Abstract

Title: Daylighting Pogues Run
Student: Luke Kessler
Degree: Master of Landscape Architecture
College: Architecture and Planning
Date: April 2011
Pages: 116

This creative project adapts existing methodology to design a stream daylighting project for Pogues Run, an Indianapolis, Indiana stream. It develops methodologies for planning the daylighting of Pogues Run in order to reestablish the stream's natural dynamic functions, increase habitat in the urban core, and improve the livability of downtown neighborhoods, transforming the stream into a vital element in the city of Indianapolis.

Strategies address the interactions of the hydrological and ecological systems of Pogues Run with its urban context, and seek to minimize adverse impacts resulting from the project.

Methods of research include field studies, interviews, photographic and map-based site documentation, identifying potential implications of existing plans affecting the site, and synthesizing research obtained from relevant literature and scientific reports. Methods for designing this project are drawn from the studies of landscape ecology and fluvial geomorphology. The product of this research includes planning and design at a range of scales to fully demonstrate the implications of the project.

This creative project is a visioning tool for the future Pogues Run and its context for a new addition to the Indianapolis system of greenways. Design methodologies produced during this project can be applied to other stream daylighting projects in urbanized Midwestern cities.
Acknowledgements

Enormous gratitude goes to Chris Baas, Martha Hunt, and Amy Gregg for their advice, wisdom, and encouragement during this creative project. My thanks are also extended to Tina Jones, who was a wellspring of ideas early in the project. Special thanks to Brad Beaubein and the CAP Indianapolis Center for sending me their geospatial data. Finally, I thank my classmates, faculty, and staff for their support during our time at Ball State together.
Table of Contents

Abstract ............................................................................................................................................ iii
Acknowledgements ........................................................................................................................ iv
Table of Figures ............................................................................................................................. vii
Table of Tables .............................................................................................................................. viii
Chapter 1 – Introduction .................................................................................................................... 1
  Project Statement ........................................................................................................................... 1
  Scope ........................................................................................................................................... 1
  Key Research Areas ...................................................................................................................... 2
  Significance ................................................................................................................................ 2
  Methodology Overview ................................................................................................................ 3
  Underlying Assumptions .............................................................................................................. 4
  Delimitations ............................................................................................................................... 4
Chapter 2 – Background ..................................................................................................................... 5
  Water and Land Patterns for Stream Daylighting ....................................................................... 5
    Stream Form and Processes ..................................................................................................... 6
    Urban Watersheds .................................................................................................................... 11
  Ecological Planning in Urban Areas ........................................................................................... 15
    Principles .................................................................................................................................. 16
    Balancing Ecology and Urban Environments ......................................................................... 17
  Riparian Greenway Planning ....................................................................................................... 21
  Conclusions .................................................................................................................................. 25
Chapter 3 – The Problem and Its Setting ......................................................................................... 27
  Goals and Objectives ................................................................................................................... 27
  Site Inventory and Analysis ......................................................................................................... 30
    Regional Water Features .......................................................................................................... 30
    Regional Ecological Features .................................................................................................... 33
    Regional Transportation System ............................................................................................... 35
    Regional Park System ................................................................................................................ 37
    Regional Land Use .................................................................................................................... 38
    Local Flood Zones .................................................................................................................... 40
    Local Historical Sites and Cultural Districts .......................................................................... 42
Table of Figures


Figure 4. Park Ecosystems. Source: Anne Whiston Spirn, *The Granite Garden* (New York: Basic Books, Inc., 1984), 249, fig. 13.2. ........................................................................... 20

Figure 5. Regional Water Features. .............................................................................................................. 32
Figure 6. Regional Ecological Features. ........................................................................................................... 34
Figure 7. Regional Transportation ................................................................................................................... 36

Figure 8. Existing Historic Park and Boulevard System. Map by Storrow Kinsella Associates, Inc. .............................................................................................................................. 37

Figure 9. Regional Landuse. .......................................................................................................................... 39

Figure 10. Flood Zones. .................................................................................................................................. 41

Figure 11. House at 932 E Market St. .............................................................................................................. 42

Figure 12. Anheuser Busch Beer Agency ......................................................................................................... 42

Figure 13. Historic and Cultural Districts. ...................................................................................................... 43

Figure 14. Historic Sites. .................................................................................................................................. 44

Figure 15. Local Park System. ......................................................................................................................... 47

Figure 16. Soils. ................................................................................................................................................ 49

Figure 17. Storm Water Systems. ..................................................................................................................... 51

Figure 18. Topography. .................................................................................................................................. 53

Figure 19. Urban Topology. .............................................................................................................................. 55

Figure 20. Transportation Systems. ................................................................................................................ 57

Figure 21. Ecological Assets. ........................................................................................................................ 59

Figure 22. 1836 Plat of Indianapolis. .................................................................................................................. 60

Figure 23. Kessler Park and Boulevard System. ................................................................................................ 61

Figure 24. Population. ...................................................................................................................................... 64

Figure 25. Suitability Analysis for Stream Placement. .................................................................................. 70

Figure 26. Calculated Stream Geometry ....................................................................................................... 73


Figure 28. Recommended Alignment Corridor within Context ........................................................................ 80

Figure 29. Intermediate Study Area. ............................................................................................................... 83

Figure 30. Key plan showing design study sites. ............................................................................................. 84

Figure 31. Site plan for “Park” area .................................................................................................................. 86

Figure 32 View of park towards stadium ........................................................................................................ 87

Figure 33. Section A-A’ .................................................................................................................................. 87

Figure 34. Site plan of “Stadium” area ............................................................................................................. 89

Figure 35. View towards stadium with monumental stairs ........................................................................... 90
Table of Tables

Table 1. Historic Sites. *Source: Center Township, Marion County, Interim Report.* (Indianapolis: Historic Landmarks Foundation of Indiana, 1991). .........................................................45

Table 2. Local Soils. *Adapted from* USDA Natural Resources Conservation Service and Marion County Soil and Water Conservation District, “Non-Technical Soil Descriptions for Marion County, Indiana” (Indianapolis: Marion County SWCD, 2003), http://www.marionswcd.org/soils.htm (accessed October 1, 2010). ........................................48
Chapter 1 – Introduction

Project Statement

This project presents research based design interventions to restore the natural hydrological functions of Pogues Run, an urban stream in downtown Indianapolis, Indiana. These interventions also provide a framework for small, but significant, ecological improvements, and create sites that strengthen a positive community identity.

Scope

Three main phases constitute the bulk of this project. The first phase examines previous research on the topics of stream restoration in urban areas and greenway planning. This research defines the data required for the second phase. The second phase compiles relevant data about Pogues Run. This data is analyzed and the conclusions of the analysis drive the development of phase three. The final phase is a test and demonstration of methodology developed as a result of phases one and two. Phase three consists of planning, programming, and conceptual design of sites which are part of the project to daylight Pogues Run.
Key Research Areas

- Identify appropriate interventions necessary to recreate the hydrological functioning of Pogues Run.
- Identify appropriate interventions to develop sites of increased ecological diversity within the greater Pogues Run site.
- Identify community recreation and education needs which may be assisted by interventions within the greater Pogues Run site.

Significance

The significance of a stream daylighting project for Pogues Run is tangible, theoretical, and historical. First, water systems are one of the most important systems to society because water availability and quality directly affect quality of life. Tangible benefits of daylighting Pogues Run include providing a large-scale example of stream daylighting in a dense, mid-western urban area, which results in reduced flooding risk, increased water quality, increased ecologic diversity, new environmental education opportunities, cultural preservation, neighborhood enhancement, greenway development, and increased tourism.\(^1\)

Second, stream daylighting at Pogues Run lends itself to the advancement of the profession of landscape architecture. Landscape architects are reevaluating their relationship to culture. The analytical process of McHarg’s overlay system remains in use, but now increasing emphasis is placed on local cultural practices in addition to hard sciences such as geology or ecology.\(^2\) This project tests the combination of the overlay system, fuluvial geomorphology, and landscape ecology on a large stream daylighting project in a Midwestern downtown.

---

Third, the upper reaches of Pogues Run are part of the Indianapolis Historic Parks and Boulevard System, of which the project site was not a part. Redevelopment of Pogues Run as a greenway strongly links elements of the century-old plan for Indianapolis’ parks. Finally, developing and testing methodology for stream daylighting on Pogues Run produces plans and designs of tangible, theoretical, and historical value.

Methodology Overview

This project is divided into four general procedures. The first procedure is the determination of the alignment of Pogues Run stream channel. This is determined, in large part, by using the overlay method developed by Ian McHarg. Suitability criteria are defined for Pogues Run and suitability maps are produced showing the relative appropriateness of any given location for the Pogues Run channel. The most suitable areas are connected to form the basis for developing a project site. The second procedure is the design of the stream, according to the principles of fluvial geomorphology. This project improves the ability of Pogues Run to function integrally with the natural hydrological cycle, in spite of its urban context. The third and fourth procedures are the development of ecologically diverse sites and the creation of a greenway. Due to the requirements of the urban context, these two procedures are conducted simultaneously during the design process. Methodology derived from landscape ecology seeks to balance requirements for ecological greenways with an urban context and limited space to achieve solutions which are not only ecologically beneficial, but socially and culturally appropriate for the site.
Underlying Assumptions

- Stormwater and CSO rate and quality discharged into Pogues Run will remain at the average of the years 2007-2010; this follows the completion of the Pogues Run sewage overflow reduction project (Pogues Run Art & Nature Park, etc.) in 2006. The quantity of stormwater flow (and CSO events caused in part by excessive stormwater flow) will possibly decrease in the future as urban infiltration rates increase (with the increased adoption of porous pavement, infiltration swales, etc.).
- The inner city neighborhoods near Pogues Run increase in value as transportation costs increase, and “urban living” becomes increasingly desirable.

Delimitations

- The implementation and management structure and related funding mechanisms are not identified.
- Technical remediation of existing soils and conflicts with existing utilities on the project site are not addressed.
- Hydrologic system improvement strategies occurring outside of Pogues Run (for example, infiltration swales) are not covered.
Chapter 2 – Background

A stream daylighting project for Pogues Run requires awareness of several important issues. First, the site of Pogues Run comes with histories of ecology, human use, and planning. These histories influence and direct the planning for the future of the site. Second, daylighting restores and references the hydrology of the stream system. To understand how this aspect of daylighting unfolds, it is necessary to understand the physical interventions used to recreate an urban stream. Third, daylighting influences the ecology of the stream corridor. These influences include establishing new ecologies and restoring or referencing pre-urban ecologies. Fourth, daylighting reflects the urban context. A theoretical understanding of how ecological systems are influenced by built systems is useful to determine the role of the urban context in daylighting. Understanding how the processes of streams interact with context is important to accomplish this task.

