

Stormwater as amenity: The application of artful rainwater design

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ABSTRACT

The concept of "artful rainwater design" is based on the premise that new stormwater management techniques focusing on non-point source pollution, water balance, and small storm hydrology can also be used to create new site amenities. These designs result in greater user satisfaction and perceived value—i.e. design that not only addresses stormwater management in better ways, but also transforms these management systems into stormwater-based amenities. These new stormwater requirements present significant amenity design opportunities that deserve to be recognized and exploited. This paper presents specific design techniques grounded in case study of 20 selected projects nationwide, to transform stormwater management into experientially rich artful rainwater design.

KEYWORDS

Amenity, Design, Landscape, Stormwater, Techniques, Urban Drainage

INTRODUCTION

More and more national and municipal regulations demand that stormwater runoff quantity and quality be addressed in site design to ensure a beneficial impact on natural systems. Additionally, some forward-thinking and innovative municipal officials and designers recognize that on-site stormwater treatment systems can be designed in such a way as to create site amenities; that is, the rainwater itself becomes a feature that can engage, educate, and even entertain visitors. The authors use the term "Artful rainwater design" (ARD) to describe this approach to stormwater treatment. Addressing the amenity aspect provides a useful strategy for stormwater management to "start at the source," as so many experts have advised (Richman, 1999; Ferguson, 1991; Liptan, 2006; Schueler et al., 1992; Coffman, 2000; France, 2002). Moreover, as thousands of municipal governments find themselves required by new regulations to create, develop, adapt, and implement stormwater management programs to reduce non-point source pollution, the need to rethink current paradigms for stormwater management design is urgent (USEPA, 2005). These site-wide stormwater management systems suggest—in fact, nearly demand—that designers find ways to integrate amenity and hydrological function in a holistic site design strategy. How, then, might designers employ stormwater management to create amenity value? A small but growing number of designers worldwide are engaged in ARD, creating places recognized as beautiful, meaningful, and educational—from lush and colorful rain gardens to plazas that artfully expose how rainwater flows across and infiltrates into land. This article, therefore, reports on a systematic analysis of innovative ARD projects in the USA and in doing so identifies a range of strategies used by

their designers to make experience and awareness of stormwater management into a site feature.

BACKGROUND

Beautifully designed detention ponds have long been recognized by developers and communities for their visual, recreational, and hence monetary value (Bookout et al., 1994; Ferguson and Debo, 1994; Tunney, 2000). A few authors have recognized that new stormwater-treatment methods including bio-retention, vegetated swales, and rain-garden systems have the potential to add various and distinct amenity values to a project (Göransson, 1998; Wenk, 1998; Niemczynowicz, 1999; Thompson and Sorvig, 2000; Dreiseitl, Grau, and Ludwig, 2001; Dreiseitl and Grau, 2005). While specific techniques for creating, restoring, and protecting aquatic habitat have become common in stormwater management manuals (Coffman, 2000; Hager, 2001; Urbonas et al., 1989), no current manuals for stormwater design specifically present best management practices as a means to enhance the aesthetic, experiential attributes in urban landscapes. Roesner and Brashear (1999) in their study of existing stormwater management literature reported that design guidance that addresses perceived amenity value as a design criteria is completely lacking.

