Urban Water

SEEKING CULTURAL, ECONOMIC, AND ENVIRONMENTAL CONNECTIONS

Candice D’Arcangeli. Spring 2012. Thesis Mid-Term
How can our design with urban stormwater incorporate the three pillars of sustainability; economy, environment and society?

These three components or “pillars” are the foundation to a sustainable environment and need to be kept in equilibrium with each other. “A change in one component affects the other two... the balance between all three is the fundamental premise of sustainability.” (Novotney, Brown & Ahern, 2010) For example, a pull towards economics can lead to pollution, and impairment to the environment. These components will act as guidelines throughout my design process to create a unique, stormwater management solution.

**Figure 1.** The trinity of factors and impacts determining sustainability. Adapted from Brundtland (1987), Novotny (2003) and Allan (2005).
Stevens Square neighborhood is a historic neighborhood to the city of Minneapolis being one of the first neighborhoods to be developed. Because of its close proximity to the downtown area of Minneapolis, Stevens Square became one of the most dense neighborhoods in Minneapolis and attracts people between the ages of 25-35. This neighborhood is in the process of trying to revitalize the neighborhood, one example being the community organization giving grants to home owners that want to renovate their buildings.
Site Topography

- Green Space = 905,702 sq ft
- Building Rooftops = 1,616,478 sq ft
- Parking Lots = 762,030 sq ft
- Boulevards/Sidewalks = 772,990 sq ft
- Streets = 772,990 sq ft

Total Area Sq Ft = 4,778,218
Total Impervious Area Sq Ft = 3,872,516

Source: http://climate.umn.edu/doc/twin_cities/twin_cities.htm
Stormwater Analysis

**Total Area:**
- Subcatchment Area 1 - 482,728 sq ft
- Subcatchment Area 2 - 646,578 sq ft
- Subcatchment Area 3 - 890,010 sq ft
- Subcatchment Area 4 - 2,844,502 sq ft

**Green Space:**
- Subcatchment Area 1 - 176,278 sq ft
- Subcatchment Area 2 - 86,381 sq ft
- Subcatchment Area 3 - 11,020 sq ft
- Subcatchment Area 4 - 510,373 sq ft

**Rooftops/Parking:**
- Subcatchment Area 1 - 120,335 sq ft
- Subcatchment Area 2 - 389,745 sq ft
- Subcatchment Area 3 - 449,277 sq ft
- Subcatchment Area 4 - 1,458,948 sq ft

**Streets:**
- Subcatchment Area 1 - 45,086 sq ft
- Subcatchment Area 2 - 159,021 sq ft
- Subcatchment Area 3 - 91,523 sq ft
- Subcatchment Area 4 - 465,994 sq ft
Runoff Rate 1yr/30min Storm:

<table>
<thead>
<tr>
<th>Subcatchment Area</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.08</td>
<td>8.64</td>
<td>9.95</td>
<td>30.86</td>
</tr>
</tbody>
</table>

Stormwater Analysis
Stevens Square has the opportunity to create stronger connections to the parks surrounding the neighborhood through the walkability of the neighborhood, and the idea of wayfinding objects.
The Australian Aborigines are a primitive culture established in the Australian desert where water is a vital part of their daily lives and the way they keep track of where the water is through songs and dances that lead them to oasis's of water. The songs describe the land, and require the aborigines to use all their senses. This concept has become my design inspiration, and will be linked with the idea of way-finding and high imageability researched by Kevin A. Lynch.

Lynch described way-finding as “In the process of way-finding, the strategic link is the environmental image, the generalized mental picture of the exterior physical world that is held by an individual. This image is the product both of immediate sensation and of the memory of past experience, and it is used to interpret information and to guide action.”

He then defined Imageability as, “that quality in a physical object which gives it a high probability of evoking a strong image in any given observer...where objects are not only able to be seen, but are presented sharply and intensely to the senses.” Through using the aborigines wayfinding practices, I plan to seek strong imageability throughout my neighborhood.

These three ideas combined will push me to design the neighborhood in a way that creates memorable areas for people to discover as they walk throughout the neighborhood.
Project Goals:

1. The incorporation of aboriginal wayfinding as a guide to experience the neighborhood and its natural attributes for pedestrians, applying the high imageability created through the utilization of all the senses.

