[Re] - Forms: A Master Plan for Michigan State University

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Abstract

Despite Michigan State University’s campus being praised as one of the most beautiful campuses in the US according to ASLA, its central core area represents a dated and lackluster image of stormwater management, social space, In State University's campus being praised as one of the most beautiful campuses in EU S by Ashley, its central core area represent sedated in lackluster image of stormwater management, social space and pedestrian oriented design. With over half of the 22 acre site dominated by Baron parking lots.Its connection to the Red Cedar River represents a challenge of how not only to effectively capture stormwater, but treat the runoff before it enters the river. These shortcomings are reflective of a campus and river, which experience frequent seasonal flooding. Low dissolved oxygen levels, high total, suspended solid.Levels in organic contamination reform seeks to bridge this gap between beauty and bpce. Through a series of Daylighted river portions and pedestrian boardwalks, the design blends creative stormwater management strategies with campus engagement instead of hiding runoff. It is our hope that meshing it with the space.Will strengthen this campus's relationship to the river.

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1 Introduction

Michigan State University (MSU) has a rich history of connections to nature as it was the first university to offer an undergraduate degree in landscape architecture. This connection is largely tied to the Red Cedar River of which two miles flow through the entirety of the campus. Red Cedar River serves as a longtime landmark of MSU and serves multiple schools in their research and curriculum. The importance of the Red Cedar River should be reflected in the importance the campus places on the natural environment and future developments of the campus. Unfortunately, many decisions that have affected the design of the campus have neglected the Red Cedar River as a major stakeholder in the conversation. Little effort currently exists to treat the runoff that feeds into the river or maintain the vibrant ecosystem of the river.

Current trends on campus have seen the incorporation of design approaches such as green roofs, semi-permeable pavements, and inclusion of more native plantings to address environmental concerns. Despite this, flooding still inundated the campus multiple times a year. This is in large part due to the large quantity of impervious surfaces across the campus. At our specific site, at the heart of the campus with the river in the center, we aimed to improve these conditions. With our design approach, we decided to not only redefine spaces to decrease the amounts of impervious surfaces, but also to tactically address existing green spaces to better suit them for large runoff events.

Our design additionally aims to incorporate the river into the campus through connection between natural spaces and the facilities essential to MSU. Given the geographical significance of our site on campus, we wanted to make it not just a crossing pass for pedestrian and vehicular traffic, but additionally a destination location.

2 Background

2.1 Site Area

MSU is in East Lansing, MI and comprises approximately 5,200 acres of land contiguously [1]. Our site area, however, only encompasses 22 acres at the center of MSU as shown in Figure 1. Our site location is at the center of the campus and has two main roads intersecting through: Farm and Shaw Ln.

Figure 1 Location of Site

2.2 Collaboration and Outreach

Discussion with fellow MSU students was conducted to understand what parts of the campus were lacking and which areas had the most potential. Additional conversations were had with faculty and

professors to understand what parts of the campus had been historically underinvested in yet had large connection with the identity of MSU. Additionally, MSU campus plan and the City of East Lansing environmental plans were consulted to understand how our ideas could further the direction established by both MSU and the city.

From this engagement with the school population, we determined that the MSU campus could benefit most from a better core that includes the Red Cedar River as a primary stakeholder in design considerations.

2.3 Site Inventory and Analysis

The following abiotic, biotic, and anthropogenic factors were inventoried and analyzed to determine the best course of action for the site plan.

2.3.1 Water Conditions

Two miles of the Red Cedar River that flows through MSU and is the urbanized portion of the Red Cedar River Watershed [2]. The two-mile stretch is characterized by constant flooding during the two rainy seasons in Michigan. Additionally, testing by MSU faculty and students as well as government officials has shown the Red Cedar River to have low dissolved oxygen (DO) levels, high total suspended solids (TSS) levels, and high organic contaminant levels. [2] Waters with low dissolved oxygen levels are poor habitats for aquatic animals, however, can be remedied with oxygen producing planting and less movement of sand (decreasing runoff volumes and speeds.) A decrease in frequency of runoff and increase in retention capacity of stormwater management practices and low impact development decreases the amount of TSS introduced to a water system. Organic contaminants presented to the Red Cedar River are primarily transmitted from dog poop and wildlife. [2] Buffers and a healthy riparian edge allow for treatment and capture of organic contaminants before reaching the river edge.