Water and Land Patterns for Stream Daylighting

In order to restore or reference the hydrology of Pogues Run, two issues must be considered. To determine the correct hydrologic features for the stream, it is necessary to understand the processes which create the form of streams. To reference the naturally occurring hydrology of the stream, within the built environment, it is necessary to understand how fluvial processes can be controlled and manipulated to produce a desired
hydrological result. Authors such as Leopold and Cech have addressed these issues in books such as *Fluvial Processes in Geomorphology*, and *Principles of Water Resources*.³

**Stream Form and Processes**

The hydrological processes responsible for the form and function of streams were researched by Leopold, whose studies demonstrate that streams are predictable geological entities with unique processes of evolution which often maintain them in a state of long-term equilibrium. The channel geometries of waterways are the result of specific environmental influences such as the flow of water, the type of sediment carried by the water, and the materials of the bed and banks, including vegetation.⁴

Streams and rivers have been shown to follow certain patterns of geometry across many variables (e.g., characteristics and flows). Since these geometric laws are influenced by the hydraulic qualities of a stream, they are known as hydraulic geometry. Hydraulic geometry is based on evidence that stream geometry results in linear outcomes based on variables such as flow. Luna Leopold documented many of these patterns over his career, especially in *Fluvial Processes in Geomorphology*.⁵

Fluvial geomorphologists have demonstrated that many qualities of streams influence each other including characteristics, including: channel shape, size, and slope; roughness (obstructions to water flow); and average volume of flow. A stream is said to be in *equilibrium* when the sediment output of the stream is equal to the sediment input it receives. The equilibrium state maintains relatively stable stream qualities over time. Change

---

for a stream in equilibrium comes slowly. If outside influences such as human activity or natural disasters change any of the qualities of a stream, all the other stream characteristics may be affected as the stream tries to achieve a new balance.⁶

There are two important geomorphic entities seen in any cross section of a stream, the floodplain and the channel. Topographical floodplains make up what is commonly referred to as a valley, beginning at the edges of topographic change which contain most floods. They are formed by a stream undercutting and eroding consolidated soils as it meanders over time. The hydrologic floodplain is the area within the topographic floodplain that has been filled by deposits of sediment. These deposits can occur during floods, when the entire floodplain may receive sediment as flood waters retreat, or are left as deposits on the inside of meanders as the stream moves laterally. On average, a stream (in healthy balance) floods its floodplain once every two years. Another geomorphic entity seen in section is a terrace. A terrace is the remains of a floodplain where the stream no longer floods, due to downward degradation (or erosion) of the stream channel, leaving that former floodplain ‘high-and-dry’.⁷

The second geomorphic entity seen in cross section is the stream channel. The stream channel usually only carries a relatively shallow flow of water. However, the channel has been shown to be sized so that a bankfull level holds an average once in every 1.5 year flow. This flow level is responsible for many of the characteristics of a stream. Restoration designs should not attempt to create a channel for flowers larger than the 1.5 year flow because the channel adapts itself anyway to the dimensions of the bankfull channel through deposition. This fact causes significant costs for dredging in channelized drainage projects.

---

Separate high flow channels may be constructed if restoration projects are not able to preserve enough floodplain to absorb large event flows.  

![Stream Cross Section](image)


One metric seen in a stream cross section, used to compare stream channels, is the width to depth ratio. At bankfull level, the width to depth ratio represents the width of a bankfull flow divided by the depth of that flow at its deepest point. This ratio can be used to evaluate channel stability and capacity, and is used as criteria for stream classification in systems such as the standard Rosgen stream classification system.

From plan view, two important parts of a stream’s geometry are visible, the meander and the pool and riffle pattern. Both of these patterns are the results of erosion and deposition of sediment by hydrologic forces. The meander pattern of a stream is one of the most striking parts of its geometry from a plan view. The pool and riffle pattern is important not only for stability of the stream, but also for habitat. When combined with the floodplain

---

and the bankfull channel, the meander pattern and pool and riffle pattern create many of the aesthetic qualities of a stream.


The meander pattern is calculated based on the channel width, which is determined by channel flow. A meander (back and forth from parallel) is measured along the thalweg (deepest part of the channel). The thalweg typically trends towards the concave banks of meanders, crossing over the center line of the stream at the point of inflection. Riley summarizes the findings of Leopold:

- *The meander length averages about 11 times the channel width and is nearly always between 10 and 14 channel widths.*
- *The radius of curvature of the central portion of a channel bend averages about 1/5 of the meander length.*
- *The radius of curvature is commonly 2-3 times the channel width.*
• The meander amplitude is commonly in the range of 0.5-1.5 times the meander wavelength.

• Pools and riffles are spaced at repeating distances at about 5-7 channel widths measure along the channel.¹²

Therefore, once the bankfull width is determined, it is possible to reconstruct a typical meander pattern. It is important that any restoration project restores a proper meander pattern; otherwise the stream destabilizes and requires erosion control interventions.

Vegetation

Vegetation plays an important role in stream restoration. It is key to ensuring a stable width and depth for a stream channel. Roots increase the resistance of the soil to erosion, and leaves and stems increase hydrologic resistance of the floodplain during floods. Riley summarizes the functions of vegetation as follows:

• Tree roots, shrub species, vines, and other growth bind the stream bank soil and provide resistance to the erosive forces of the water. This produces deeper channels with banks that are undercut but held together with exposed root systems. These undercut banks, complete with overhanging vegetation, provide important escape cover for fish.

• Riparian vegetation moderates water temperatures, making the stream habitable for fish.

• Most of the streams' biological energy and the base of the food chain for stream life come from the leaves, fruit, cones, and other plant detritus from the riparian vegetation.

• Woody debris that falls into the stream forms pools for fish, creates habitat by causing backwater pools, and provides storage areas for sediment that otherwise might be released into spawning areas.

• Riparian vegetation can slow flood velocities and help deposit and store sediment on the floodplains as opposed to the stream channel downstream. During high flows the vegetation lies against the banks and protects them from accelerated erosion.

A well-vegetated channel helps store water along the stream corridor during the rainy season for slow release to the stream in drier seasons, which helps maintain the base flows of water for the fish.

Even further, studies have shown that removal of riparian vegetation from existing streams has direct impacts on water quality: increased water temperatures, turbidity, nutrient levels, and sedimentation. However, dense riparian vegetation in a stream which may flood increases the likelihood of flooding, since water is not conveyed through the stream system quickly enough. Several vegetation management practices can increase flood carrying ability: thinning the understory of a riparian forest; leaving the over story to shade out rushes and reeds; and removing only logs that back up flood flows or cause bank erosion, while leaving other logs for habitat creation.

Urban Watersheds

It may be necessary to consider how the urban context of Pogues Run influences its hydrologic processes. The form (meandering, braided, etc.) of a stream is heavily influenced by the slope, sediment composition, and vegetation near the stream. Restoring the pre-Indianapolis nature of Pogues Run would not create a stream that is in equilibrium within its existing context. The watershed has changed enormously in the past 200 years with the addition of paving and reduction in native vegetation. A stable daylighting of Pogues Run must accommodate changes within the watershed, such as the amount and type of sediment and water that enter the stream, and the vegetation surrounding the channel.

The water flowing in streams reaches them by several means (Figure 3). First, precipitation may fall directly into a stream in the process of channel interception. Second,

---

runoff may flow into the stream. Third, subsurface flow from recently infiltrated water contributes to stream flow. Finally, groundwater may flow into a stream. These four flows account for the entire quantity of stream flow at any given time. The proportion of total stream flow from each flow may vary, depending upon many factors, including urbanization.


---

Urbanization of a watershed typically results in several changes in how water reaches the stream. Impervious materials and structures make up a large percentage of urban areas. Impervious materials reduce or eliminate the ability of a watershed to infiltrate water. Also, in the process of paving and building, the amount and quality of vegetation is dramatically reduced when an area becomes urbanized, reducing interception by vegetation as a result. Therefore, after urbanizing, the amount of water which would have been intercepted by vegetation leaves or infiltrated into the soil takes the form of urban runoff. Runoff flows much more quickly than infiltrated water in subsurface or groundwater flow. This increase in flow rate to the stream means that the maximum volume of water carried by a stream increases dramatically and quickly decreases without subsurface flow.\textsuperscript{18}

Urbanization of a stream watershed also affects the drainage network spatially. The preexisting stream network hierarchy is superimposed with a grid network – streets. Rural roads are often graded above surrounding terrain, but urban streets are often below the surrounding grade and become a drainage way. Another addition to streets are storm sewers, which carry water through a watershed rapidly. Therefore, when considering the urban watershed the most precise documentation includes streets feeding into storm sewers, storm sewers, and streams. The increased spatial density of the urban drainage way network ultimately decreases the distance and barriers water encounters on its path exiting the watershed.\textsuperscript{19} The increase in drainage network density combined with increased runoff produces the typical urban flash flooding effects.

Water quality is generally referred to as a measure of stream health, and is impacted by land use. Studies show that excessive sediment, nutrients, and lack of oxygen may result

in poor water quality. Suspended sediment is a natural element in streams. However when excessive erosion caused by human disturbance occurs, the ecology of the stream is changed resulting in changes in species. Excessive nutrients in a stream, as might be caused by fertilizer runoff or combined sewer outflows, begin a process of eutrophication. Eutrophication describes a lack of oxygen caused by decaying algae blooms that may feed of excessive nutrients. Oxygen levels are another important quality in stream water. Temperature affects oxygen; a cool, shaded stream has more oxygen than a stream that is exposed to sunlight and warm. Therefore, to improve water quality in an urban stream, it is necessary to consider interventions which encourage the appropriate amounts of sediment, nutrients, and oxygen.

Lazaro identifies several categories of solutions to problems with urban water quality and excessive runoff quantity. Water quality is affected by the initial flow of runoff which carries heavy metal dusts, wastes, and trash into streams. There are two strategies to reduce contaminants: remove them from the environment before runoff occurs, or remove them from runoff water itself. Strategies to reduce pollution before street runoff occurs include: use of sedimentation control to prevent sheet erosion, use of vacuumized street sweepers, increasing use of concrete streets over asphalt streets, and maintenance of pavements to a high degree of quality. Removal of pollution from runoff including creation of runoff storage so that heavy flows do not overload a sewer system, causing an overflow, and instead may be held in storage until processing capacity opens up at a sewer treatment plant.

---

Another way to remove pollution from runoff is the use of vegetation species which filter pollutants from water.\textsuperscript{21}

Excessive runoff quantity can be reduced by several engineering interventions. Rooftop storage has a large potential to reduce runoff quantities – roofs typically make up more than 50\% of impervious surfaces in a city. One method of rooftop storage is the increasingly common use of green roofs. Porous pavement allows water to infiltrate, helping to recharge groundwater and reduce runoff rates. Surface detention, the most commonly used method of reducing runoff, usually consists of holding ponds which prevent or delay runoff from entering the sewer or stream system. Some detention structures are designed to increase infiltration.\textsuperscript{22} Though these methods are not comprehensive, they provide a basic understanding of some ways that runoff quantity can be reduced.

**Ecological Planning in Urban Areas**

While daylighting Pogues Run, the need to recreate or reflect the native ecology of the stream requires knowledge of how to create an ecologically functioning corridor. Within the built context, Pogues Run may become an extension of the existing greenway system. In Smith and Hellmund, James Thorne has described various relationships between greenways and their context, focusing on the containment or exchange of biological energy and natural resources within the environment at large. The six basic relationships are habitat (entirely contained exchanges), conduit (pathway for exchanges), barrier (prevent exchanges), filter (limited exchanges), source (one way travel out of the corridor), and sink (one way travel into

Analyzing the ecology of the corridor by separating functions into each of these relationship types provides a measurement of ecological success. These relationships may be a valuable tool for assessment of ecological function of the corridor; however, they give little guidance about how to initially design a greenway corridor.

