ABSTRACT

THE CREATION OF A SUSTAINABILITY INTERNSHIP GUIDEBOOK FOR THE CINCINNATI ZOO AND BOTANICAL GARDEN

by Mary Sticklen

This paper discusses the research and development of a Sustainability Internship Guidebook for the Cincinnati Zoo and Botanical Garden. The purpose of this guidebook is to provide future sustainability interns with an accurate history and portrayal of the zoo’s sustainability program, provide a structured framework of weekly responsibilities and goals, and create opportunities for networking and career development. To create this guidebook I conducted research on guidebook design, internship satisfaction, and professional development. In addition, I worked closely with the Cincinnati Zoo’s sustainability coordinator to ensure the guidebook included all the necessary information and accurately reflects the zoo’s sustainability program. The resulting guidebook contains five sections: 1) an introduction and overview to the Cincinnati Zoo and its sustainability program, 2) a weekly schedule and outline of intern responsibilities, 3) Green VolunTeen management information, 4) potential, significant project information, and 5) resource documents.
THE CREATION OF A SUSTAINABILITY INTERNSHIP GUIDEBOOK FOR THE CINCINNATI ZOO AND BOTANICAL GARDEN

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Chapter 1: An Introduction to the Cincinnati Zoo and Botanical Garden’s Sustainability Program

1.1 History and Background of the Cincinnati Zoo’s Sustainability Program

Since its opening in 1875, the Cincinnati Zoo and Botanical Garden has been dedicated to the conservation of plants and animals. The zoo was founded on 65 acres in the middle of the City of Cincinnati and had a very small original animal collection. Despite beginning with a small collection, the zoo has had a very successful captive breeding program, beginning with endangered trumpeter swans and sea lions back in the 1880s and continuing with the establishment of the Lindner Center for Conservation and Research of Endangered Wildlife (CREW) in 1986. Now the zoo’s collection has grown to include over 200 species of animals and 3,000 species of plants (Cincinnati Zoo and Botanical Garden (b) 2014). The Cincinnati Zoo is also dedicated to the preservation of plants and species native to Ohio. Bowyer Farm is a 600 acre property located in Mason, Ohio that was donated to the zoo in the 1990s. The zoo is restoring this former farm back to its native habitat, including reclaiming 24 acres back to its natural wetland state. Already, the restoration has resulted in the reintroduction of 125 bird species and 200 native plants (Richardson 2014, Kaeff 2011).

In 2006, the zoo’s leadership team furthered its dedication to conservation by making a formal commitment to aggressively pursue environmental stewardship and develop a strong sustainability program. The zoo recognizes that the conservation of natural resources is critical to saving wildlife and their habitats (Cifuentes 2015). Today, the zoo has a comprehensive and robust sustainability program that focuses on energy efficiency, water usage, storm water management, waste management, sustainable design and construction, and community outreach. The program has been so effective that despite being the second oldest zoo in America, the Cincinnati Zoo was declared the “Greenest Zoo in America” in 2010 (Rexhausen 2012).

The Cincinnati Zoo’s sustainability efforts began when it designed the Harold C. Schott Education Center (figure 1.1). To save money and minimize environmental impact, the building was designed to Leadership in Energy and Environmental Design (LEED) Silver standards. The Schott Center was not only the first LEED Silver building at the Cincinnati Zoo; it was the first LEED project in Cincinnati (Burns n.d.). The success of this building prompted the commitment that all future buildings be constructed to at least LEED Silver standards (Cincinnati Zoo and Botanical Garden (a) 2014). From there, the zoo appointed an inspired and ambitious facilities
director. He formed a “Green Team” comprised of zoo volunteers with various backgrounds and expertise in project management, solid waste, engineering, and water, as well as key staff members involved in different areas of the zoo. The Green Team meets every month to develop plans to accomplish them. They tackle tasks like researching for grants, talking with keepers and other staff about their day-to-day habits, and doing the “dirty work,” such as dumpster diving “audits,” in an effort to stay up to date with the zoo’s practices.

The goals for the zoo’s sustainability program are straightforward: to reduce the zoo’s carbon footprint and use of natural resources, thus reducing costs, while maintaining world-class care for the animals and plants. They set out to achieve these goals by focusing on reducing water and energy consumption, becoming a zero landfill facility, ensuring all new construction projects reach a minimum of LEED Silver standards, and decreasing its greenhouse gas emissions (Cifuentes 2015).

