fourth, during the construction phase, no lasting harm should be inflicted on the ecosystem. And, fifth, both pre- and post-assessment must be completed and data made available.

According to Matt Kondolf, if we wish to successfully restore streams and rivers we better do our interdisciplinary homework – and prepare for long-term monitoring and adaptive management.

20. Typically, a primary goal of most ecological restoration projects should be to ***re-establish functional ecosystems of a designated type in a manner that allows for the maturation of these systems by natural processes*** (Clewel, et al. 2005) – after exotic weed control, planting, and possibly grading, temporary biotechnical stabilization, and irrigation. In short, ***restored ecosystems should be capable of responding to changing environmental conditions, particularly if proposed within or near urban landscapes.***

21. Once restored, a site or ecosystem ***will likely require periodic management in order to maintain “ecosystem integrity”*** in response to ongoing human impacts. Thus, as John Cairns, Jr. noted in his Spring 2006 article entitled “Restoring Damaged Aquatic Ecosystems” (53), although complete restoration may be our aspiration, ***partial restoration is typically a more realistic goal.*** Active, ongoing monitoring and management are attributes of what I now view as the “partial and early stages of restoration” initiated at Furstenberg Park in Ann Arbor, Michigan in the early 1990s.

22. There are different types of appropriate goals related to our work as planners and designers. However, **when we are explicit about our goals, objectives, and expected levels of performance we can better learn from our successes, mistakes, and the unexpected surprises that dynamic, living systems bring.** We will also have a better yardstick to measure or assess what we've done.

23. **To achieve success, planners and designers must typically work with experts in soils, hydrology, biology, plant science, wildlife ecology, history, sociology, political science, engineering, and other pertinent disciplines.** Of course, those familiar with *or* having prior experience in ecological restoration are particularly valuable partners. This was the case as I coordinated work related to the Tom's Creek Riparian Restoration project in Blacksburg, Virginia several years ago.

24. **To achieve success, interdisciplinary ecological restoration project teams must understand essential physical and ecological processes, the drivers of environmental change in a region, and the site-specific dynamics in the location where restoration is being proposed. Additionally, economic and socio-political factors must be accounted for.**

In a 1999 *Conservation Biology* article, Cathy Geist and Susan Galatowitsch (pg. 974) argue that ecological “restoration efforts that do not address the full range of human needs and benefits will not likely receive adequate support to be sustained.” And, that “effective ways to develop commitment to recovering ecosystems at a project's inception are crucial for ensuring long-term restoration success.”

25. Pre- and post-project monitoring, as highlighted by this discussion of the re-generation of Central Park's Woodlands, is another very important part of the ecological restoration picture. **Results from**

monitoring help avoid large-scale missteps and focus attention on solving problems instead of treating symptoms. In addition to documenting monitoring projects, the woodlands manager at Central Park records all management interventions, including plantings and restoration strategies. Monitoring and good recordkeeping are critical for successful long-term ecological restoration. **Current painstaking work means little unless future managers can verify the results of a project.**

26. In 2005 Geomorphologist Matt Kondolf and I interviewed 17 experts in ecological restoration and found that a number of important themes emerged, including: the need for effective collaboration and communication between planners, designers, relevant agency personnel, other disciplines, clients, stakeholders, and the public; basing project goals upon a realistic appraisal of what is feasible given current and expected conditions in the area and region; the need to be explicit about desired future conditions and to establish measurable performance standards related to project intentions, goals, and objectives; recognizing that invasive species monitoring and management will likely be part of each ecological restoration effort; and the need to build the institutional infrastructure necessary to manage a restored site, ecosystem, or landscape over the long-term.

Per these professionals, indicators of “successful ecological restoration” include two primary outcomes: *the project’s effectiveness in meeting stated project goals, objectives, and performance criteria, and the ability to create a system that functions in accord with desired ecosystem attributes and conditions.*

27. How do we determine “desired ecosystem attributes and conditions”? Reference ecosystems should be created using ecological descriptions and species lists of the systems we are seeking to emulate. Additionally, we should draw upon other available and relevant sources of information.

28. Other indicators of vital concern in defining the “success” of ecological restoration projects include: Employing aesthetics to create pleasing human experiences; creating projects that are acceptable to clients, stakeholders, and the public; initiating sustainability of the restored site, ecosystem or landscape by promoting the system’s capacity to adapt to its particular setting – ecological and socio-political; creating systems that are productive/regenerative, complex/bio-diverse, and dynamic; properly designing, implementing, managing, and monitoring projects by using appropriate references and specifying appropriate materials; employing appropriate tools and techniques, and ensuring that project sites are enjoyed and cared for over the long term; optimizing multiple benefits (namely recreation opportunities, aesthetic, spiritual, and educational experiences, and ecosystem services); using resources (ecological, cultural, and financial) efficiently and wisely; bringing participants together in a meaningful learning process; and, helping leverage funds for other conservation and restoration work.