Three exceptions stand out: Peter Stahre's research showing how efforts in Malmö, Sweden, have added "positive values"; literature from the United Kingdom based on SUDS (Sustainable Urban Drainage Systems) that demands amenity attributes in stormwater management design; and the work of Nigel Dunnett and Andy Clayden in their book *Rain Gardens* (2007). Peter Stahre has documented the array of "positive values of open storm drainage." He classifies the values as aesthetic, biological, cultural, ecological, economic, technical, educational, environmental, historical, recreational, and public relations—the last value being a result of the others. The United Kingdom has introduced policies that include amenity factors in stormwater management as a key part of the "Urban Drainage Triangle" Indeed, regulations in the United Kingdom now require amenity to be evaluated along with quality and quantity for all new drainage plans. Originally the amenity designation focused on creating wildlife habitat and open space; however, the Sustainable Urban Drainage Systems regulations revised the definition to include "community value, resource management (e.g., rainwater use), multi-use of space, education, water features, habitat creation, biodiversity action plans" (National SUDS Working Group, 2003). While Stahre and SUDS present the amenity potential inherent in stormwater management, neither articulates ways that designers can actually achieve it. Likely the most inspiring examples of artful rainwater design documentation are provided in Nigel Dunnett's and Andy Clayden's book *Rain Gardens* (Dunnett and Clayden, 2007). Their research describes and illustrates examples of projects from around the world that capture, divert, and reuse rainwater in beautiful and unconventional ways. Using photographs and drawings, the book explains how different elements of the stormwater treatment chain can be integrated into typical residential and public or commercial landscapes.

All three of these publications offer new ideas for designers to consider when creating new stormwater management systems; but they do not address specific design techniques or intended outcomes. This paper strives to address that gap, presenting the results of a case study of exemplary ARD projects in order to identify and clarify some specific design techniques that can add amenity value to a project.

METHODS

This research is a qualitative analysis of select innovative projects in the United States that take an ARD approach. The project documents design techniques found in the case studies that add amenity value. To determine the study cases, a list of projects from around the United States was developed by reviewing the past ten years of design awards presented by the American Society of Landscape Architects (ASLA, 1997–2007) and the American Institute of Architects (AIA/COTE, 1997–2007) for projects that clearly included stormwater management systems designed to create amenity focused on stormwater management. The designers of these projects along with leading educators, publishers, and experts in stormwater issues were then asked to suggest other projects that best represented exemplary ARD until no additional projects were being suggested. To narrow the list, we then identified those projects most frequently suggested for inclusion. This process resulted in a list of twenty-one artful rainwater designs that represent a diversity of settings, project types, and runoff treatment methods:

10th@Hoyt, Portland, Oregon by Stephen Koch Landscape Architect
110 Cascade, Seattle, Washington by Seattle Public Utilities
Automated Trading Desk, Mount Pleasant, South Carolina by Nelson Byrd Woltz
Buckman Heights, Portland, Oregon by Murase Associates
Cedar River Environmental Center, Cedar Falls, Washington by Jones & Jones, Ltd
Stephen Epler Hall, Portland, Oregon by Mithūn Partners
Glencoe School, Portland, Oregon by Portland Bureau of Environmental Services
Growing Vine, Seattle, Washington by Carlson Architects
High Point Development, West Seattle, Washington by Mithūn Partners
Maplewood Rainwater Gardens, Maplewood, Michigan
Melrose Edge Streets, Seattle, Washington by Seattle Public Utilities
Seven Corners Market, Portland, Oregon by Ivan McLean
New Seasons Market, Portland, Oregon by Portland Bureau of Environmental Services
Oregon Convention Center, Portland, Oregon by Meyer/Reed
Oregon Museum of Science and Industry, Portland, Oregon by Murase Associates
Outwash Basin at Stata Center MIT, Cambridge, Massachusetts by Olain Partners
Pierce County Environmental Services, Chambers Creek, Washington by Miller|Hull
Siskiyou Street, Portland, Oregon by Portland Bureau of Environmental Services
SW 12th Avenue, Portland, Oregon by Portland Bureau of Environmental Services
Water Pollution Control Laboratory, Portland, Oregon by Murase Associates
Waterworks Garden, Seattle, Washington by Lorna Jordan with Jones & Jones

This selection process is admittedly biased by the publicity regarding and the relative popularity of particular projects, and it has likely resulted in many excellent projects being overlooked. It is not surprising that most of the suggested artful rainwater design projects are in the U.S. Pacific Northwest as numerous factors have made the region a mecca for ARD proponents. A limitation is that all the projects reviewed are located in the United States. While there is noteworthy work of artful rainwater design abroad, temporal and financial limitations restricted the project study sites in this research to the U.S. The sheer amount of rainfall there virtually requires that citizens develop strategies to “live with rain”—ranging from establishing very strict stormwater regulations to developing innovative ways to transform rainwater from a nuisance to an asset. Though this is a limitation, the authors conclude that many of the projects’ attributes will prove adaptable for use in other regions.