**Principles**

Due to the potentially challenging context for treatment of Pogues Run as an ecological corridor, it may be helpful to use principles of ecological planning to develop and prioritize design proposals. Forman outlines several general principles of ecological planning in *Landscape Ecology*. First, landscapes are made of structural systems called patches, corridors, and matrices. A generalized patch is a nonlinear ecological structure, while a generalized corridor is a linear ecological structure. Both are distinct from the matrix surrounding them. A generalized matrix is an ecological structure which dominates the landscape, is highly connective, and highly influences ecological systems. Second, as landscapes become more diverse, the number of species generally increases. Third, the diversity of the landscape determines the quantity and quality of the energy, material, and life flows. Fourth, landscape is least diverse when it experiences great disturbance or no disturbance. Maximum diversity is achieved during periods of moderate disturbance. Finally, the fifth principle applicable to stream daylighting is the stability principle. Landscapes which are most stable fall into one of three categories: physical stability with little biomass, a low amount biomass present with rapid recovery, and a high amount of biomass that resists change.  

---


More specific design philosophies are outlined in *Ecological Design and Planning* by Peggy Gaynor. First, aim to create a self-renewing ecological system which does not require human intervention. If it is not possible to establish a self-renewing ecological system, then create ecological reflections of a system. The end result may not be a self-sustaining ecology, but an ecology which is an interpretation of the desired ecology. It may require periodic intervention by humans (such as invasive species or erosion control) to maintain ecological equilibrium.25 For Pogues Run, an intervention such as constructed wetlands may be able to mitigate several of the harmful hydrological affects of the built environment. Constructed wetlands emulate the functions of natural wetlands by purifying water and modifying flood hydrology, along with several factors separate from hydrology.26 By using Forman’s principles as a guide for setting priorities combined with Gaynor’s options to provide design flexibility by creating new wetlands, it seems possible to establish Pogues Run as an ecological corridor.

**Balancing Ecology and Urban Environments**

Pogues Run may influence the form and patterns of the surrounding built environment. This means that the daylighting of the stream should influence the future suitability of land use types in the area. The relationship between Pogues Run and its context is one of mutual influence. Understanding how the ecologic system and the built system can work in partnership is important to maximizing the benefits of urban stream restoration. For McHarg, the results of this partnership hinge on the value systems that construct the built environment. Anthropocentric values, such as the control of streams by pipes and diversions

---

are seen as short-sighted, while viewing *Homo sapiens* as a part of natural processes leads to the creation of ideal environments. The forms of the environment are the result of processes, which can be judged by the benefits of the forms. This means that the end form either celebrates or condemns the process by which it was created. As urbanization increased, the integrity of the form of natural areas has become less robust while functional value decreased. Applying this design approach to Pogues Run, by allowing the processes of ecology and hydrology to determine the form of the stream, the relationship of society to the stream should be positive.

Forman echoes McHarg in *Urban Regions* by observing that close proximity of built environments to ecological systems significantly reduces the ecologic level of function. However, built systems are often able to function regardless of the surrounding ecologic systems. The goal of ecological planning is to find a balance between these systems to allow them to coexist and if possible, provide benefits to both systems. To accomplish this, Forman recommends a “two-step planning approach” that first creates a regional vision and then implements parts of that vision over time. In this way, small projects, completed individually at varying times may fit together and function as a systematic whole which is envisioned from the beginning in a regional plan. Returning to the interaction of form and process, Bell argues that built forms should be subordinate to ecological forms, or at the very least, respect the processes responsible for their creation while altering them. Prioritizing the ecological forms allows natural processes to continue to produce new iterations of ecological forms and prevent large or sudden adaptations of process (landslides,

---

floods, etc.) necessary to conform to a built form imposed upon environmental processes.\textsuperscript{30} These ideas can be used to determine how to allow for the processes and resulting form of Pogues Run to influence the built environment.

However, in addressing links between ecology and urbanism, Krier points out that the built environment is only a form. As such, it represents the physical manifestation of a process. In order to fully integrate with ecological systems, built systems must also integrate their processes with the processes of ecological systems.\textsuperscript{31} Just as a stream meanders over time in its floodplain, Krier implies that it is natural for a neighborhood to change over time, but it should maintain the same form. The result is that the stream and the neighborhood change over time, but yet remain recognizable as landscape features. The challenge is to establish how to create a process that adapts to change, but still produces built forms which are in sync with the ecological forms of the context. For example, Pogues Run may take the form of a meandering stream with one bank developed and the other maintained in a “natural” condition. The resulting built form should therefore allow for the stream to change its course slightly over time without detracting from the potential recreational use of the stream corridor. The specific challenge of this scenario is how to develop a process for guiding development of the built environment.

To reduce energy required to maintain an urban park, a systems approach can be helpful. Spirn categorizes urban plant communities into cultivated or “open” and uncultivated or “closed” communities. A highly cultivated park managed as an “open” ecosystem requires inputs of plants, energy to maintain turf, and chemicals. Also, little of the organic wastes are reused within the park. Cultivated communities are most heavily

\textsuperscript{30} Simon Bell, \textit{Landscape: Pattern, Perception and Process} (New York: Routledge, 1999)
influenced by human factors and include streetscapes, parks, plazas, and sports facilities. A
less cultivated park, managed as a “closed” ecosystem with well adapted vegetation requires
few, if any, inputs or wastes. Uncultivated communities are most heavily influence by
environmental factors and include floodplains, steep slopes, transportation corridors,
abandoned land, and waste disposal sites. 32 Within a riparian corridor used as an urban
park, it is expected that both cultivated and uncultivated plant communities would be
required. The “closed” type of ecosystem management may be most appropriate for the
environmental requirements of a riparian community. Since streams are dynamic features,
areas most heavily impacted by the stream should be as “closed” as possible to reduce
constant management requirements. However, areas far from the stream, developed as
parks, may need an “open” community to accommodate programmatic requirements for
plazas, playgrounds, and other typical park features.

Figure 4. Park Ecosystems. Source: Anne Whiston Spirn, The Granite Garden (New York: Basic
Books, Inc., 1984), 249, fig. 13.2.

Urban environments pose challenges to plant species survival. All species require certain parameters of water, air, light, and nutrition. However one or more of these is often not ideal in urban environments. To achieve a correct plant community, it is best to look for natural analogues to the urban condition. For example, street tree environments share many conditions with floodplain trees such as lack of leaf litter and soils deficient in oxygen, respectively caused by compaction and flooding. It is therefore, not appropriate to automatically specify native stream plants for Pogues Run, until the design phase is able to establish that the environment is well suited to a particular species or community.

**Riparian Greenway Planning**

Riparian corridors are a type of corridor which borders a stream, the width of the corridor generally determined by the size of the stream. Essential functions of a riparian corridor are controlling “water and mineral nutrient runoff… reducing flooding, siltation, and soil fertility loss.” A secondary role of these corridors is the movement of species. Some species may flourish in the wet floodplain, but upland species require a continuous strip of upland habitat. So then, Forman concludes that the proper width for the stream corridor should include the topographic floodplain, to control flooding, siltation, and erosion; and a strip of upland interior habitat to facilitate the movement of upland species. Breaks in a corridor, such as might be encountered in a below grade stream in a congested urban area, prevent the movement of some species, depending upon the length of the break. Forman highlights a need for additional research on the impacts of breaks within corridors.

---

In Smith and Hellmund, Binford and Buchenau outline three main requirements for determining the width of an ecologically sound greenway. The first requirement is to contain the meanders of the stream, which the authors assume to be the “geomorphic floodplain.” The second criterion for width is the extent of riparian vegetation, or vegetation dependent upon the stream. Finally, the area contained by the shallow groundwater dependent upon the stream, which functions as a retention area or source for stream water (depending upon rainfall) is the last criterion for determining riparian greenway width.36 Forman has two main requirements. The first requirement is a riparian corridor that includes the flood plain, similar to the first requirement of Binford and Buchenau. Second, the corridor should include a full transition from the streambank, up to and including the upland communities on at least one side, to allow for free movement of species along the corridor. The goals of this approach are to minimize erosion, nutrient runoff, and flooding while encouraging travel of plants and animals in the landscape.37 Forman’s requirements may be a better guide for the Pogues Run corridor because they allow recreational use of one side of the corridor, but still provide ecological benefits. Binford and Buchenau’s requirements might be difficult on the proposed site due to limited space and complex (and possibly contentious) hydrology of urban water tables and their effects on nearby properties.

Riparian corridors are often incorporated into greenways because their physical form and energy and material flows through them are similar. Pogues Run has potential for development as a greenway, and may facilitate several positive outcomes if it is developed as such. One possibility is that it could initiate changes in the development of the area, possibly inducing new investment in the nearby neighborhoods. Neighborhoods are most successful

when they contain a diverse population with a unifying factor, such as a natural landmark or cultural landscape; otherwise they risk becoming developed as generic communities that could be found in any number of cities. A greenway would create a unifying characteristic for neighborhoods bordering Pogues Run. In order to increase the vitality of urban areas, they must be able to compete with the amenities of suburban communities. Drawing from the ideas of Jane Jacobs, Duany views the ideal urban community as an active, pedestrian-oriented neighborhood supported by 24-hour amenities accessible to all residents. In this sense, a greenway provides a major public amenity to residents by encouraging activity in public spaces, improving the quality of the pedestrian environment, and providing a 24-hour amenity. These ideas are important because they relate the Pogues Run daylighting plan to the surrounding context of Pogues Run. Pogues Run may serve as a greenway connecting the surrounding neighborhoods to the Indianapolis Park and Boulevard system, create an amenity, connect the community to the larger metropolitan area, and create a unifying element for revitalization of the immediate area.

A greenway designed as an ecological corridor may increase the livability of an area including aesthetic, social, educational, recreational, and ecological aspects. The social functions of greenways include recreation, improvement of urban aesthetics, and cultural interpretation. Ecological functions may have positive social impacts through education and awareness of the environment and improved environmental conditions for residents. In *Green Nature Human Nature*, Charles Lewis describes the experience of leading inner city

---

students on a trip to the Morton Arboretum. Having no exposure to forest ecology, with
dense vegetation, the students reacted fearfully to the arboretum because they associated it
with a jungle containing vicious predators. He helped the students to understand the forest
structure by using analogies between the forest and an urban neighborhood.43 The benefits
most affecting land development near greenways include tourism potential, better
environments for business and retirement communities, the protection of nearby
ecologically sensitive sites, and health benefits to local residents from contact and recreation
in green environments.44 Beneficial economic outcomes of greenway development have been
documented by the National Park Service. Some benefits included increased local property
values, increased demand for recreation industries, increased tourism, increased government
and corporate investments, and reduced long-term infrastructure costs.45 Results of
economic studies have shown that the amenities offered by California stream restoration
projects account for 15 percent of the value of nearby residences and that increased property
values from a Colorado greenbelt resulted in an increase of property tax revenue capable of
repaying the costs of the greenbelt within three years. Particularly relevant to stream
daylighting and restoration projects, a study conducted in the 1970’s reached the
unsurprising conclusion that “use and values assigned by the public to urban streams were
greater if the water quality was good.”46 Finally, Riley writes a thorough list of incentives for
communities to implement stream restoration projects:

• Reduce flood damages.
• Reduce damages from stream bank erosion.
• Preserve or restore a historic or cultural resource.
• Encourage the return of birds and wildlife in urban refuges.
• Develop pedestrian and bicycle trails.
• Upgrade the quality of life in urban and neighborhood environments.
• Restore a regional or local identity.
• Provide greenbelts, open spaces, and parks.
• Create boating and other in stream recreation opportunities.
• Create interesting educational opportunities for schools.
• Return or improve recreational and commercial fishing.
• Revive a decaying downtown and a depressed commercial economy.
• Create meaningful jobs and provide job training.
• Increase property values.
• Correct the performance problems and reverse the damages of large or small engineering projects.
• Provide a safe food source for family fishers.
• Return public life and commerce to urban waterfronts.  