29. Let me very briefly highlight a few projects that exemplify these indicators of success. Andropogon’s plan for Avalon Park and Preserve is a wonderful example of creating pleasing human experiences.

30. When I interviewed Carol Franklin in 2005 she emphasized that **successful restoration projects must be adapted to the unique attributes of specific geographies and places** and that planners and designers should help open our eyes to a place by revealing its patterns and functions. She stated that designers can **reveal transitions between plant communities and build a series of experiences for visitors by considering micro-climates, micro-responses, and micro-places.** Her comments about **designing with biological soup and orchestrating complexity back into landscapes** are keystones if we are to restore or otherwise create well functioning ecological systems in urban areas!

31. Carol noted primary obstacles – human, ecological and bio-physical.

32. And, she noted ways to overcome these obstacles – focusing on first addressing the causes of degradation, then reintroducing appropriate patterns and processes, helping clients and visitors understand the importance of vigilant monitoring and management, and rallying and organizing volunteers.

33. Taken in concert, such actions can build client and public support for ecological restoration.

34. And, they can increase an ecosystems’ capacity to sustain itself over time.

35. Of course, the particulars of design, implementation, and management are critical – and SERI offers a detailed set of guidelines on its website that are very valuable reference points for landscape architects interested in ecological restoration.

36. Although primarily focused on ecological concerns, the work of Vigil-Agrimis of Portland, Oregon (and other practitioners in the west) show how multiple benefits can be derived from ecological restoration and natural resource based planning and design.

37. Among the many mid-western firms involved in ecological restoration, Conservation Design Forum present a number of excellent project examples of wise and efficient resource use achieved by integrating ecological design and ecological restoration. They have shown clients the cost-savings associated with native landscapes and prepared “green templates” to highlight ways to integrate ecological restoration into community development plans and detailed site designs.

38. CDF – like Andropogon and Biohabitats for Nine Mile Run – successfully bring different disciplines together to build understandings about natural and cultural landscape systems.

39. CDF’s work has leveraged funds for conservation and restoration work across the US.

40. Finally, ecological restoration – whether envisioned at the watershed or small-site scale – is fun, exciting, challenging, and renewing work!

41. In closing, I go back to six “big ideas” discussed in a 2002 paper on “Principles for Ecological Restoration”. Landscape Architects can play a significant role in each of these arenas, but generally have expertise related to ideas 2 and 3 – involving local community members in the planning/design process, developing appropriate vehicles for public education and outreach, and creating special places. To do these tasks well, we must work and communicate effectively with other disciplines and professionals, and be willing to learn from both our successes and our mistakes.

42. We must also play an active role in preventing the spread of invasive species, which are frequently one of the most serious challenges related to successful ecological restoration. Because invasive species are generally symptoms of underlying problems, we must first determine what these problems are. Then and only then can we begin to consider the most appropriate ways to address this daunting issue.

43. Broadly speaking, three major steps will help us as we seek to restore and reclaim ecological processes in urban settings.

44. Allegra will discuss how the following steps guided work related to the restoration and reclamation of Nine Mile Run. What I want you to remember is that a lot of upfront work is required to insure that detailed designs and construction efforts are really useful from both ecological and cultural perspectives, and monitoring essential if we are to adapt management efforts over time.

45. Please go to the ASLA website and take a look at the publication: “Successful Ecological Restoration: A Framework for Planning/Design Professionals”.

46. This list of references offers a glimpse at the literature. Reading articles in Ecological Restoration, Restoration Ecology, Conservation Biology, and Ecology is very important, and there are a number of essential texts available through Island Press, CRC Press, and other publishers.

47. This slide reiterates some of the reasons all landscape architects should care about ecological restoration. Allegra and Andi’s presentations build upon the ideas I just scratched the surface of.

48. Allegra Bukojemsky discusses nine steps related to Restoration Design – the first being to establish a team that can adequately address the complexities of the site, landscape, and project requirement (as with the Nine Mile Run project in Pittsburgh, PA – <http://www.ninemilerun.org/>). Andrea Cooper discusses

the Kresge Foundation Headquarters project in Troy, Michigan – an example of restoring hydrologic processes by creating and implementing integrated construction and rain-water management plans (<http://www.kresge.org/about-us/our-green-headquarters/site-landscape-and-water-use>).

49. Selected references (see below).

50. As a Co-Chair for the Reclamation & Restoration Professional Practice Network I hope that we will continue this conversation and deepen our collective understanding of important principles and opportunities in the months and years to come. Thank you! LRS Sep. 2009 / updated in Nov. 2012

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