Information was gathered using websites, published literature, telephone and in-person conversations with designers, and site visits to talk with local municipal officials. The

information was documented using voice recordings, journal notes, drawings, and on-site sketches and photography. It was then organized and analyzed to look for specific design techniques that created amenities specific to stormwater management design. The list was then reduced by combining and categorizing the design techniques. After constructing the resulting list, the information gathered for each project was reexamined to determine how or whether each observed design technique resulted in an amenity focused specifically on the rainwater. It is important for the reader to realize that the design techniques presented here are not all characteristic of every case study project, nor do they represent all possible design strategies for creating an amenity. Rather, this paper presents a range of noteworthy techniques, each found in one or more of the study projects.

RESULTS AND DISCUSSION

Qualitative analysis of rainwater-focused design techniques found in the case studies revealed the following categories of amenity types: education, recreation, safety, public relations, and, aesthetic richness. The remainder of this paper documents recurring design strategies found in the case studies grouped by amenity category and presents them in Tables 1–5.

Education. In the context of ARD, education is understood as creating favorable conditions for learning about rainwater and/or related issues. Examples include presenting opportunities to learn about BMP systems, the site’s historical water condition, riparian plant associations, etc. These ideas may be gleaned directly from the design as specific “lessons learned” or, less didactically, as enriched experience of place. ARD may also entail providing programmed educational opportunities through tours, games, etc. Recurring design techniques to enhance education found in the case study projects are presented in Table 1.

Design Techniques to Enhance Education
Make the stormwater treatment system visible and legible
Create a narrative of stormwater and the hydrologic cycle
Make stormwater-related artifacts integral to design
Create symbols of past watershed conditions
Make the stormwater treatment system playful, intriguing or puzzling
Include a variety of stormwater treatment systems in design
Create systems that visibly collect and store trash and pollution
Provide a variety of visible riparian plant types and communities
Provide a variety of interesting wildlife habitat by using plants that provide wildlife food, providing different water depths, and creating shelter for wildlife such as bird and bat houses
Provide simple signage or exhibits with brief text and clear graphics
Design the stormwater treatment system to invite educational games or activities
Create visual interest by varying the appearance of different parts of the stormwater treatment system
Create a variety of spaces for groups to explore, gather or sit near the stormwater treatment system
Create treatment systems that are touchable

Table 1 – Design Techniques Used to Enhance Education.

The case studies contain some particularly noteworthy examples of design techniques aimed at providing education about stormwater management. An excellent example of a visible and legible stormwater treatment system coupled with a particularly effective signage system is

that of the Pierce County Environmental Services Facility. Two other projects present intriguing landscape narratives Seven Corners Market and Oregon Convention Center.

Recreation. As a design category, recreation means providing conditions that are favorable for interacting with the stormwater treatment system in ways that are relaxing, amusing, and/or refreshing. In contrast to the education category, the focus here is on playful interaction with enjoyment as the intent. The distinction between “education” and “recreation” is admittedly nuanced, with considerable overlap; but we present them as distinct categories to help designers who wish to emphasize one over the other. Recurring design techniques to enhance recreation from the case study projects are presented in Table 2.

Design Techniques to Enhance Recreation
Create overlooks with views of the stormwater system
Create destination points related to stormwater treatment systems
Provide seating using walls, benches and /or tables and chairs with views of the stormwater system
Provide paths in strategic locations that ensure encounters with the stormwater treatment system
Connect on-site trails to off-site trail systems and destinations that ensure encounters with the stormwater treatment system
Provide clear points of entry into the stormwater system that are visually inviting, mysterious and easily accessible
Provide a variety of small and large places to play in or explore the stormwater treatment system
Make areas that invite climbing and physical exploration that balance perceptions of safety with adventure
Create systems that can be safely modified by the user such as small movable river rocks and weirs

Table 2 – Design Techniques Used to Enhance Recreation.