As a final note, all the livability benefits discussed here are only a range of possibilities, and should be influenced by intentional design decisions based on perceived community needs.

Conclusions

Several issues relevant to daylighting Pogues Run that have been examined include stream morphology, urban ecology, and greenway planning. In a stream daylighting project, it is necessary to understand fluvial geomorphology to create a self-sustaining system to discourage excessive erosion or sedimentation. Adapting design methodologies to the unique circumstances of urban ecology will create systems appropriate to the urban context.

Though they may not be entirely self-sustaining, this aspect will be emphasized where possible. Finally, by applying adapted corridor design methodologies, habitat value, water

quality, and recreational potential are increased. In conclusion, understanding stream
morphology, urban ecology, and greenway planning provide the fundamental knowledge
required to develop appropriate design methodologies for an urban stream daylighting
project on streams such as Pogues Run.
Chapter 3 – The Problem and Its Setting

Goals and Objectives

Based on the research of Chapter 2, the following goals and objectives serve as a framework underpinning the information and analysis necessary to understand the site. They also provide criteria for design interventions and ultimately influence program development and site design. Due to the limited scope of this project, all objectives are not necessarily demonstrated in the design phase.

I. Improve the water quality of Pogues Run
   a. Design according to scientific principles of how natural streams function, while adapting to the urban context
      i. The stream shall remain within the soil type where Pogues Run formerly flowed
      ii. The stream shall be designed to function as part of the hydrologic system
         1. Receiver of overland flows
         2. Receiver of increasing subsoil flows as advanced stormwater management is implemented
      iii. The morphology of the stream shall reflect the natural processes of aggregation and deposition
   b. Design the Pogues Run site to accommodate slow, natural changes in the environment
      i. The program shall include space for meandering within the floodplain over time
ii. The stream shall be initially constructed with a meander pattern and pool-riffle sequence derived from scientific methods

iii. The stream shall provide some level of function for all levels of water
   1. Deep pools shall provide oasis habitats in times of severe drought
   2. Adequate flood plains shall prevent flooding during times of severe precipitation

c. Design Pogues Run to be successfully classified into a coherent stream type of the Rosgen Classification System in order to demonstrate its ability to be as self-regulating as possible

II. Improve the ecological potential of Pogues Run
   a. Establish a corridor of vegetation along Pogues Run
      i. Design areas for vegetation within the stream corridor
         1. Preserve areas shall not be accessible to visitors
         2. “Park” areas shall have vegetation appropriate to aesthetic and programmatic demands
   b. At a minimum, vegetate at least one side of the stream
   c. Establish appropriate communities for the site
      i. Vegetation near the stream shall be selected to encourage shading of the water
      ii. Vegetation on the floodplain shall not be so dense as to impede floodwater flows

III. Incorporate Pogues Run into the local cultural context
   a. Capitalize on positive site features
      i. Connect existing features along Pogues Run
         1. Pogues Run shall be a greenway trail connecting Brookside Parkway (the existing Pogues Run greenway) to the White River Greenway
            a. The greenway shall accommodate bicyclists and pedestrians
            b. The greenway trail shall be intended for 24/7 use
2. Pogues Run shall connect to the Virginia Avenue Cultural Trail
3. Pogues Run shall provide an attractive plaza space and park to compliment the stadium

ii. Borrow culturally important aesthetics from the area
   1. Pogues Run shall be designed in a mostly naturalistic manner
   2. Built elements of the site shall be influenced by existing elements of Indianapolis parks

b. Introduce new site features which contribute to local culture
   i. Design areas where users can interact with the natural processes of the stream habitat
      1. Designs shall create differentiated habitats which are influenced by the site conditions
      2. Plantings shall be specified and maintained to provide a secure and welcoming environment for users

c. Interpret the historical importance of the site and its context
   i. Interpret local historical events/people/ideas (such as George Pogue, the Battle of Pogues Run, 1913 floods, industrial development, Babe Denny neighborhood)
   ii. Highlight significant built features
      1. Designs shall emphasize views to the Soldiers and Sailors Monument
      2. Designs shall manage views of the stadium to express its significance while establishing a pedestrian scale near it
Site Inventory and Analysis

In order to understand the systems which are relevant to the goals and objectives of this project, research is necessary to identify useful information and draw conclusions for what it means for this project. Regional systems inventoried include water features, ecological features, transportation, parks, and land use. More systems are relevant to a local scale of interest, including: flood zones, stormwater systems, soils, ecological features, parks, historical sites and cultural districts

Regional Water Features

Daylighting Pogues Run replaces a box culvert with over 2.5 miles of open stream, connecting the existing stream in Brookside Parkway with the White River. Currently, the Pogues Run Watershed is shown as the area which drains into the mouth of the Pogues Run Culvert at New York Street (Figure 5, page 32). Watersheds which Pogues Run alters after daylighting include the White River-Indianapolis Watershed and the White River-Pleasant Run-Bean Creek Watershed. The nearest water features to Pogues Run are the Indiana Central Canal and Fall Creek to the northwest, the White River to the west, and Pleasant Run to the southeast.

The Pogues Run Watershed, as measured from its mouth at the White River, will grow from its present size as a result of daylighting the Pogues Run culvert. Without accounting for storm sewers, it is evident that the eastern sections of the White River-Indianapolis Watershed and a small area of the White River-Pleasant Run-Bean Creek Watershed will become part of the Pogues Run Watershed. Due to limited infiltration and collection of rainwater into storm sewers, the effects of the additional watershed area would initially have little impact on flows into Pogues Run. Through continual upgrades and
renovation of stormwater infrastructure, as outlined in the *Indianapolis Stormwater Design Manual: Green Infrastructure Guidance*, green infrastructure such as biodetention channels along the Cultural Trail will eventually replace or supplement traditional pipe-based systems of stormwater management. As a result of this, the future may show increasing infiltration of rainwater and a lower peak rate of stormwater runoff. Additionally, increased infiltration would increase subsurface flow and groundwater flow to Pogues Run, creating a less volatile stream flow with improved water quality.
Figure 5. Regional Water Features.
Regional Ecological Features

Ecological Assets within Marion County are defined as waterways, public parks, and areas of vegetated land, excluding field crops (see page 34). Northern Marion county hosts two large ecological features: Eagle Creek Park in the northwest and Fort Harrison State Park in the northeast. Southern Marion County has no ecological features comparable in size to the North. The largest area of green in the southwestern area is the Indianapolis International Airport, which of course is managed to discourage birds and other wildlife disruptive to air travel. The dominant pattern for most of Marion County shows large residential areas with street trees. Southern Marion County contains a few agricultural field rows. The White River links all the streams together, which in turn pass through many of the large green spaces. Finally, the most striking pattern is the lack of green space at the center of Marion County, near the proposed Pogues Run Alignment.

Two conclusions relevant to daylighting Pogues Run can be drawn by observing these ecological patterns in the landscape. First, due to the lack of existing green space near the project site, any green space which might be designed would provide an important toehold for biodiversity within central Marion County. Second, even though Pogues Run might function as an ecological corridor, lack of significant patches adjacent to the stream limits its habitat value for species which require patches to thrive.
Figure 6. Regional Ecological Features.
**Regional Transportation System**

Within Marion County, both rail and interstate highways are generally oriented radially around downtown Indianapolis (see page 36). Both transportation systems also have peripheral rings to allow traffic to bypass the center. Trails, which may be used for transportation in the future, currently occur often along riparian corridors (which also pass through downtown Indianapolis), and abandoned rail lines.

The proposed alignment for daylighting Pogues Run crosses the epicenter of the radial networks for both rail and interstate highways. Therefore, this project would be seen by many people passing on the interstate or embarking from Union Station in downtown Indianapolis, increasing its potential as a landmark which may redefine the popular image of an entire district of Indianapolis. Also, a proposed trail along the Pogues Run alignment would connect to the White River corridor and existing trails along Pogues Run, increasing the trail density in the downtown core.
Figure 7. Regional Transportation
Regional Park System

The regional park system illustrates two patterns. First, trail density within Marion County generally increases towards the center, downtown Indianapolis. Second, there is a notable lack of any large public park in the southern half of the county, which has fewer parks in general.

Figure 8. Existing Historic Park and Boulevard System. Map by Storrow Kinsella Associates, Inc.

The park and boulevard system envisioned by George Kessler has remained important to the City of Indianapolis. In 2003, over 3,400 acres of the original park system was listed on the National Register of Historic Places.48

The proposed alignment for daylighting Pogues Run has the potential to serve as a medium sized park, relative to the existing system in Marion County. Additionally, it could

connect existing recreational trails on Pogues Run, the Cultural Trail, and the White River trails. The increased trail connectivity would provide additional routing options for recreational users, providing a more varied experience.

**Regional Land Use**

Indianapolis is a city in an agricultural landscape. Cropland dominates many of the counties surrounding Marion County, which is mostly urbanized (see page 39). In general, green spaces fall between urbanized areas and cropland. Finally, centers of development concentrate at the center of the urbanized area and at apparent nodes in the transportation system, whose radial and ring roads are discernable even without being explicitly depicted due to the increased development surrounding them.

The proposed alignment for daylighting Pogues Run sits along the southern edge of the major cluster of dense urban land use which represents downtown Indianapolis. If it is developed as a greenway, it has the potential to create a boundary between the denser land use of downtown Indianapolis and urbanized areas to the South. However, it could also attract development to the corridor, extending denser land uses along its length.
Figure 9. Regional Landuse
Local Flood Zones

Flooding is an important issue when dealing with urban streams. Large portions of downtown Indianapolis lie in a 100 yr floodplain downstream from the entrance to the Pogues Run culvert (see page 41). This area has a history of flooding during heavy rains. However, the construction of the Pogues Run Art and Nature Park several miles upstream has resulted in substantially lower flood flows for Pogues Run. This is not necessarily reflected in the current floodplain delineation. According to landscape architect Tina Jones of Indy Parks, this issue is currently being brought to FEMA by local agencies interested in development. Another flooding related condition are the levees along the White River which protect many buildings from flood damage.

Designs for daylighting Pogues Run should not cause flooding problems, and should try to alleviate the threat of flooding to private property. The levees along the White River should be redesigned to allow Pogues Run to empty into the river without risking flooding any area not already at risk. For the length of the daylighting project, measures should be taken to ensure that the stream design does not increase flood risk to the community.

---

49 Tina Jones, June 24, 2010. Interview by author. Indianapolis, IN.
Figure 10. Flood Zones.
Local Historical Sites and Cultural Districts

Respecting historic sites and acknowledging cultural districts are vital to designing landscapes which integrate the history of a site. Indianapolis has established historic districts and cultural districts to promote and protect the history and the culture of unique and valuable assets in the community. The only historic district which contains a section of Pogues Run, in the project context, is the Arsenal Technical High School District. The proposed alignment of Pogues Run does pass close to the Wholesale District, which has both historic and cultural designations with slightly different boundaries (Figure 13, page 43).