Since the implementation of its sustainability program in 2006, the zoo has seen remarkable results. The zoo has invested around $2 million into the sustainability program, but has saved more than $5.6 million in the process. In 2013, the zoo spent $350,000 less for utilities than in 2005, despite having 25% more buildings, 50% more visitors, and doubled water rates (Cifuentes 2015). The zoo’s systems (HVAC, electrical, Life Support) have experienced no detrimental effects from sustainability initiatives. The program has also resulted in better water quality, better lighting, better space conditioning, and less waste (Cifuentes 2015).

Besides saving the Cincinnati Zoo money, improving its performance, and reducing its impact on the environment, the sustainability efforts have also led the zoo to take action to promote sustainable living, strengthen relationships, and support the local Avondale community immediately surrounding the zoo. This area is recognized as a “food desert” (figure 1.2) (Auffrey and Shah 2013, City of Cincinnati Food Access Task Force 2013). Food deserts are defined as “urban neighborhoods and rural towns without ready access to fresh, healthy, and affordable food” (United States Department of Agriculture n.d.). To combat this problem, the zoo has turned vacant lots into safe, vibrant parks and urban farms and partnered with a local community kitchen to provide a place where residents can obtain fresh, healthy and affordable food (figure 1.3). These efforts have helped address local food issues for the immediate community neighbors, but also allows the zoo to have a tighter grasp on its own food sourcing for animals and guests.
The sustainability initiatives described above are just one side of the zoo’s sustainability commitment. The other side includes sharing this information with the 1.3 million people who visit the park each year. Through education programs, signage, exhibits, green tours, and its website, the Cincinnati Zoo provides as much information as possible about what it is doing, why it is doing it, how it affects the environment, and how visitors can be green at home or at school.
One key education exhibit is the Go Green Garden at the main entry – a 7,000 square foot model dedicated to the zoo’s sustainability efforts (figure 1.4). It highlights the zoo’s sustainability efforts and explains how individuals can do the same at home. During the summer months, the exhibit is staffed mainly by Green VolunTeens – a teenager volunteer program. The program is designed to engage visitors with direct dialogue and provide the teens with leadership opportunities.

The key to the success of the Cincinnati Zoo’s program has been a common sense, no-excuses, practical approach coupled with dedication across all parts of the zoo’s staff, administration, and board. This resulted in a transformation of the entire institution – aesthetically, financially, and culturally.

1.2 History of the Sustainability Coordinator Position and Sustainability Internship

In 2009, the success of the Cincinnati Zoo’s sustainability program prompted the creation of a sustainability coordinator position. This position allowed the zoo to further its mission of creating adventure, conveying knowledge, conserving nature, and serving the community through outreach about sustainable living and conservation. The sustainability coordinator offers “green” outreach to zoo members, guests, schools, the surrounding neighborhoods, and the Greater Cincinnati region. The coordinator also oversees the Green VolunTeen program, manages the Go Green Garden, and coordinates the Green Team.

With the growth of the sustainability program, more learning opportunities have developed. The summer of 2014 was the first time a full-time sustainability internship was offered at the Cincinnati Zoo. I and another graduate student individually contacted the zoo’s sustainability coordinator to inquire if she’d be willing to accept summer interns. She agreed and the internship was created. I got a firsthand look at how an organization makes decisions about if, when, and how to incorporate sustainability into everyday practices, and to see how the zoo promotes sustainability within the park and throughout the community. My internship duties included:

- Managing the zoo’s Green VolunTeen Program
- Understanding all the aspects of the zoo’s sustainability program and the areas of sustainability the zoo has targeted
- Learning how to conduct Green Tours and communicate effectively about sustainability to the zoo guests
- Giving Aquaponics Keeper Chats
- Editing and updating documents and website pages pertaining to the zoo’s sustainability program

Figure 1.4 The Go Green Garden exhibit. At this exhibit guests can learn about the zoo's Sustainability Program and how to live a greener lifestyle (Klosinski 2013).
• Working with local organizations to strengthen the zoo’s connection with the community and promote sustainable living
• Writing about sustainability topics on the zoo’s blog
• Helping complete some significant, ongoing projects such as: starting an employee carpooling program, locate missing utility data, and researching possible grants for new sustainability efforts

1.3 Practicum Project Description

Because the sustainability internship was created only a couple months before the start date, there was not enough time for the sustainability coordinator to create a formal internship “guidebook” outlining the expectations and learning objectives for the internship. For my practicum project, I created a Sustainability Internship Guidebook for future summer interns. The sustainability coordinator asked that the guidebook contain 1) learning objectives for the internship, 2) internship responsibilities, 3) information on how to network and connect with local sustainability leaders and the community and 4) ideas for potential ongoing projects the intern could work on throughout the summer.