2. Respecting the simplicity of aboriginal sensibilities, dramatically increase the ratio of green space, indigenous vegetation and newly introduced plantings in relation to the existing preponderance of urban hardscape.

3. As the native Australians honor the search for water with traditional water sticks, they create a network of sustenance throughout the arid desert, providing a system of land water management passed generationally for basic survival. The creative development of a diverse yet simple and direct storm water management program in the Steves Square Neighborhood honors the basic importance of rainfall, providing an interactive and educational construct.

4. Through these deliberate plantings, unique green space and water retention areas, increase the viability and economic attraction of the neighborhood during an era of financial challenges and stress.
Masterplan Legend

- Existing Buildings
- Proposed Mixed Use Buildings
- Plazas
- Parks/Pocket Parks
- Alleyways
- Gutter Areas Between Buildings
- Bike Path

Map showing

- I-94
- 35W
- Franklin Ave.
- Nicollet Ave.
- Stevens Square Park

Legend:

- Brown: Existing Buildings
- Blue: Proposed Mixed Use Buildings
- Orange: Plazas
- Green: Parks/Pocket Parks
- Red: Alleyways
- Green: Gutter Areas Between Buildings
- Brown: Bike Path
Australian Aborigine Art inspired the connections throughout my design. The image to the left is a work of art called the “Tingari Cycle” by Warlimpirrnga Tjapaltjarri inspired by the Tingari people and depicts the Dreaming song lines connecting the aborigines to the water in the desert. The Tingari men were a respected group of ancestral leaders that voyaged throughout the desert finding water and mapping it through song, often bringing young novices to teach and pass down their knowledge to the next generation. The circles represent gathering areas or watering holes for the tribes to come together. The lines represent the journeys, paths to each area that become the “song”, that guide them to the water. My design emulates these same connections throughout the neighborhood; the parks and plazas represent the gathering areas or “watering holes” for the community and the smaller interventions, such as gutter areas, become the connection points, the places people walk through to get to the parks/plazas.
All the boulevards throughout the neighborhood will be turned into raingarden swales that will capture runoff from the sidewalks and buildings. These swales will not affect the normal storm drains and will be able to handle up to 7 inches of rain before the water will overflow into the storm drains. These swales will have any array of colored plants making the boulevards places of high imageability while demonstrating water.
The streetscape will be pedestrian scale creating a feeling of safety and security as the pedestrians walk throughout the neighborhood. At night it will be well lit and the bus stop will create places of attraction because of their bright light.
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### Boulevards - raingarden swales

**Species:**
- **Fox Sedge/ Carex vulpinoidea**
  - Sun: Full
  - Location: Part Bottom
- **Bur Oak/ Quercus macrocarpa**
  - Sun: Full/Part
  - Location: Bottom/Top
- **Astilbe/ Astilbe**
  - Sun: Full/Part
  - Location: Part Bottom

[Sources](http://www.swallowtailgardenseeds.com/perennials/astilbe.html) [Sources](http://www.bemisfarmsnursery.com/tree_descriptions.htm)
Bus Stops - exhibiting water

My design takes advantage of the amount of time people spend at bus stops waiting for the bus and uses it to demonstrate water and educate them. The water is pumped to the roof, flows across it and makes a “song” as it hits the symbols in between the two glass panels on the back side. Once the water gets to the ground it is then captured in a cistern underneath and eventually repumped back to the roof.
The flow rate at which the water is pumped onto the roof will correlate with the distance of the bus. The closer the bus is the faster the flow rate will be, while increasing the intensity of the “song” being created by the water.
At night there will be lights shining through the glass that will change colors as the bus gets closer to the bus stop, informing people how far the bus is.
Only main bus stops along the edge of the neighborhood and Nicollet Ave. will have water circulating through them, but every bus stop will have some type of feature that demonstrates water. An example would be creating a bus stop that demonstrates water in the winter through cycles and the prisms they create when light refracts through them.
All the alleyways will be repaved with permeable brick that will allow the water runoff to penetrate through the soil and recharge water tables. By repaving the alleys they will become more inviting for pedestrians and bikers creating a vertical connection throughout the entire neighborhood. Along the road of the alley there will be a change in paver pattern and color to signify where pedestrians should walk. Also along the side there will be a small trench that will collect water while it is raining and take the water to a storm drain, this allows people to see the water being managed and interact with it.
Because Stevens Square is such a high density neighborhood, collecting runoff from the rooftops will help decrease the amount of runoff reaching the stormwater drains. These areas are great opportunities to get the community involved in caring for the landscape around them while also teaching them about the importance of water and how it can be used in a more sustainable manner. These areas will offer gardening plots to the tenants using the water harvesting from the rooftops to water their plants. Although they will have to grow plants that require low amounts of light because of the height of the buildings.