2.3.2 Biotic Factors

Before development, the Red Cedar River Watershed consisted of mainly forested wetlands with the upland ecosystem containing mostly Beech/Sugar Maple Forests or Oak/Hickory Forests and the lowlands containing mainly conifer swamps. Today however, the watershed has experienced a 90% loss of forest cover and 60% loss of wetlands [2].

Riparian conservation and restoration is essential to the health of any river system. Along the Red Cedar River, restorative trees such as silver maples, red maples, willows, and eastern cottonwood amongst other floodplain species have been proven to promote a healthy riparian ecosystem. [3] Because of the loss of forest cover and wetland, restorative measures and bank stabilization are essential to returning the biological health of the system.

Native planting that can be used at the site is shown in Figure 3. The list takes into consideration the drought and flood tolerance of the plant, the time of year best for planting, and the soils that best suit the plant.

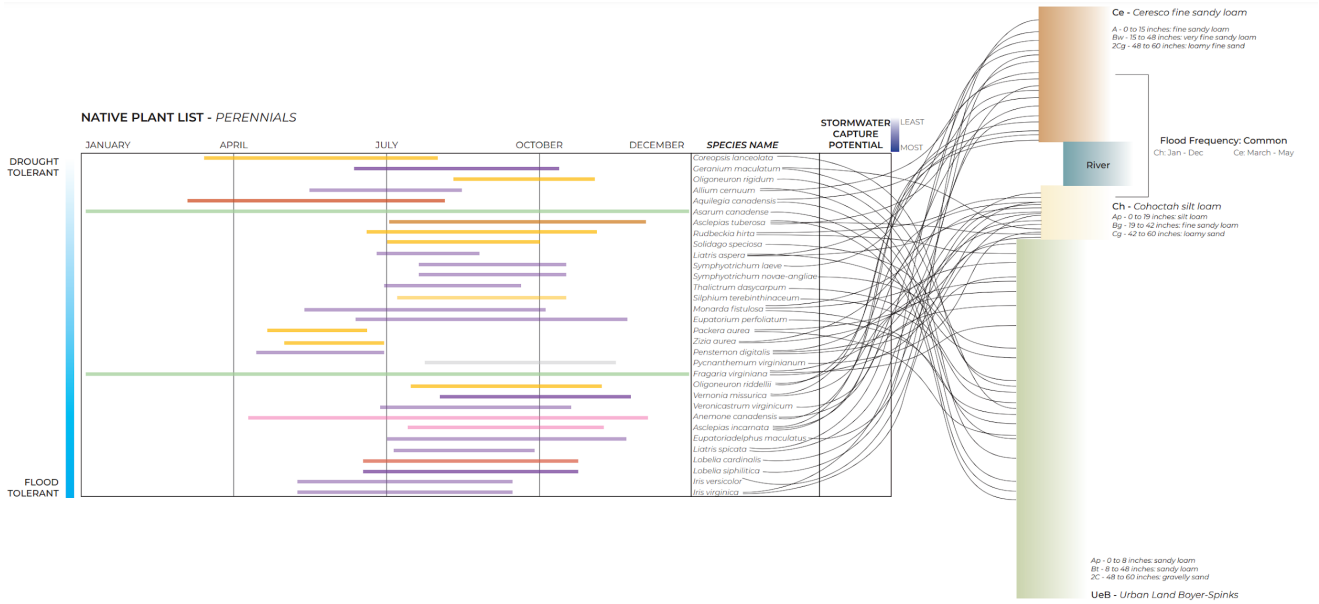


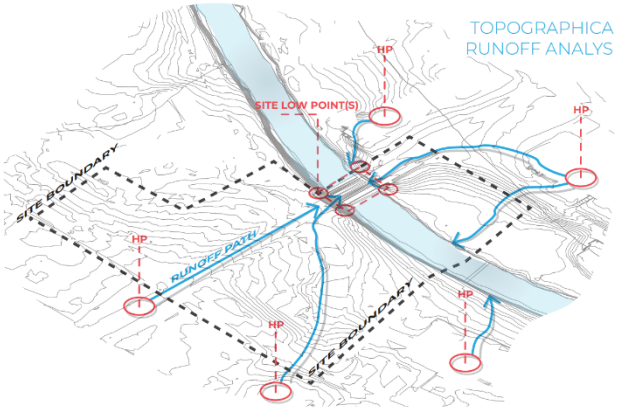
Figure 3: Native Plant List

2.3.3 Land Use

The river bisects our site area creating two distinct northern and southern areas. The northern portion of the site includes the Rock (figure to the right) – a significant landmark to the culture and tradition of MSU campus. This is a space for clubs and organizations to advertise, for fraternities and sororities to paint their lettering on, but most importantly, it serves as a social instrument that college students can use to voice their opinions on real world issues. Major locations just outside of our site area in the northern portion include the MSU Auditorium, Fairchild Theatre, and Bessey Hall.

