Kadrie, Anna
Critique 2

Grey and Green Infrastructure: Is integration possible?

In the modern urban landscape trees and greenspaces are desirable from both an ecological and architectural standpoint. The barrier is that integrating the needs of both stable pavement and foliage can be complex and is not always compatible. In order for pavement to be stable the soil needs to be compacted to create support for the high volumes of anticipated traffic. This reduces the soils capacity for aeration and hydration, as well as for root penetration and exploration. The ability to successfully combine urban greenspaces and grey infrastructure is being evaluated and green solutions are going to be essential to replace failing infrastructure as well as guide new infrastructure.

Engineered soils have been developed to increase soil volume for trees in confined spaces, and has been shown to improve growing conditions. Skeletal soil and structural soils consist of a variety of mixtures of stone and high texture mineral soils to create a high-porosity matrix. A paper written by Bartens, et al. (2010) evaluates tree stability in engineered soils by comparing two tree species in contrasting soil quality tolerances in a suspended pavement design and in a conventionally prepared soil pit. This study makes steps to fill a void in research addressing tree stability in structural soils. The findings suggest that there are species specific responses to how the trees will root in structural soil versus a conventionally prepared soil pit. The more sensitive tree species in this study was found to be more prone to uprooting due to poor root development in soil pits, and that skeletal soil mixes could improve root anchorage. While this might enhance tolerance to severe weather events in urban forests, the study admitted it's limitations in evaluation procedures. The trees that were evaluated were smaller diameter trees, and a pulling procedure was used to test stability. Larger diameter trees that are exposed to a large wind force might behave differently. This study was effective in exploring a new concept in the evaluation of skeletal and structural soils that can guide future research. It created questions for research that can help to increase a tree's stability, which will continue to be imperative as climate events might become unpredictable and increase in intensity.

Kadrie, Anna
Critique 2

Skeletal and structural soil could be used in a variety of urban environments. An informational youtube video titled *Structural Soils, construction technology* from Stockholms Stad in association with NCC gives a great overview of how structural soil would be built in an urban environment. Like the previously mentioned study, the video's text explains the impacts that compacted ground can have on the health of trees standing in paved areas. Structural soil can increase the flow of oxygen and hydration In order to increase survivability of urban trees. The development project was done in Stockholm and the end result shows a bike and pedestrian pathway with drains for air ventilation and stormwater. Another strip had trees placed on it that showed the positive growing conditions that were present. The video was a great visual to use to become informed on the concept of structural soil. The construction process highlighted the ways that structural soil works, and how it would look after completion in the correct setting.

Another urban area where green solutions can be used to address stormwater runoff and green infrastructure is in parking lots. A fact sheet titled *Green Parking Lots* was created by the Seattle government to explain what green parking lots are and how they can be beneficial. They use a combination of natural landscape and permeable paving to reduce runoff and help meet water quality, landscape, and flow control requirements for lots. Not only do they create a "green island" for clients and customers, but can reduce capital costs and overall facility maintenance costs. The fact sheet evaluated three different options for green parking lots in an existing 15 acre commercial parking lot against an existing conventional parking lot design. It was found that the green parking lot solutions were feasible and cost-effective, as they were either comparable or less expensive than the conventional parking lot design option. This calculation also included maintenance costs. While there was a slight increase in landscape spending there was a substantial decrease in water quality spending due to the filtration systems that were put in place. This document was effective in explaining the overall mechanics of green parking lots and how they can work within a city's codes and requirements,

while also giving the reader a structured plan of action. This would be a great fact sheet for a large scale installation, and therefore is geared towards government or large corporation/company spending. It leaves me wondering if this is possible for a smaller private company or smaller area to accomplish.

In order to continue to invest in urban greenspaces there must be research available to help guide the integration of grey infrastructure. Affordability and reliability is increasing as more products and research comes out. It is important for large infrastructure to change, but also for information and guidance for smaller private property owners to consider in their construction as well. While the cost of green parking lots seems to be promising, it would be great to gather further research on how structural pavement can be widely integrated into downtown and other urban environments.

References

Bartens, J., Wiseman, E., Smiley, T. (2010) Stability of landscape trees in engineered and conventional urban soil mixes*, Urban forestry and greening, 9, 333-338.*

Stockholms Stad in association with NCC. (2011, May). *Structural Soils, construction technology* [Video]. YouTube. https://www.youtube.com/watch?v=S7kbSnnJwDI

Seattle Department of Construction and Inspections. (2005, September). SDCI Tip #515 Seattle Permits - Green Parking Lots. Seattle government website. https://www.seattle.gov/DPD/Publications/CAM/CAM515.pdf