The water will be collected from the rooftop and stored in cisterns underground for later use by the tenants.
Area Between Buildings - collecting runoff from rooftops

**MASTERPLAN**

- Rocks water filter through
- Tulips
- Fountains water trickles down

1" = 10'
Area Between Buildings - collecting runoff from rooftops
There will be several parks throughout the neighborhood that connect together by serving different purposes for the community. For example Stevens Square Park will serve as a recreational park while another park may be used to meditate and relax. Because Stevens park is the biggest park and centrally located within the neighborhood a detailed design was created for it.
To emulate the Aborigines in the center of the park is a swirling circle path and swale that has a gentle decreasing slope which captures any runoff during a storm. The water is then carried to the center of the circle where it is stored in a cistern and is used for a splash pad in the middle of the circle. The path that leads to the center of the park is surrounded by vegetation creating a strong ecology for the park and inviting environment for wildlife. The vegetation surrounding the path will correlate with every season as well as ensuring that no matter what season it is the park will be alive with color.
### Parks - Plants Throughout the Parks

**Plant Name:**

<table>
<thead>
<tr>
<th>Season</th>
<th>Plant Name</th>
<th>Type</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>Red Osier Dogwood/Cornus sericea</td>
<td>Decidious Shrub</td>
<td>Part Sun</td>
</tr>
<tr>
<td>Winter</td>
<td>Paper Birch/ Betula papyrifera (2)</td>
<td>Decidious Tree</td>
<td>Full Sun</td>
</tr>
<tr>
<td>Winter</td>
<td>Douglas Fir/ Pseudotsuga (3)</td>
<td>Coniferous Tree</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Spring</td>
<td>Astilbe/ Astilbe</td>
<td>Perennial Flower</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Spring</td>
<td>Hyacinths/Hyacinthus</td>
<td>Perennial/Bulb</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Spring</td>
<td>Hydrangea/Hydrangeas</td>
<td>Perennial/Bulb</td>
<td>Part Sun/Shade</td>
</tr>
<tr>
<td>Spring</td>
<td>Tulips/ Tulipa</td>
<td>Perennial/Bulb</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Spring</td>
<td>Wisteria/Wisteria</td>
<td>Vine/Shrub</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Summer</td>
<td>Coneflowers /Echinacea</td>
<td>Perennial Flower</td>
<td>Full Sun</td>
</tr>
<tr>
<td>Summer</td>
<td>Peonies/ Paeonia</td>
<td>Perennial Flower</td>
<td>Full/part Sun</td>
</tr>
<tr>
<td>Summer</td>
<td>Rhododendrons/ Rhododendron</td>
<td>Perennial Flower</td>
<td>Part Sun/Shade</td>
</tr>
<tr>
<td>Summer</td>
<td>Fox Sedge/ Carex vulpinoidea</td>
<td>Grass</td>
<td>Full/Part</td>
</tr>
<tr>
<td>Fall</td>
<td>Amur Maple/ Acer ginnala (2)</td>
<td>Decidious Tree</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Fall</td>
<td>Bigtooth Maple/ Acer grandidentatum (2)</td>
<td>Decidious Tree</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Fall</td>
<td>Red Maple/ Acer Rubrum (4)</td>
<td>Decidious Tree</td>
<td>Full/Part Sun</td>
</tr>
<tr>
<td>Fall</td>
<td>Bur oak/ Quercus macrocarpa (1)</td>
<td>Decidious Tree</td>
<td>Full/Part Sun</td>
</tr>
</tbody>
</table>
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