The southern portion of our site has three distinct surface parking lots framed by Shaw Ln. running East and West and Farm Ln. running North and South. Buildings in the southern portion of the site include the College of Education, Shaw Residence Hall, and Abrams Planetarium. Major Locations just outside of our site are in the southern portion include the College of Engineering, School of Physical Sciences, and College of Law.

2.3.4 Existing Stormwater Runoff



tormwater Management on MSU is characterized by engineered piping and culverts connected directly to the Red Cedar River. A topographical runoff analysis was conducted to determine the flow in which runoff takes to the river, the results of which are shown in the figure to the right. High points sit on the outer edge of the site and flow to four main site low points along the existing Farm Ln Bridge. At these low points, culverts feed water directly into the river with no interruption in imperviousness for water quality treatment. From the high points to the low points, no interruption exists to treat the water quality. High runoff volumes with no water treatment has led to high sediment levels being presented to the river system. High TSS levels are often driven up by direct connection from stormwater runoff to water systems. The higher TSS volumes increase turbidity in the river which gives habitat for more harmful pathogens as is indicated by the E. Coli presence in Red Cedar Creek [4]

3 Project Goals

This proposal has 6 main goals to improve the overall experience and quality of our site area:

Goal 1: Improve water quality of the Red Cedar River by reducing runoff and increasing green stormwater management practices

Goal 2: Supporting social space design and user engagement using green infrastructure design

Goal 3: Improve student experience through connectivity amongst different spaces

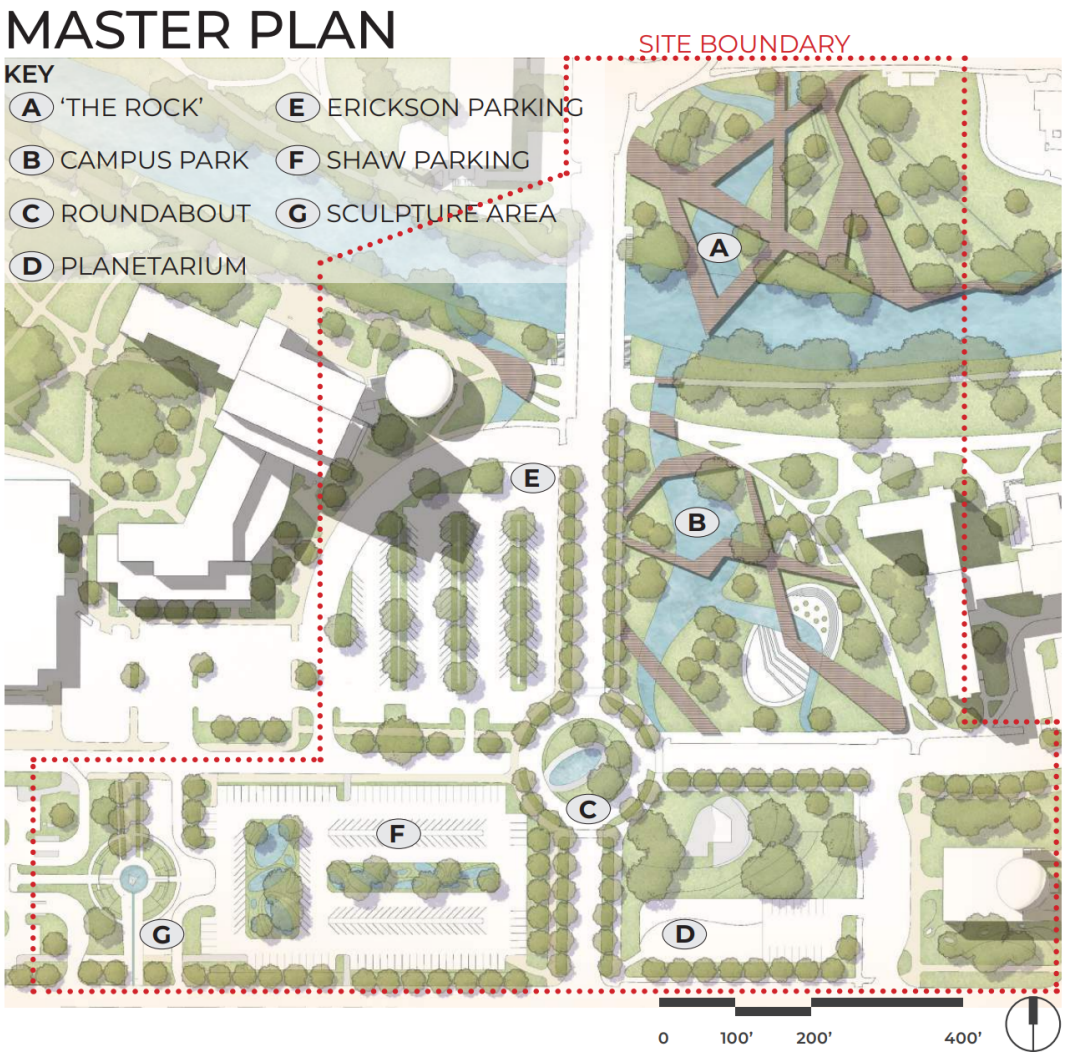
Goal 4: Make heart of MSU a destination space for different user groups and make the Rock's surrounding area socially and culturally as significant

