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Critique #2

Urban storm water runoff continues to be increasingly recognized as a serious problem in U.S. cities. As urban areas are developed, soils become compacted which reduces the soil's capacity for absorption. As a result, the excess runoff overloads water treatment facilities and pollutes waterways with a variety of contaminants including metals, pesticides, and bacteria (Levitan, 2013). Another byproduct of compacted soils is the reduced likelihood of survival for urban trees; lack of hydration, aeration, and room for roots to explore create poor conditions for growth. To combat this problem, city planners are finding more innovative ways to manage storm water and with integrated green and gray infrastructure design. This can be in the form of enhanced boulevard design (egenartproduktion, 2011), green parking lots (SDCI, 2005), or alternative soil types for tree plantings (Bartens et al, 2010), among many other best practices. By integrating one or more of these methods, urban storm water runoff can be better managed and, in turn, promote the health of urban nature.

Examples of green infrastructure design can be found throughout Stockholm, Sweden, the first city to be awarded the European Green Capital title (European Commission, n.d.). For instance, the boulevards lining Stockholm's bustling city streets are designed to promote substrate hydration and aeration, a system which has resulted in healthy, thriving trees. In the video "Structural Soils, Construction Technology.m4v", viewers can observe the construction of one of these boulevards, layer by layer. The video begins by outlining the issue of compacted soil and its role in poor growing conditions for street trees. However, this is quickly followed by the description of Stockholm's solution to promoting a healthy urban canopy: structural soil. To achieve this, layers of crushed rock and soil are alternated in order to provide a load-bearing surface for above-ground activities while providing a healthy growing environment for trees. Not only does this promote positive tree growth, it also increases the capacity for storm water collection. Each stage of the process is illustrated in detail, from layering the material to placing the drains and tree bunkers. The last thirty seconds of the video shows the boulevard six years later; the trees are lush and healthy. Although the construction process was helpful, the video may have been more impactful if empirical and/or qualitative data was included. In other words, *how* has this design impacted the community? What kind of measurable benefits are community members experiencing because of the improved storm water management? What other kinds of benefits (psychological, social, etc.) are community members experiencing? Concluding the video with this type of data would be helpful in promoting this design for other urban development projects around the world.

Another city that is promoting green infrastructure is Seattle, Washington where the Department of Construction and Inspections (SDCI) is encouraging the use of green parking lots over more conventionally-designed lots. The city's website provides a list of factsheets about a variety of tips concerning city permitting, land use codes, and compliance policies; green parking lots fall under tip number 515 on the list. This literature effectively and concisely communicates pertinent information regarding green parking lot design. Specifically, there are three pieces of information which would undoubtedly prove to be the most useful for project managers: 1) definitions of the two key concepts of green parking lot design (permeated pavement and natural drainage systems), 2) the benefits, limitations/considerations, and relative code requirements met by green parking lot designs, and 3) a comparison between four different scenarios in order to illustrate important differences between conventional and green design. Outside of the obvious environmental benefits, SDCI goes on to list some potential business-specific benefits including the cost-savings achievable with green design, enhanced customer experience, and the feasibility of converting existing landscapes on the property. Sample designs, cost comparisons, and links to additional resources further contribute to a comprehensive document which makes a strong case for choosing green design over the traditional parking lot design. However, it is important to note that project managers may want to see real-world examples of Seattle-based businesses who are successfully using the green parking lot design. By seeing the true benefits of green parking lots, future project managers might feel more motivated to utilize these practices in their designs.

An integral piece of mitigating excess runoff is the survival and sustained health of street trees. This can depend on a number of factors; one of utmost importance is the structure of the soil in which the trees are planted. In Charlotte, North Carolina, researchers made important conclusions about soil structure and its impact on tree trunk stability. Due to a lack of case studies on the topic, the authors recognized a need to document empirical evidence regarding tree stability and soil structure. The study aimed to explore three variables of trunk stability: 1) tree species (flowering cherry versus Chinese elm), 2) engineered versus conventional substrate conditions, and 3) drained versus near-saturated soils. To test stability, researchers used a pulley system to deflect each trunk two degrees while simultaneously measuring the amount of force needed to create such resistance. As a result of these tests, the researchers found that the saturation of the soil did not impact tree stability. They also found that substrate type did not impact Chinese elm stability whereas stability of the flowering cherry greatly increased with a skeletal soil mix (80% gravel, 20% loam soil). In fact, stability increased approximately two times while roots lengths were approximately 40 to 60 times longer in a skeletal soil type versus other substrate types. Ultimately, the authors conclude that skeletal soil types are the most appropriate substrate type for urban trees, especially those that are sensitive and/or prone to uprooting. This soil type promotes aeration, hydration, and root exploration. The literature includes information which may provide valuable lessons to future researchers on this topic. For example, the authors discussed adjustments made to the study framework, potential gaps in their findings, and, as a result, opportunities for future research. Considering the wide range of useful data in this case study, the literature will undoubtedly serve as a helpful resource for urban landscape developers.

Green infrastructure designs can greatly enhance storm water management systems in urban environments. This can be accomplished with a wide variety of techniques such as green parking lots and engineered soil structures which promote healthy tree growth. As cities continue develop, more innovative solutions will be necessary for managing excess runoff. Urban landscape developers should review literature on this topic in an effort to assess best practices and lessons learned by other developers.

References

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