Historic sites are concentrated in the downtown core; however some significant historic sites recorded in the 1991 *Center Township, Marion County, Interim Report* are near the path of the proposed alignment of Pogues Run. In the twenty years since the date of publication of this report, many of these structures have been removed from the site (Figure 14, page 44). Table 1 (see page 45) describes the significant structures contained in the report that are within five-hundred feet of the proposed alignment.
Historic/Cultural Districts

Figure 13. Historic and Cultural Districts.
Figure 14. Historic Sites.
<table>
<thead>
<tr>
<th>Historic Rating</th>
<th>Site Description</th>
<th>Address</th>
<th>Year Built</th>
<th>Notes</th>
<th>Design Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Emmerich Manual Training High School</td>
<td>525 S Meridian St</td>
<td>1895</td>
<td>Occupied by Eli Lilly Co.</td>
<td>Design to Avoid</td>
</tr>
<tr>
<td>O</td>
<td>Commercial Building</td>
<td>340 S Delaware St</td>
<td>c.1850</td>
<td>None</td>
<td>Design to Avoid</td>
</tr>
<tr>
<td>O</td>
<td>Sterling Block</td>
<td>241 Virginia Ave</td>
<td>c.1880</td>
<td>Demolished 1990</td>
<td>None</td>
</tr>
<tr>
<td>O</td>
<td>Ko-We-Ba Pure Foods</td>
<td>240 Virginia Ave</td>
<td>1918</td>
<td>Demolished</td>
<td>None</td>
</tr>
<tr>
<td>O</td>
<td>B &amp; O Terminal</td>
<td>220 Virginia Ave</td>
<td>1918</td>
<td>Demolished 1990</td>
<td>None</td>
</tr>
<tr>
<td>O</td>
<td>Indianapolis Rubber Company</td>
<td>544 E Georgia St</td>
<td>c.1910-c.1920</td>
<td>Demolished 2006</td>
<td>None</td>
</tr>
<tr>
<td>O</td>
<td>Cole Motor Company</td>
<td>730 E Washington St</td>
<td>1914</td>
<td>Occupied by Marion County Jail</td>
<td>Design to Avoid</td>
</tr>
<tr>
<td>N</td>
<td>House</td>
<td>645 S Meridian St</td>
<td>c.1880</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>Warehouse</td>
<td>620 S Capitol St</td>
<td>c.1910</td>
<td>Demolished</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>Morris Building</td>
<td>546 S Meridian St</td>
<td>1922-1923</td>
<td>Occupied by Eli Lilly Co.</td>
<td>Design to Avoid</td>
</tr>
<tr>
<td>N</td>
<td>Bessire and Company</td>
<td>409 S Pennsylvania</td>
<td>c.1890</td>
<td>Demolished</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>Commercial Building</td>
<td>960 E Washington St</td>
<td>c.1870</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>House</td>
<td>919 E Market St</td>
<td>c.1880</td>
<td>Demolished 1991</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>House</td>
<td>932 E Market St</td>
<td>c.1860</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>N</td>
<td>Anheuser Busch Beer Agency</td>
<td>920 E Ohio St</td>
<td>1891</td>
<td>Design to Avoid</td>
<td>None</td>
</tr>
</tbody>
</table>

*Historic Significance is based on National Register of Historic Places Criteria for Evaluation O=Outstanding, N=Notable

Table 1. Historic Sites. Source: Center Township, Marion County, Interim Report. (Indianapolis: Historic Landmarks Foundation of Indiana, 1991)
Local Park System

Parks are factors that contribute to the quality of life of a community. Within the local context of the proposed alignment of Pogues Run, there are three general park types. Monumental parks such as the zoo, Military Park, American Legion Mall, and Monument Circle serve a regional user base and often host large events. Greenways line the riparian corridors of the White River, Pogues Run, and Pleasant Run. Smaller parks serve the residential areas to the northwest and southeast of downtown. Few parks exist in close proximity to the proposed site (Figure 15, page 47), though there are few local residents.

Trails are fast growing community assets in the Indianapolis area. Near the project site there are many trails such as the White River Greenway, Pogues Run Greenway, Pleasant Run Greenway, the Monon Trail, and the Cultural Trail. Plans are currently in place to connect the Pogues Run Trail with the Monon Trail and Cultural Trail near Massachusetts Avenue.

The proposed alignment of Pogues Run would function and a greenway extension of the existing Pogues Run Trail. If residential development were pursued near this alignment, community parks should be developed along the same alignment. Additionally, the Lucas Oil Stadium site would benefit from its own monumental park for large outdoor events.
Figure 15. Local Park System.
Local Soil Features

A striking feature in the project area is the pattern of Urban-Genesse complex soil following the historic path of Pogues Run. The Genesse complex occurs on floodplains. It is surrounded by Fox complex soils, which are found on terraces, which are the remnants of old floodplains that no longer flood with frequency. This pattern should be a main determent of the proposed alignment for Pogues Run. Table 2 below describes soil types found in the area and serves as a key to Figure 16 (see page 49).

<table>
<thead>
<tr>
<th>Soil</th>
<th>Soil name</th>
<th>Slope</th>
<th>Drainage</th>
<th>Vegetation</th>
<th>Geology</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ua</td>
<td>Udorthents</td>
<td>varies</td>
<td>varies</td>
<td>variable</td>
<td>cut and fill</td>
<td></td>
</tr>
<tr>
<td>Ub</td>
<td>Urban land–Brookston complex</td>
<td>0-2%</td>
<td>poor, high seasonal water table</td>
<td>water tolerant grasses and hardwoods</td>
<td>upland depressions</td>
<td>hydric</td>
</tr>
<tr>
<td>Uc</td>
<td>Urban land–Crosby complex</td>
<td>0-2%</td>
<td>somewhat poor, high seasonal water table</td>
<td>hardwoods</td>
<td>upland rises</td>
<td></td>
</tr>
<tr>
<td>UfA</td>
<td>Urban land–Fox complex</td>
<td>0-3%</td>
<td>well drained</td>
<td>hardwoods</td>
<td>terraces</td>
<td>droughty</td>
</tr>
<tr>
<td>UfC</td>
<td>Urban land–Fox complex</td>
<td>6-12%</td>
<td>well drained</td>
<td>hardwoods</td>
<td>terrace sideslopes</td>
<td>droughty</td>
</tr>
<tr>
<td>Ug</td>
<td>Urban land–Genesee complex</td>
<td>0-2%</td>
<td>well drained, high seasonal water table</td>
<td>hardwoods</td>
<td>floodplains</td>
<td>flood risk</td>
</tr>
<tr>
<td>UmB</td>
<td>Urban land–Miami complex</td>
<td>0-6%</td>
<td>moderately well drained, high seasonal water table</td>
<td>hardwoods</td>
<td>droughty</td>
<td></td>
</tr>
<tr>
<td>UmC</td>
<td>Urban land–Miami complex</td>
<td>6-12%</td>
<td>moderately well drained, high seasonal water table</td>
<td>hardwoods</td>
<td>droughty</td>
<td></td>
</tr>
<tr>
<td>Uw</td>
<td>Urban land–Westland complex</td>
<td>0-2%</td>
<td>poorly drained, high seasonal water table</td>
<td>water tolerant grasses and hardwoods</td>
<td>depressions on terraces</td>
<td>hydric</td>
</tr>
<tr>
<td>W</td>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Local Soils. *Adapted from:* USDA Natural Resources Conservation Service and Marion County Soil and Water Conservation District, “Non-Technical Soil Descriptions for Marion County, Indiana” (Indianapolis: Marion County SWCD, 2003), http://www.marionswcd.org/soils.htm (accessed October 1, 2010).
Figure 16. Soils.
**Local Stormwater System**

Pogues Run functions as part of the stormwater drainage system for Indianapolis. Other than streams, the current stormwater infrastructure consists largely of small segments of storm sewer which empty into sanitary sewer systems (Figure 17, page 51). During periods of heavy rain, this system may become overloaded and result in combined sewer overflows (CSOs), which release unprocessed sewage into streams and rivers. In the past decade major sewer improvements have been taken to reduce the number of CSO events each year.

The Pogues Run culvert carries Pogues Run from New York St. to the White River. The majority of the length of the culvert consists of twin concrete culverts, each measuring 16’ wide and 14’ tall. As a result of the construction of the Pogues Run Art and Nature Park, several miles upstream from the culvert, the peak flow rate of Pogues Run has decreased enough so that only one of the existing culverts is needed. The other culvert was converted to a storage reservoir for CSO overflows, allowing overflows to be held until the capacity to process it occurs.50

Plans for the proposed Pogues Run alignment should acknowledge its role as stormwater infrastructure. This can be accomplished by eliminating CSOs, incorporating green stormwater infrastructure in surrounding areas, and accounting for the additional flows the stream will receive from runoff. Unfortunately, due to health concerns, the public should not come into contact with the water in Pogues Run until CSOs are eliminated.

---

Figure 17. Storm Water Systems.
**Local Topographic Features**

The topography surrounding Pogues Run shows a gentle valley where the stream flowed at the time of settlement (Figure 18, page 53). To the east, there is a rise; to the west, a slope towards the White River. Two major topographic alterations caused by humans accompany rail and interstate infrastructure. Along a large portion of the proposed Pogues Run Alignment, a rail embankment makes a large area impassable. On an even grander scale, the interstate is almost entirely above or below the surrounding grades. In a way, it seems to function as a wall/moat that separates the Pogues Run alignment and downtown Indianapolis from the neighborhoods to the South and East.

A significant opportunity for the proposed alignment of Pogues Run is to increase the sense of connection across the large topographic boundaries constructed with transportation infrastructure. Trails could pass under the interstate in manner that would transform the passage into a grand pedestrian gateway to the downtown core. Also, passages across the rail embankment boundary could become inviting public spaces and allow greater mobility for pedestrians in the area.
Figure 18. Topography.
Local Urban Form

Examining the building footprints of downtown Indianapolis reveals a definite pattern (Figure 19, page 55). Building footprints are dense in the downtown core, often with large structures such as convention centers and stadiums. However, southeast of the proposed alignment of Pogues Run, building footprints generally show a fine grained residential network, with the exception of large swaths cut by the interstates and the large buildings of the Eli Lilly Company headquarters. A greenway along the proposed alignment of Pogues Run could establish an edge between the downtown bustle and quieter, smaller scale neighborhoods. Alternatively, it could spur the infill of large voids and parking lots north of the Lilly complex and south of Lucas Oil Stadium with new residential and commercial projects.
Figure 19. Urban Topology.
Local Transportation System

Downtown Indianapolis is the center of many regional transportation systems (Figure 20, page 57). Rail lines feed into Union Station. Currently Amtrak provides passenger rail service to Union Station, but if commuter rail is implemented in the Indianapolis region, it would also be likely to serve Union Station. Interstate highways I-70 and I-65 both pass over the proposed Pogues Run alignment and serve as the center of the Indianapolis highway system. Many bus routes pass across the site, converging on a downtown loop. Many trails used by bicyclists such as the greenways and Cultural Trail are also in the area. The network of surface streets carries local traffic and some pedestrians. The streets leading to downtown Indianapolis which have on-ramps or off-ramps to the interstates are heavily travelled.