Some design techniques to address recreation stand out in the case studies: one project—the Stepher Epler Hall encourages relaxed viewing through effective and strategically placed seating. Two others provide views of the stormwater treatment for those strolling or biking on well-placed paths. These are the Water Pollution Control Laboratory and the Waterworks Garden. Another project—the Oregon Convention Center allows visitors to enter and play in the stormwater system through inviting access points

Safety. Danger associated with stormwater cannot be overlooked. In the litigious context of the U.S., the goal of addressing safety concerns effectively is central to making ARD possible. Standing and/or running water often forms a central part of the experience; but how do we prevent it from being a drowning hazard? And if we prevent it from being so, can we prevent it from being perceived as unsafe? Recurring design techniques to enhance safety from the case study projects are presented in Table 3.

Design Techniques to Enhance Safety
Provide walls, screens or railings that allow views but prevent access to stormwater Provide upland, riparian or wetland plant massing that allows views but prevents access to stormwater Use bridges, boardwalks or platforms to allow users to view stormwater safely from above Use water-themed aboveground water storage facilities such as rain barrels, water towers or cisterns Disperse stormwater into shallow storage facilities using flow splitters or tiered basins Limit stormwater depth by creating horizontal space for water to spread out or by adding large river stone to basins where people could have access Do not collect or move stormwater in large centralized conveyance facilities Create “water brakes” to slow stormwater by abruptly changing flow direction or by creating small waterfalls that dissipate energy

Table 3 – Design Techniques Used to Enhance Safety.

Within the case study projects, three examples of design techniques addressing safety stand out: Waterworks Garden limits physical access to water in a range of notable ways, 110 Cascades effectively limits water velocity; while Glencoe Elementary School limits water depth using an effective approach that we saw frequently in the cases

Public Relations. As a category, public relations means that either a feature or the overall design character makes a semiotic statement about the values of those who created and/or own the site. Any such design message is inherently a public relations gesture, whether overt or implicit. Once again the reader may find considerable overlap between this category and others in this paper; but we present it as a distinct category so that readers may understand different public relations message types and design techniques used to achieve them. Recurring design techniques to enhance public relations from the case study projects are presented in Table 4.

Design Techniques to Enhance Public Relations
Locate stormwater treatment systems near entries, courtyards or windows for high visibility Use signage explaining stormwater treatment strategies to make the stormwater trail easy to find and follow Create opportunities for programming educational activities Use commonly available materials Create small scale replicable interventions Utilize common settings such as sidewalks and parking lots Utilize new forms and materials Utilize traditional stormwater treatment methods in new ways Be opportunistic by using small, leftover and unexpected spaces Achieve additional functions such as traffic calming and beautification Make the stormwater trail mysteriously disappear and reappear Make the stormwater or water treatment system touchable Make the stormwater audible: plunge pools, downspouts Make the stormwater move in different ways: tumble, run, splash Create elegantly simple composition Use refined/expensive materials Use refined/expensive construction methods Use restraint in diversity of materials and forms Design for manicured look: clipped, trimmed, clean Use unusual water presentation forms and themes

Table 4 – Design Techniques Used to Enhance Public Relations.

Within the cases, two projects present particularly effective examples of design techniques addressing public relations. One project, an upscale urban condominium courtyard 10th@Hoyt employs compositional elegance and restraint along with careful choice of materials to convey the public relations message “we are sophisticated.” High Point a mixed-income neo-traditional community, conveys the messages “we care” and “we are progressive” through a range of techniques site-wide.

Aesthetic Richness. Aesthetic richness means that the design is composed to create an experience of beauty and pleasure focused on stormwater. One could argue that aesthetic richness is embedded in all the categories presented here; but sometimes richness of experience is created simply through the arresting combinations of forms, colors, sounds, etc ,of the composition itself. The authors hold that the strategies that encourage attention to stormwater strictly through compositional means are worth calling out. In the broadest terms, the composition may address visual, auditory, tactile, and/or olfactory experience; but because our case studies lack examples of olfactory richness, our findings are limited to the visual, auditory, and tactile. Recurring design techniques to enhance aesthetic richness from the case study projects are presented in Table 5.