Goal 5: Improve ecosystem of the Red Cedar River by stabilizing the streambank and restoring native planting

Goal 6: Educate school population and local community on the impact they have on the river and what can be done to help

4 Site Plan

Our site plan addresses seven main areas as shown below. These seven main areas – the Rock, Campus Park, Roundabout, Planetarium, Erickson Parking, Shaw Parking, and Sculpture Area – all have improved stormwater management practices that address water quality and work to incorporate low impact development. Our design suggests moving the stormwater systems above ground where water can be channeled through a network of a swale planting for treatment before it reaches a catchment basin for its storage. Additionally, all of the proposed measures and designs can be implemented across the campus and has the opportunity for future growth beyond the scope of this proposal.



The Rock

As discussed previously, the Rock is an essential campus landmark, and thus we set out to design a space that reflected this. With our redesign of the Rock Space, we wanted to focus on making the entirety of the space an attraction. Our design makes the Rock the focal point of the space. By adding a type of plaza and seating elements to the space, using the gentle existing slope to our advantage in pulling

runoff generated from Farm Lane to the river, and giving the users the ability to interact with our improved stormwater practices and Red Cedar River through a series of boardwalks that span the site, the space becomes multifunctional and creates a landmark space rather than just a landmark object.

Currently, the only formal user connections to the red Cedar River are large concrete bridges which creates an unfriendly user experience. By installing a series of ADA accessible walkways and boardwalks that reach out into the river, we're tempting users to get a closer look and a more intimate connection to the water body that makes its campus unique.

Campus Park

Campus Park boasts a major daylighted outlet where the existing site channels water and stormwater runoff underground through a series of culverts as discussed previously. As previously discussed, the current system of water management directly connects stormwater runoff to the Red Cedar River and allows no opportunity for water treatment. Because of the already poor condition of the Red Cedar River, special attention has to be placed into what enters the river, and specific measures need to be taken to proactively act instead of react. Thus, we determined daylighting, or moving these systems to an above ground type where water is channeled into a small dry bed or dry swale and moved through a network of planting and other natural materials, will best help not only treat the water but store any runoff. By the time that this water does reach the Red Cedar River, it will be not only treated, but greatly absorbed along its course through this daylighted major outlet channel. Additionally, these changes create an exciting amenity for the campus in land that is currently underutilized.