Design proposals for the alignment of Pogues Run should adapt or maintain heavily travelled surface streets, trails, interstates, and rail lines. Each element of these infrastructure systems pose challenges to the creation of a healthy stream, but all give a great opportunity for improvements to Pogues Run to be appreciated by thousands of people who may not even use the site.
Figure 20. Transportation Systems.
Local Ecological Features

In an urban center such as Indianapolis, there are often few areas devoted to natural ecology. Almost all parks in the downtown area are maintained as turf and lawn trees. Some notable exceptions are White River Greenway and Pleasant Run Greenway, as well as Pogues Run Greenway at some distance upstream. Each of these corridors has dense vegetation along the stream or river corridor (see page 59). However, aggressive exotic species dominate the local plant community unless managed.

Due to the lack of connectivity in existing ecological features and sections where Pogues Run must cross streets, highways, and rail lines, there are major challenges to developing a self-sustaining ecological corridor. However, smaller creatures can benefit from small improvements in local ecology. Even more importantly in a highly urban area, proposals for the Pogues Run alignment strive to represent natural ecosystems, even if they do not function as they do in a wilderness area, or even suburban environment. These ecosystem representations must be balanced with programmatic requirements necessary to make Pogues Run useful as a greenway and park space.
Figure 21. Ecological Assets.
Site History

The proposed site for daylighting Pogues Run lies on the south side of downtown Indianapolis. The original location of Pogues Run, in the southeast quadrant of Indianapolis’s original Mile Square, is used as a railroad right-of-way or is intensely developed from its mouth on the White River to Interstate 65. Named after the first American settler of the land which became the square mile plat at Indianapolis’ founding, Pogues Run was a “very uninviting locality” during the early years of Indianapolis. In the mid 1820’s, the state legislature appropriated fifty dollars to improve drainage of Pogues Run, “so as to cut of some of its malaria-breeding powers.” Holloway writes in 1870 about the construction of the 1831 depot near Pogues Run:

"The Madison Railroad depot was built… on the elevation… on South Street, east of Pennsylvania, then entirely out of town. The whole unoccupied, "bottom" of Pogue's Creek intervened, and it was then, as it had been from the first, a muddy, unwholesome intervale, which bade fair to remain unsettled till long after the town had spread illimitably northward. Consequently, the location of the depot was generally censured as unwise."

In George Kessler’s 1910 plan for the Indianapolis Park and Boulevard System, the upper section of Pogues Run, including Brookside Park, was to be incorporated into the

51 Indianapolis Division of Planning, “Indianapolis Regional Center Plan 2020” (Indianapolis: Indianapolis Division of Planning, 2004)
53 Max Hyman, ed., Hyman’s Handbook of Indianapolis, (Indianapolis: Carlon & Hollenbeck, 1897), 35.
parkway system. The lower section of Pogues Run had been straightened and lined with concrete in the late 1800’s. It is still shown on the 1910 Park and Boulevard System Plan.

Figure 23. Kessler Park and Boulevard System.

After the 1913 floods, the decision was made to construct the present box culverts to control flooding and hide the foul smell and unsightly appearance of Pogues Run. The culvert was completed in 1915. Later, landscape architect Lawrence Sheridan expanded the scope of the Kessler plan in the 1920’s. These plans provided for a “network of transportation and recreation corridors” to guide growth of the city, manage flood damages,

---


55 *Combined Sewer Overflow Long Term Control Plan and Water Quality Improvement Report*, (Indianapolis: City of Indianapolis, 2001), 4.46.
reduce water pollution, and conserve natural spaces.\textsuperscript{56} However, the lower section of Pogues Run was never part of the Indianapolis park system.\textsuperscript{57}

In 2001, an Urban Design Workshop took place in the area of the Pogues Run Site. Three alternate futures for the area were envisioned. Building on the presence of medical and insurance headquarters, the first vision of the area encouraged the location of corporate facilities. The second vision restored the historical neighborhoods of the area that have suffered decline and disinvestment since the 1970s, caused by the development of the downtown interstates. The final vision is of a sustainable mixed-use neighborhood that capitalizes on the present corporate headquarters to develop local commercial and housing markets.\textsuperscript{58} Interestingly, Lucas Oil Stadium was not a part of any of the plans, and will have a significant impact upon the area’s future development.

Public vision statements from the 2001 Urban Design Workshop emphasized the need for improvement of the ecological conditions of the existing Pogues Run corridor, upstream from the proposed site. Additionally, the community area in which the project site is proposed is severely deficient of greenway mileage, according to the 1994 Indianapolis Greenways Plan.\textsuperscript{59} A daylighting project for the lower section of Pogues Run has potential to produce an ecological corridor or greenway that connects to existing greenways in the upper section of Pogues Run.

\textsuperscript{56} Indy Parks, “2009-2014 Indianapolis-Marion County Park, Recreation & Open Space Plan” (Indianapolis: Indy Parks, 2009), 55.
\textsuperscript{57} Indy Parks, “2004 Indianapolis-Marion County Park, Recreation and Open Space Plan” (Indianapolis: Indianapolis Division of Planning, 2004)
\textsuperscript{58} Indianapolis Division of Planning, “Regional Center Plan 2020”
\textsuperscript{59} Indy Parks, “Indianapolis Greenways Plan” (Indianapolis: Indy Parks, 1994)
Population

Though population trends in this area may change over time, the 2000 census offers a glimpse of information to understand how many people live near the site (Figure 24, page 64). Many of the surrounding neighborhoods are quite dense, due to their urban location. However the densest neighborhoods are not along the proposed alignment. Institutions and office complexes seem to have located closer to the alignment, reducing the residential quality of the neighborhoods.

In densely populated areas, designs for Pogues Run should be a 24-hour neighborhood park which blends with the character of the neighborhood. However, in less densely populated areas, designs should focus more on trail users, use by local workers, and attracting people on their way to special events at the stadium or other places downtown.
Figure 24. Population.
Conclusions

Goals and objectives set forth in the framework for this design project provide the basis for the inventory and analysis of environmental systems, infrastructural systems, history, and population which affect design outcomes. The analyses of these influences on the site are directly incorporated into the design phase and shape the outcome at design study sites.
Chapter 4 – Planning and Design for Daylighting Pogues Run

Methodology

Information on how design occurs in this creative project is necessary to evaluate the results. Documenting the scientific principles and rational design process of this project gives potential users of this project’s methodology a guide and the results of that methodology for immediate evaluation.

General Site Selection

For this creative project, a site was chosen that fulfilled several requirements. First, to leverage university research expertise on Indiana landscapes, a site in the State of Indiana was preferred. Second, three urban streams which were discontinuous (meaning culverted or otherwise interrupted) were identified using hydrology maps. These streams were Cardinal Creek in the Ball State Campus in Muncie, Authen Ditch and Bowman Creek in a heavily developed residential area of South Bend, and Pogues Run near downtown Indianapolis. Third, ease of access and research interest of the author played a role. The author is not familiar with South Bend and has never been to that location, but is familiar with Muncie and Indianapolis. Finally, the ability of this project—if it were to be implemented—to impart a profound change in the landscape was desired. For this reason, the Indianapolis site of Pogues Run was chosen because of its simultaneous proximity to underutilized land and major economic centers such as downtown Indianapolis. Additionally, this site selection
builds upon the institutional foundation of research contained in *Daylighting Pogues Run: an urban stream solution*, a 2003 Ball State University Master of Landscape Architecture creative project by Heather Rippey. Rippey’s project focused on daylighting 1500 feet of the culvert starting from the White River in order to improve the water quality of runoff entering the river. Conducted before ground had been broken for Lucas Oil Stadium it incorporated redevelopment of existing warehouse structures which have since been destroyed. Therefore, though these projects share the Pogues Run watershed, their location, scope, and contexts are unique.
Planning and Design Scales

Due to the limitations placed upon the duration, time commitment, and scope of this creative project, design occurs at three scales. The largest scale is the planning of the location and size of the alignment for Pogues Run between the existing culvert entrance at New York Street and flowing downstream to the White River. An intermediate scale addresses the programming, general landscape guidelines and stream restoration for the length of Pogues Run from the Virginia Avenue Cultural Trail downstream to I-70. This section of stream is particularly demonstrative because it contains a combination of existing drivers of development that would use the greenway, and many challenges that are typical to the entire project. The most detailed scale of design occurs in three areas located along a reach or segment of Pogues Run within the two previous scales of design. The first is located near the Faris Campus of the Lilly Company, centering on South Meridian Street. It is the narrowest section of the entire project site. The second is located adjacent to Lucas Oil Stadium. This area has an existing user base of sport, music, and other event enthusiasts which creates a high-profile location which is likely familiar to the intended audience of this creative project. The third location for a site design is the remnant of the Babe Denny neighborhood located between Lucas Oil Stadium and Interstate 70. Designs at this scale focus on the spatial manifestations of the site program and specific interventions related to hydrology and interpretive ecology.

Suitability Analysis

A suitability analysis, completed using GIS raster image calculations, provides spatial data during the process of designing the alignment for Pogues Run. Most factors accounted for in the suitability analysis are weighted with negative values, except for the Urban-
Genesse soil. This soil type reflects the pre-settlement location of Pogues Run, and therefore is a good starting point for locating a restoration of Pogues Run. Moderately negatively weighted elements include roads and railroads. Pogues Run could easily pass under these obstacles if bridges were built, but bridges may negatively impact the connectivity of the trails and vegetation of Pogues Run, as well as add to the cost. Building footprints larger than 17,000 sq. ft. (the size of the smallest building than must be kept that is built on the Urban-Genesse soil, the Hurst Building in the southeast corner of the stadium block) are weighted heavily negative for suitability. These analyses are overlaid to produce a suitability analysis map showing the relative suitability for stream placement (Figure 25, page 70).
Figure 25. Suitability Analysis for Stream Placement.
Stream Design Methodology for Pogues Run

As demonstrated in Chapter 2 – Background, streams are generally predictable systems which obey certain natural laws. This fact makes it possible to determine an optimal channel geometry for a stream in a situation such as Pogues Run, where the pre-settlement stream has been totally erased from the landscape. Riley documents the steps used by the Waterways Restoration Institute for daylighting streams such as Pogues Run (shown below in Daylighting Design Process).60 These steps are modified slightly to accommodate the information available on Pogues Run and the limitations of this project. In the following section, the results of the application of this process to Pogues Run are documented on a step-by-step basis.

Daylighting Design Process

1. Determine if your watershed is: (a) fully urbanized; (b) undergoing a new phase of urbanization, continuing from past development; or (c) in the beginning stages of urbanization...

As seen in Figure 9 (see page 39), the Pogues Run watershed is fully urbanized.

2. Develop regional averages for the bankfull widths, depths, and discharges of streams for different-sized drainage areas using stream cross-sections that represent an “urban equilibrium.”

See documentation in Appendix B: Field Work.

3. Measure the slope of your project site… Using a topographic map, measure the slopes of nearby stream channels, or reaches of your stream immediately up and downstream of your project site. Use this information to help find reference reaches… to use as a model for your restoration project.

From the existing culvert inlet at New York St to the White River, along the estimated alignment of Pogues Run, the slope measures 0.26%.

4. *Survey cross-sections of stream channels, floodplains, and terraces… and use them as “reference” sections… [they] should have similar slopes, soils, bank material, and channel bed materials, as well as drain the same drainage area.*

See documentation in Appendix B: Field Work.