Design Techniques to Enhance Aesthetic Richness
Create water collection basins as a features / focal points
Create visual emphasis on water direction change using scuppers, basins, cisterns, splash-blocks
Use downspouts, runnels, flumes, bioswales, etc. to draw attention to the line of the stormwater trail, enhancing legibility as well as interest and curiosity
Stack horizontal and vertical planes such as pools and falls to exploit the visual interest of stormwater flowing over surfaces, plunging down planes, through weirs or over edges
Create visual interest or themes with basins that hold plants and water: sunken, raised, orthogonal, curved, organic, geometric, small, large
Contrast natural elements with manmade elements, such as clipped lawn, steel or concrete.
Juxtapose river rock and riparian grasses for compositional contrast
Dramatize an implied axis by aligning treatment systems, basins and runnels connected by the water trail.
Create unified design themes by repeating system of bioswales, basins, weirs, ponds, raingardens, etc
Create a variety of sounds and volumes by allowing stormwater to fall from various heights onto different materials such as stone or steel
Create changes in sound pitch by allowing stormwater to fall on different forms such as flat block, metal tubes, drums and ponds
Create different sound rhythms by varying the amount and rate of stormwater falling and flowing through the treatment system
Use a variety of water-related plants within visitors’ reach, such as rushes and grasses
Use various water-related hardscape such as river pebbles and driftwood to provide interesting surfaces
Allow people to touch stormwater in different forms such as flowing, falling, splashing, standing, sheeting, or damp surfaces where water can soak in or evaporate

Table 5 – Design Techniques Used to Enhance Public Relations Aesthetic Richness.

An array of projects in the case study display notable examples of design techniques that create aesthetic richness focused on stormwater treatment. One project presents a striking example of a visually interesting line in the water trail (Cedar River Watershed Education Center; 12th Avenue establishes a clear, appealing visual rhythm through repetition of stormwater-focused elements; and numerous projects display striking visual contrasts between rocks and plants (two particularly eye-catching examples are found at 10th@Hoyt and Stepher Epler Hall). 10th@Hoyt uses a variety of techniques to create auditory interest. And two

projects create tactile interest through accessible, touchable water (“Cistern Steps” at Growing Vine Street and Automated Trading Desk.

CONCLUSIONS

Rainwater management is a longstanding concern for architects, landscape architects, and engineers, one that will only accelerate in significance as land-development rates continue to rise and once-porous acreage is converted to impervious surface. Dealing with runoff strategically and effectively is of paramount importance to property owners and developers who are faced with the challenges of managing rainwater on site. Stormwater design needs to be transformed from a reluctantly addressed, regulated requirement into a clear value-added component of good site design. To help accomplish this, designers can seek out, examine, and learn from a collection of highly successful rainwater design examples that:

- provide inspiration and vision to make rainwater a focal point of beautiful, interesting places to live and visit; and
- demonstrate rainwater design ideas that add tangible value to properties and encourage development investment for value-added.

Clearly opportunities exist for artful rainwater design to contribute to the quality of urban landscapes. However, additional design information and research are needed to address such questions as: What facets of ARD do the public value and what attributes are considered most desirable? What are the goals and objectives of stormwater management conceived as site amenity and what design techniques can designers use in their own artful rainwater designs? What are the special maintenance and management needs of artful rainwater design? How can current green-building rating systems be adapted to recognize the value of artful rainwater design? What are the lifecycle costs of ARD and do they satisfy the interests of bottom-line-oriented developers? Where are the best retrofit opportunities? And how can we make sure that artful rainwater design ideas are considered early in the design phases of new projects so that they are integral to the site design process?

NOTE: Photographs and case study information are available at:
www.artfulrainwaterdesign.net

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