The guidebook I created consists of five main sections:

1. **Introduction:** An overview of the Cincinnati Zoo and Botanical Garden’s sustainability program and an outline of the internship responsibilities and learning objectives.

2. **Weekly Schedule:** Each week of the 12-16 week internship will focus on a specific sustainability topic. These topics include: an overview to the zoo, water conservation, stormwater management, energy efficiency, green building, transportation, solid waste management, land stewardship, local food, and community outreach. For each topic, the intern will learn how the zoo addresses that area of sustainability and how different sustainability efforts have benefited the zoo and community. This section also outlines the weekly responsibilities expected of the intern. These include: Aquaponics Keeper Chats, Green Tours, community engagement, interview a zoo employee about how sustainability efforts affect his or her job, and speak and/or visit with someone who works in that topic’s field, and complete an activity relates to the topic that.

3. **Green VolunTeen Management:** Information about how to interact with the zoo’s teenage volunteers and how to teach them about sustainability. It also includes information about the different exhibits and areas around the zoo where the Green Volun Teens are stationed.

4. **Potential Projects:** Descriptions of significant, ongoing sustainability projects which the intern could work on throughout the duration of the entire internship.

5. **Resources:** Documents referenced throughout the guidebook that supplement the learning of the intern. This includes documents as: the Green VolunTeen Handbook, the Green Tour Guide, and Aquaponics Field Guide.
This report provides an explanation of the resources I used to create the Internship Guidebook. It also outlines the reasoning behind each section. Chapter 2 provides details about the structure of the Sustainability Internship Guidebook. Chapter 3 describes some of the more significant tasks that were completed during the creation of the guidebook. Chapter 4 presents my recommendations for the continued growth and advancement of the sustainability internship at the Cincinnati Zoo. Finally, Chapter 5 presents a reflection on my experience creating this practicum project.
Chapter 2: Components of the Sustainability Internship Guidebook

To fulfill its mission, the Cincinnati Zoo and Botanical Garden strives to hire people who actively demonstrate a specific set of values and behaviors. These values are stated clearly on its website (Cincinnati Zoo and Botanical Garden (b) 2014). The five key principles are:

1) Collaborate with others through open communication and active listening
2) Maintain a positive attitude and energy
3) Holds oneself and others accountable to high standards
4) Demonstrate progressive thinking by thinking creatively and striving to further their own knowledge
5) Shows pride, passion, and a sense of ownership of the zoo and its resources

I felt it was important that the Internship Guidebook reflect these core values and provide ways for future sustainability interns to display these values throughout the course of the internship.

To view an entire draft of the Sustainability Internship Guidebook, see Appendix A.

2.1 Section 1: Welcome to the Zoo!

The Internship Guidebook is written in a positive tone that encourages the intern to have a sense of pride in the zoo, take ownership of his or her responsibilities, and develop innovative projects. The first section of the Internship Guidebook begins with a letter welcoming the new intern to the zoo signed by Sophia Cifuentes, the zoo’s sustainability coordinator (figure 2.1). Following the personalized message is a brief outline of the responsibilities and expectations of the intern as well as the learning objectives for the internship. I felt that stating this information up front would help the intern understand what is expected and how the internship would benefit him or her. My goal was to inspire the intern about what’s to come both in the guidebook and throughout the internship.

Section 1 ends with a positive description of the history of the zoo’s sustainability program. This informs the intern about significant facts in the history of the sustainability program and highlights some of the signature projects that have been implemented. The idea is to portray the
Cincinnati Zoo and the sustainability program in a positive light so the intern feels proud to work for an organization that has great reputation throughout the industry and the community.