5. *Interview the neighborhood residents on their recollections of stream widths, depts., and meanders, flood stages, and instream life.*

Pogues Run was culverted in 1913, 98 years prior to this project; therefore this step is determined to be unfeasible.

6. *Acquire whatever historical photographs are available for the channel.*

The earliest known aerial photography dates from 1941, after Pogues Run was fully culverted.

7. *Select a restoration bankfull width and depth based on combining your observations from the above steps.*

Based on the field studies contained in Appendix B: Field Work, the bankfull width is 30’ and the bankfull depth is 5’.
8. Use a variety of methods to cross-check the values you choose for bankfull width, depth, and discharge. This includes rating curves of discharges versus stages, USGS data on mean annual flows combined with regional ratios to bankfull flows, and other techniques which would require a trained scientist.

9. Using your selected value for bankfull width, use the following equations to estimate the channel meander length and amplitude... of the meander: average meander length = $11 \times$ width of bankfull channel, average meander amplitude = $2.7 \times$ width of bankfull channel, the radius of curvature is approximately $1/5$ of the meander length and averages $2.3 \times$ the bankfull channel width.

The average meander length for Pogues Run is 330’, the meander amplitude is 111’ and the radius of curvature for meanders is 69’.

10. Using these average values for channel shapes, draw a calculated restoration design meander to scale...

![Figure 26. Calculated Stream Geometry](image)
11. Make observations of stream cross-sections at similar drainage areas with similar slopes, soils, and geology to determine whether and to what extent floodplains are part of the regional landscape features... [Generally,] the more floodplain you can design into the project, the better.

See documentation in Appendix B: Field Work.

12. Add any floodplain restoration features to your restoration cross-section. Even in regions where floodplains are naturally very subtle to small features of the natural landscape, it can be beneficial to include some floodplain into your restoration cross-section... [to provide] adjustment room for a bankfull channel that may continue to widen...

Based on the data contained in Appendix B: Field Work., a total floodplain width of 120’ in addition to the bankfull channel of 30’ is recommended, bringing the total recommended width for Pogues Run to 150’.

13. Transfer the drawing of the calculated bankfull channel restoration meander including the floodplain required to accommodate the channel width and its meander amplitude onto transparent paper and place it over your site map... [Consider the options for relocating [urban structures and utilities]... Desirable slopes for channel banks and terrace banks range from 1:1 to 1:3 depending on project right-of-way options and need for public access... If it is necessary to restrict the restoration corridor project right-of-way, it is better to save space by making the banks steeper and not narrowing the room needed for the meander amplitude.

Space is limited due to existing structures. Large structures and historically significant structures are constraints on the width of the project right-of-way.

14. Vary the meander shape to fit the site conditions and add to or subtract from the floodplain area depending on the site constraints and opportunities... Also, calculate the meander sinuosity, which is the length of the design meander divided by the straight...
length of the meander. Over any reach of the stream, the sinuosity should be maintained, even though the shape of the meander may be altered to fit site conditions.

Meander sinuosity based on the calculated stream geometry in Figure 26 (see page 73) is 1.24 feet of meander for every foot of length from beginning to end of the daylighting design.

15. Measure the change in elevation from the upstream to the downstream restoration project boundaries to determine the... slope of the restoration channel.

From the existing culvert inlet at New York St. to the White River, along the estimated alignment of Pogues Run, the slope measures 0.26%.

16. In the event that is absolutely impossible to avoid the stream channel being too short... the energy of the stream channel will probably need to be dissipated...

Appropriate meander sinuosity is achieved in the design. There is no need for energy-dissipating interventions in Pogues Run.

17. If the excavation of a new or restored floodplain is a part of the restoration project, the floodplain elevation should be designed to be equal to (or possibly higher than in difficult urban situations) the top of the bankfull channel.

Floodplains are designed where greenway width allows.
18. Floodplain restoration designs need to take into account the historical relationship between the floodplain and the bankfull channel... it is advisable to acquire historical data from interviews, records, reports, maps, photos, etc…

Due to the urbanization of the site and constrained width, this step is considered irrelevant.

19. Estimate the discharges for the larger flood flows above the 1-in-1.5 year flood. This can be done using flood-frequency data, watershed rational-method models, or more sophisticated models…

See Step 20 below.

20. Draw flood elevations on the cross-section you have designed for the bankfull channel and floodplain for the 1-in-25 year, 75-year and 100-year flood… Determine if your cross-section has adequate area to safely convey the high flows.

The maximum recorded flow, since the USGS installed a gauge at Vermont St, was 565 cfs on June 4, 2008. Additionally, since one of the two box culverts has been converted to storage for CSO events, and stream flow peaks have presumably decreased, since the Pogues Run Art and Nature Park can hold a 100 year precipitation event (though this is miles upstream), it is assumed that one box culvert, at 9’x18’, can carry the maximum flow. The total cross sectional area of the box culvert is 192 square feet. Not accounting for slower velocities due to vegetation, the Pogues Run channel accommodates these flows. In sections of the channel where there is less space, it is important to decrease the resistance factor of the vegetation and reinforce the channel with stone or concrete as necessary.

---

21. Note the velocities associated with the discharge estimates for the different-size storms. If they range above 6 feet per second, you may want to create or enlarge floodplains areas to help absorb the impact of the flows.

Velocities may be an issue in narrow or canal-like sections of Pogues Run. Further analysis is needed to accurately estimate velocities.

22. If there is a reservoir regulating flow releases to your stream, one of your project design considerations may be to bring in experts to develop a plan for reoperating the reservoir…

The Pogues Run Art and Nature Park does regulate the amount of water entering Pogues Run, but it was designed to limit flooding downstream, it satisfies the suggestions of this step.

23. Upon completing the design of your channel and floodplain after it has been fitted to your site plan, determine the stream “type” you have designed into the landscape using the Rosgen stream classification system. Check the values Rosgen has calculated for the ratios of bankfull width to depth, meander length, and sinuosity for the stream type you have design… If you are within the Rosgen values, it helps confirm that the dimensions for the basic features of your restoration project are within a reasonable range.

Combining field study results with calculated stream geometries shows in Figure 27 that Pogues Run as designed fits the criteria of a Rosgen stream type, C3. The C3 type is a stream with a “riffle/pool sequences in a gentle sloping, meandering, alluvial channel… characterized by point-bars in a well defined floodplain.”62

---

Defining Site Boundaries

After selecting a specific alignment for Pogues Run, the next step in the planning process is to define the size of the greenway. The typical greenway width is the minimum recommended width of the topographical floodplain. However, in some areas it may make sense to expand the greenway to include an entire parcel. Applying design criteria to determine just how large the greenway becomes is a balancing act. First, the larger the greenway, the more ecological and hydrological benefits it can provide. Second, buildings that are not directly displaced by the space of the topographical floodplain should remain, and require space for parking lots, driveways, service entrances, etc. Third, the greenway should have a sense of being a defined element of the city, so highly irregular borders are not desired. Considering these three criteria produces greenway boundaries which achieve a balance between the greenway, users, and the context.
Design Outcomes

Designs for daylighting Pogues Run are treated at three scales. One scale addresses the location of the alignment where the stream flows for the entire length between the existing culvert entrance and the White River. Another scale of design addresses the planning process for the stream geometry in a study corridor about 1/3 of the length of the first scale. Finally, the most detailed scale of design addresses site-specific interventions and recommendations on a site comprising about 1/3 of the size of the second scale.

Pogues Run Alignment Planning

Plans for the alignment for daylighting Pogues Run are influenced by several criteria. First, a continuous stream travelling from New York Street to the White River is desired. This is important for developing the idea of Pogues Run as a landscape fixture, a pedestrian path, and ecological corridor. This criterion is more important than any other due to its impact on the perception of the entire project. Second, the stream alignment uses the suitability analysis (Figure 25, page 70) to determine optimum paths. Third, an alignment scenario that minimizes the amount of land required for stream daylighting is preferred. These three criteria drive the entire process of the proposed Pogues Run alignment planning.
Figure 28. Recommended Alignment Corridor within Context.

The 2.5 mile recommended alignment corridor has several general characteristics. The amount of highways, streets, and railroads require a very fragmented corridor—an “archipelago greenway.” The stream ties each section together, but it necessitates many bridges. Seen at this scale, the stream meanders look very regular. They are designed in a “blank slate” environment. The meanders are intended to adjust themselves slowly as logs
and boulders carried from upstream create disturbances and begin to alter the currents. Finally, it is evident that the corridor connects a variety of land uses: industrial, residential, office, government, recreation, and transportation. It ties these uses together and provides a common element create an identity for the near south side of Indianapolis.

**Intermediate Study Area**

An intermediate study area is necessary before selecting design study sites (Figure 29, page 83). The intermediate study area develops a program and determines how each section of the corridor relates to its context. Criteria to determine the intermediate study area include: land use, transportation infrastructure, pedestrian activity, and corridor width. The goal of combining these criteria is the selection of a study area which has the greatest qualitative variety of these factors. The portion of the corridor from the Virginia Ave. Cultural Trail to Interstate 70 fulfills these criteria more thoroughly than any other portion of the corridor.

The intermediate study area, from the Cultural Trail to Interstate 70, has a widely varying context. To the north lie Monument Circle, the Convention Center, Conseco Fieldhouse, and Union Station. These sites, along with Lucas Oil Stadium and the Cultural Trail are major sources of potential pedestrian traffic, and epicenters of future growth. In contrast, the Post Office is mostly a processing center with no pedestrian traffic, and is quite hostile to the pedestrian environment, with 2-3 story blank concrete façade built adjacent to the sidewalk on nearly all sides of the building. A quiet location within the study area is the Babe Denny Neighborhood, a historic neighborhood which has been partially converted to light industrial use. Unfortunately, near the cultural trail, parking lots are the main land use. Transportation in the study area includes Union Station and the elevated rail lines that serve
it, the Cultural Trail, Interstate 70, and many heavily trafficked streets near the downtown. Finally, the study area presents stark contrasts in corridor width—it has both the widest and narrowest sections of the corridor. These features make this intermediate study area an ideal area to locate and test design study sites.

General emphasis is given for each section of the intermediate study area. In this study, types of emphasis include people, nature, and water. Sections that must respond to user intensive programs, more so than others, are called People. Sections that need to establish a natural area to encourage a diverse ecology are called Nature. Sections that must overcome challenges that relate to the continuity of Pogues Run are called Water. People, Nature, and Water sections do not necessarily show large contrasts in their design development—these goals serve as a rationale for shifting emphasis between the goals of this project, depending upon the site opportunities and challenges.