Roundabout

To aid in traffic concerns as well as create a safe bike and pedestrian experience, a roundabout was introduced at the intersection of Farm and Shaw. This roundabout is designed in a way that creates

Planetarium

The planetarium space provides professors, students, and the general public an opportunity to present and learn in an intimate outdoor classroom environment. The site features open space that can accommodate food trucks, pop-up shops, and live events. The gentle slopes and tapered curves of the space give it a truly cosmic aura

Erickson and Shaw Parking

According to campus officials, parking on campus has decreased by 70% over the past two years due to post pandemic learning. Our redesign of the parking lots maintains the parking needs of the campus while also increasing green space within the parking lots through tactical use of angled parking. Another important dimension of the parking lot redesign is that while the majority of the year, the space is used as typical parking lots, during football season these spaces serve as quintessential campus social spaces that are used for mass gatherings of tailgaters. Because of the importance these spaces serve to the campus identity, they could not be removed; however, they had to be redesigned in a way that did not ignore the issues of surface lot runoff. Design elements such as permeable pavers in tactical locations, green stips, bio swells, and rain gardens are included proposed parking lot designs and double as runoff

capturing mechanisms as well as green space for tailgaters to occupy during the 5% of the year were these days these tailgating days are occurring.

Sculpture Area

The sculpture area provides a thoughtful linkage between the pedestrian walkways and parking areas of campus. This area also features low impact development features discussed before, and allows for a transitional space that invokes and inspires the artistic side in a very pragmatic surrounding.

5 Community Involvement and Education

Community involvement manifests itself through our design in the way we placed stormwater management practices at the forefront of our design as opposed to tucking them away. The proposed daylighted channels would offer an excellent way for the campus to engage in these best management practices through keeping them open, accessible, and connected with a series of boardwalks that span over the daylighted portions. As reflected in our graphics, users have the choice to traverse over these the revitalized using the boardwalks or access the daylighted portions directly. Despite the rainy season lasting only 5 to 10% of the year, these daylighted portions are prepared to accommodate large quantities of water for But when thesen other words they will serve primarily as dry creek beds or dry swells that will host a variety of native planting material.

The site will include wayfinding elements and informational signage that tailor towards heightening understanding of the design's initiatives. Information consisting of the active flora and fauna that occupy the daylighted areas will be provided so that the local ecology is documented and made accessible to the general public. We hope this design promotes interspecies relationships and garners empathy between community members towards the sensitivities of a dynamic ecosystem this design supports and that the site will engage visitors to play a more active role in water sustainability.

6 Cost Estimate

The project will be primarily financed through grants and donation support. A 20-year lifetime cost estimate including initial construction costs, benefit calculations, and maintenance costs is provided in Table 6-1.

Table 6-1 Lifetime Cost Estimate

	Initial Costs	Benefits (Lifetime - 20yrs)	Maintenance (Lifetime)	Total
The Rock	$904,000	$318,000	$460,000	*$1,046,000*
Campus Park	$1,541,000	$350,000	$540,000	*$1,731,000*
Complete Street/Roundabout	$930,000	$160,000	$480,000	*$1,250,000*
Planetarium	$1,247,000	$68,000	$360,000	*$1,731,000*
Erickson Parking	$748,000	$55,000	$1,040,000	*$1,733,000*
Shaw Parking	$1,610,000	$102,000	$720,000	*$2,228,000*
Sculpture Area	$320,000	$38,000	$100,000	*$382,000*
Sum	*$6,396,000*	*$773,000*	*$3,700,000*	***$9,323,000***

Upon further development, campus maintenance workers and gardeners will become key stakeholders in the conversation to understand what native planting best suits

7 Conclusion

By implementing a multi-faceted approach towards stormwater management at the level of the campus, our project anticipates to raise Michigan State University's awareness to its own role in negotiating the water quality of its crown jewel: the Red Cedar River. In doing so, the design is expected to mitigate the majority of runoff crossing the site caused by impervious surfaces and parking lots by using native vegetation, while at the same time be provocative in ways that incentivize individuals experiencing the project to think further about water sustainability.

8 References

[1] MSU Facts. (n.d.) Retrieved from https://msu.edu/about/facts

[2] Red Cedar River Watershed Plan. (n.d.). Retrieved from http://redcedarriver.weebly.com/watershed-plan.html.

[3] On the banks of the Red Cedar: toward socio-ecologically robust riparian management in an iconic Michigan river, Journal of Freshwater Ecology (2018) Retrieved from https://www.tandfonline.com/action/showCitFormats?doi=10.1080%2F02705060.2018.1502692

[4] Total Maximum Daily Load (2019). Retrieved from https://www.cityofeastlansing.com/2065/Total-Maximum-Daily-Load