2.2 Section 2: Weekly Schedule and Internship Topics

Section 2 begins with an overview of the internship structure. Every week of the internship, a new topic is introduced. These topics are based on the zoo’s sustainability program and include:

- Week 1: An overview to the zoo
- Week 2: General sustainability
- Week 3: Water conservation
- Week 4: Stormwater management
- Week 5: Energy efficiency
- Week 6: Renewable energy
- Week 7: Green building
- Week 8: Transportation
- Week 9: Solid waste management
- Week 10: Land stewardship
- Week 11: Local food
- Week 12: Community outreach

For example, weeks 3-4 focus on water efficiency and stormwater management. In the guidebook for these two weeks there are learning objectives for each week and a general overview explaining why the zoo has focused on conserving water and managing stormwater. This is followed by a list of water conservation and stormwater management projects the zoo has implemented (figure 2.2). I also created maps for each week that show where visible sustainability efforts can be seen throughout the zoo (figure 2.3). The sustainability intern might not be familiar with the Cincinnati Zoo, so these maps could help them understand the zoo’s layout. The maps might also help the intern learn where good teaching opportunities are throughout the zoo to take guests on Green Tours or to educate the Green VolunTeens.
**Learning objectives**
A brief overview to the Cincinnati Zoo's water conservation and stormwater management programs

**Week 4 - Stormwater Management**
Objective: To learn about the stormwater management issues facing Cincinnati and how the Cincinnati Zoo has partnered with local organizations to help diminish stormwater runoff.

**Water Conservation and Stormwater Management**
The Cincinnati Zoo and Botanical Garden is a large consumer of water in Cincinnati. With over 3,000 plants and 200 animals that need water to survive, it's easy to see why. In 2005, the Zoo used over 220 million gallons of water. Consuming that much water is not only unsustainable, but it cost the Zoo over $600,000 per year. In order to reduce water consumption, the Zoo became aggressive about fixing leaks, improving systems, and working with staff to change consumption behavior. These changes led us to consume only 54 million gallons of water in 2013, a saving of 166 million gallons of water.

Not only is the Zoo a large consumer of water, but also it is a part of Cincinnati’s Metropolitan Sewer District. Cincinnati has the oldest sewer system in the country, operating on a combined sewer overflow. This means that everything from wastewater to tap water flows down the same drainage pipe. In times of heavy rain, the water treatment facility cannot handle the large influx of water. This results in an estimated 2 billion gallons of raw sewage flowing into the Ohio River each year! Recognizing that the Zoo’s 69+ acres contributes to this significant environmental challenge, we work to manage our stormwater as effectively as possible. We have partnered with the local sewer district to take a large amount of our sewage off the storm water grid. Captured rainwater is used for irrigation, lake level management, and specific water exhibits.

**Water Conservation and Stormwater Management at the Zoo**
At the Cincinnati Zoo, efforts both large and small have been employed to conserve water and reduce stormwater runoff. These efforts include the following:

**Water Reduction Projects**
- Fixing dozens of water line leaks
- Installing timer-activated valves on over 100 fill systems
- Upgrading all major water filtration systems
- Upgrade fixtures to low flow, as well as automatic in most restrooms
- Fixing leaking concrete pools
- Worked with staff to modify how and when they clean their animal facilities

**Stormwater Retention Tanks**
- 13 million gallon retention tanks located under the Africa exhibit
- The captured rainfall is filtered and reused in large water exhibits and for irrigation

**Stormwater Projects**
- Rain gardens can be found at the Go Green Garden, Education Center, and the Vine Street Parking Lot
- Rain barrels are located throughout the Zoo
- More than 30,000 square feet of pervious pavement
- Two green roofs – a 2,400 square foot green roof on top of Grizzly Ridge Barn and one on top of the Primate Center

**Figure 2.2** The water conservation and stormwater management overview in section 2 of the Internship Guidebook.
Figure 2.3 Map of the Cincinnati Zoo's Visible Water Efficiency and Stormwater Management Projects. Source: Adapted from (Cincinnati Zoo and Botanical Garden 2011).

After the overview to each topic, information is provided about the intern’s weekly responsibilities. These responsibilities include conducting Green Tours, giving Aquaponics Keeper Chats, interviewing local sustainability leaders, and community engagement. The expectations for each responsibility are fully explained, and there is a checklist and list of important supplies to help the intern complete their responsibilities (figure 2.4).
2.3 Section 3: Green VolunTeen Program

Section 3 provides the intern with information about the history of the Green VolunTeen program and how they will be expected to interact with and train the Green Volun Teens. After providing a brief background, I wrote a description on how to create monthly and daily schedules for the Green VolunTeen program.