Finally, the intermediate study area is a usefully sized context to understand how each segment relates to the others. Important entrances to the corridor are placed within the whole. A conceptual understanding of how the trail system will function along the corridor is also an important benchmark at this scale of design. This conceptual framework is then developed further at design study sites.
Design Study Sites

Within the intermediate study area, three design study sites are necessary to demonstrate the application of the design methodology (Figure 30, page 84). Desirable sites are the widest (480 feet) and narrowest (35 feet) widths of the corridor, and a highly recognizable landscape. This range of sites allows testing of the methodology at various sizes and in a well known location. The widest site is near the Babe Denny Neighborhood. Immediately north of that is the Lucas Oil Stadium site, well known to a regional audience. Continuing upstream until South St. is the section with the narrowest width. These sections happen to be contiguous, so they offer some context for transitions between sections.
Figure 30. Key plan showing design study sites.
Park

The Park section of the corridor, in the Babe Denny Neighborhood occupies land currently in use as light industry, vacant lots, a few single-family homes, a church, and the existing Babe Denny Park. These uses are removed from the site, allowing it to expand to become the largest section of the entire corridor. Removing the existing uses also prevents the need for maintaining several underutilized streets and the necessary bridges. The possibility of relocating the homes which conflict with the site plan to the western portion of the neighborhood should be explored because they could be used as infill on vacant lots while minimizing impacts on the integrity of the neighborhood. Also, similar to the location of many churches, libraries, and schools on Indianapolis’s existing greenway system, the displaced church should be encouraged to remain in the neighborhood, on the new greenway. Implementing these recommendations is a step to minimizing the adverse impacts of the Park on the Babe Denny Neighborhood.

The Park is divided into two sections by Pogues Run. On the east side of the stream, a natural area will serve as a refuge that enables greater species diversity in the urban environment (Figure 33). This side has poor connectivity because the interstate and an on-ramp separate it from the urban fabric. With Pogues Run as the final boundary, this area will be a refuge for flora and fauna. The second section, on west side of Pogues Run is an expanded Babe Denny Park. The existing park has a shelter, playground and basketball court. All of these programs are expanded to accommodate additional use by people from outside the neighborhood. Additionally, a naturalistic amphitheater accommodates group park activities. Finally, street trees and well-lit pedestrian trails improve the pedestrian experience in what is currently an often harsh landscape (Figure 32).
Figure 31. Site plan for “Park” area.
Stadium

The Stadium section of the corridor is a design study site because it is so well known within the region. Currently, this site is a parking lot for Lucas Oil Stadium. The parking spaces lost as part of this proposal are not replaced in this plan. However, if mass transit service to the area improves, it may not be necessary to replace these spaces.
The Stadium section of the corridor emphasizes People. Large crowds arriving, departing, or occupying the space must be accommodated because of its proximity to Lucas Oil Stadium. Promenades carry most pedestrians around the edge of the site quickly. A tree covered plaza is a much needed pedestrian scale environment near the stadium. It carries the vertical lines of the masonry buttresses across the landscape in tree planters and paving patterns, integrating with the design concept for the existing plaza. The plaza overlooks Pogues Run and an event lawn, 4’-8’ below, which can be reached by monumental stairs (Figure 35, Figure 36). The interior of this site is designed to provide vegetative cover for the stream, while framing views towards it. Lawns welcome users to picnic and enjoy the outdoors on their same visit to an event in the arena.

Heading upstream, Pogues Run passes between two Post Office buildings that have blank concrete facades. This area is too narrow to allow a streamside trail without creating erosion concerns. The solution to these challenges is a canopy walk that allows users to walk on a bridge structure through the branches of the trees, keeping people out of the sensitive areas by the stream and preventing the expansive concrete buildings from being too imposing (Figure 37).
Figure 34. Site plan of “Stadium” area.
Figure 35. View towards stadium with monumental stairs.

Figure 36. Section B-B’
Figure 37. Section C-C’

Lilly

The Lilly section of the study area is notable because it is the narrowest reach of stream in the entire project. It must be narrow because there are several large and/or historically significant buildings near the site. The Faris Campus of Eli Lilly Company includes the Morris Building, a rehabilitated seven-story warehouse and the four-story office building which housed the original Emmerich Manual Training High School. Additionally, the residential neighborhood south of the site, though not identified as historic, does have a great deal of architectural character that should be preserved.

In the southern portion of this site, Pogues Run flows in a stone-walled canal where Merrill St currently exists. At this location, Merrill St is only two blocks long, and both are replaced by Pogues Run (Figure 40). Since Merrill St will not intersect with Meridian St, rendering the latter a dead-end, the section of Meridian without an outlet will be developed as an intimate scale community park.

The wider part of this site lies between buildings used by Lilly Co. as offices, the current site of a fragment of Meridian St. Entrance plazas are key features needed to maintain the current function of the buildings. Facing north to downtown, trees frame views to the Soldiers’ and Sailors’ Monument while screening out the unsightly Union Station.
platform shed (Figure 39). A stone arch bridge, inspired by an early 20th century bridge in Spades Park, provides access across Pogues Run to offices (Figure 41).

Figure 38. Site plan for “Lilly” area.
Figure 39. View towards Monument from Faris Campus.

Figure 40. Section D-D’
Summary

Three design study areas demonstrate how the underlying goals of the project are achieved within varying contexts by altering the emphasis of the design within a similar language. They show that Pogues Run can provide a positive aesthetic experience to trail users, provide areas of ecological benefit, and create a functioning stream in a built up urban area. These study areas serve as potential models for design of most of the other sections of the proposed alignment.
Chapter 5 – Conclusions

Twenty-first century landscape architecture will have new imperatives for the importance of water. As climate change combines with increasing pressure for resources, water will become only more important to society. At the same time, the majority of humanity now lives in urban areas, which have often been disconnected from their natural environment. Such is the case with Pogues Run, which was transformed during the past two hundred years from a free flowing stream into a concrete sewer.

This creative project explores design interventions which bring natural hydrological functions back to Pogues Run, transforming it from a sewer into a stream. As a result, Pogues Run becomes the framework for an urban ecological corridor and a source of community cohesion that improves the livability of the area.

Though this creative project focuses on Pogues Run, its main purpose is to demonstrate methodology that can be applied to a buried urban stream to produce a stream which works in greater harmony with natural processes, rather than hiding or fighting against them. The industrial Midwest has numerous sites similar to Pogues Run because many midsized Midwestern cities share a common socio-cultural progression. This project shows the amenities that could be created as part of a daylighting project, increasing livability and encouraging society to place higher value on water systems and underutilized urban areas.
This project has several notable outcomes that present opportunities or challenges. One opportunity is the stream daylighting design methodology, the most central part of this project, which proved to be an effective tool for making design decisions. The suitability analysis which influenced the alignment of the stream corridor also was rather successful within the project framework. Both of these methods have merit for future use. However, there are some aspects of the project which may be useful areas of study in future projects. This project applied ecological methods which were not intended for and urban context. More empirical research is necessary in this topic to improve the ecological design methodology for similar sites. The lack of input, directly from the community, is another limiting aspect of this project. While Indy Parks surveys were used to influence the project goals and objectives, more communication with residents and local employers would likely result in a more nuanced approach to design. These notable challenges and opportunities provide some basis to judge the merit of this approach.

Several methods exist to expand the work of this particular project. Phasing plans would allow this project to be visualized as a long-term community goal which will be accomplished in a methodical fashion. Stormwater maintenance interventions would actively demonstrate the usefulness and function of Pogues Run as stormwater from buildings, such as Lucas Oil Stadium enters the stream. Proposals for redevelopment projects would show how daylighting Pogues Run could spur increased public and private investment in the area. These developments could conceivably contribute to the finances of the daylighting project and greenway upkeep. These ideas would expand the impact of this project, but there are also areas where research could be expanded which would provide useful information to the evaluation of daylighting proposals for streams similar to Pogues Run.
Finally, during the course of research and design for this project, several topics appeared where additional research would be helpful. First, ecological design in urban contexts was difficult due to lack of published research. Much of the established research on ecology focuses on natural systems in rural or sub-urban contexts. A greater understanding of ecologies that are appropriate for an urban context would greatly advance this research area. Second, since all streams are part of a watershed, more work could be done of the Pogues Run watershed. Proposals or guidelines for the development of advanced stormwater systems would complement the daylighting of Pogues Run. However, these projects were too large to include in the scope this project, which was conducted assuming that they would eventually be implemented. Lastly, a third area for additional research is the management of urban habitat which provides park functions for humans and habitat functions for ecological systems. Research in any of these three areas relates directly to the outcomes of projects to daylight Pogues Run.
Appendix A: Site Photography

Four formal site visits are part of the research for this project. Photographic documentation and notes record information from site visits. The photographs shown in this appendix are a small representation of the total amount of photographic documentation occurring as part of research. The images are selected to quickly encapsulate the unique qualities of locations within the site.

Figure 42. Site Photography.
Figure 43. Site Photography.


Figure 44. Site Photography.
Appendix B: Field Work

Field studies of existing streams are necessary, as part of the methodology for this project, to determine the physical characteristics of a stream restoration. Five field locations are based on the similarity of their watershed sizes, land cover, and adjacent land uses.

Figure 46. Field Study at Bean Creek, Garfield Park Site 1.

*The upper dashed line shows the floodprone area, the lower dashed line shows the bankfull level. Scale: 1” = 30’
Figure 47. Field Study at Bean Creek, Garfield Park Site 2.

*The upper dashed line shows the floodprone area, the lower dashed line shows the bankfull level. Scale: 1” = 30’*
Pleasant Run - Pleasant Run Site

<table>
<thead>
<tr>
<th>Baseball Field</th>
<th>Lawn</th>
<th>Brush</th>
<th>Stream</th>
<th>Bar</th>
<th>Brush</th>
<th>Trees</th>
<th>Lawn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Erosion</td>
<td>Gravel</td>
<td></td>
<td>Canopy of</td>
<td>Edge contains</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cottonwood,</td>
<td>Aster, Goldenrod</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sycamore,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mulberry;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Saplings of Ash,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Elm, Cherry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The upper dashed line shows the floodprone area, the lower dashed line shows the bankfull level.
Scale: 1” = 30’

Figure 48. Field Study at Pleasant Run, Pleasant Run Greenway.
Figure 49. Field Study at Pogues Run, Brookside Park Site 1.
Figure 50. Field Study at Pogues Run, Brookside Park Site 2.

Pogues Run - Brookside Park Site 2

- Parking
- Trees
- Stream
- Trees
- Road

Norway maple, Cherry, Sycamore, Cottonwood, Elm, Ash, Mulberry, Bush honeysuckle recently cut back

Small gravel, Sand, Tires, Logs

*The upper dashed line shows the flood-prone area, the lower dashed line shows the bankfull level.
Scale: 1” = 30’
Appendix C: Impact Report

The daylighting of Pogues Run would have many positive impacts. One impact of particular interest is real estate. On the following page, Figure 51 shows areas of property which could be expected to be affected by the project. Dark orange parcels will be directly affected by this project. More interestingly, the light orange parcels could be expected to increase in value since they are within a walkable distance of the corridor. Documented cases in Chapter 2 – Background demonstrate that it is possible that increasing property values (and the resulting increase in property taxes) may contribute towards payment of the cost to daylight and maintain Pogues Run.
Figure 51. Real Estate Impact.
Appendix D: Bibliography


—. 2009 Indianapolis-Marion County Park, Recreation and Open Space Plan. 2009.


—. *The Indianapolis Historic Park and Boulevard System.*


—. *Indianapolis Regional Pedestrian Plan.* 2006.


USDA Natural Resources Conservation Service and Marion County Soil and Water Conservation District. “Non-Technical Soil Descriptions for Marion County, Indiana,” Indianapolis: Marion County SWCD, 2003,


USGS. “Peak Streamflow for Indiana,” USGS.

Walsh, Christopher, Allison Roy, Jack Feminella, Peter Cottingham, Peter Groffman, and Raymond Morgan II. *The urban stream syndrome: current knowledge and the search for a cure.*