To ensure the Green Volun Teens feel comfortable with the zoo’s green topics and sustainability in general, the sustainability intern is responsible for providing extensive training. Thus, in this section I also provided the intern with information about where the Teens are stationed around the zoo, a checklist on how the Teens need to be trained, and a checklist for important supplies that need to be at each station (figure 2.5).

The Cincinnati Zoo is continuously trying to find more opportunities to engage guests in conservation. With this in mind, I dedicated the last part of Section 3 to identifying potential new stations throughout the zoo where the Green Volun Teens can educate guests about the importance of sustainability (figure 2.6). The sustainability intern will work closely with the zoo’s sustainability coordinator to obtain approval for new stations from the zoo’s administration.
2.4 Section 4: Potential Ongoing Projects

With the intern concentrating on a new topic every week, the sustainability coordinator and I felt it was important for them to have an ongoing project to help them feel a sense of pride and ownership of the zoo. In section 4 of the guidebook, I provide suggestions for potential ongoing projects the intern could work on throughout the internship. This list of projects was created based on my experiences as the sustainability intern, research I completed throughout the course of creating the guidebook, and projects the zoo’s sustainability coordinator feels would be beneficial for both the zoo and the intern. For the Sustainability Internship Guidebook, I included the following list of projects:

- Create a sustainability master plan for the zoo
- Incorporate state educational standards into Green Tours
- Engage zoo employees to participate in more sustainable behavior
- Create a teen and youth leadership program
- Identify potential development for Bowyer Farm
- Create a self-guided Green tour
- Create a zoo Green Building Guide
- Create a List of the zoo’s Sustainability Initiatives by Year Implemented

2.5 Section 5: Resource Documents

Section 5 provides all the documents that will help the intern satisfy his or her job responsibilities. These documents include:

- The Green VolunTeen Guidebook (Appendix B)
- The Green Tour Guide (Appendix C)
- Aquaponics Fact Sheet (Appendix D)
- Aquaponics Field Guide (Appendix E)
• Go Green Garden Interpretive Guide (Appendix F)
• Living Building Challenge Brochure (Appendix G)

All the documents in this final section are resources that supplement what the intern is required to know about different aspects of the zoo’s sustainability program.
Chapter 3: Logistics of Creating the Sustainability Internship Guidebook

This chapter explains some of the broader issues I grappled with while writing and designing the Internship Guidebook. These issues included incorporating other zoo publications in the guidebook, ensuring the intern feels like they are a part of the zoo, creating community connections that help the intern grow and fit with the zoo’s mission, and researching how to manage teenage volunteers.

3.1 Incorporating Other Zoo Publications

The Sustainability Department at the Cincinnati Zoo offers many different educational opportunities to inform the public about the zoo’s sustainability program and green living. For each of these programs, there is a corresponding manual or fact sheet. There are two main manuals the intern will reference in addition to the Internship Guidebook. These manuals are:

The Green VolunTeen Guidebook (Appendix B): This manual provides the zoo’s Green VolunTeens with general information about the zoo’s sustainability program and specific information about what they are expected to explain to visitors. The intern will need to reference this manual throughout the summer as they train and supervise the Green VolunTeens.

The Green Tour Guide (Appendix C): This manual provides adult volunteers who give green tours with general information about the zoo’s sustainability program. This guide goes more in depth about the technical aspects and results of the program than the Green VolunTeen Guidebook. This manual is important for the intern to reference, as they will be expected to lead Green Tours throughout the summer.

The Sustainability Internship Guidebook references information that can be found in both of these manuals. Also, all three manuals contain similar information about the zoo’s sustainability program, but are targeted at different audiences. For instance, the Green VolunTeen Guidebook and Green Tour Guide both contain information about the zoo’s renewable energy efforts. However, the Green VolunTeen Guide explains a lot about the concept of renewable energy in a way that is understandable for the teenage volunteers. In contrast, the Green Tour Guide provides more detail about each renewable energy effort the zoo has implemented. The volunteers leading Green Tours need additional details about each effort, as the people who take the tours are often college students in sustainability, employees from green companies, or adults interested in implementing their own sustainable practices.

Since each manual contains similar information, I decided that it was imperative that the organization of all three documents is parallel and all the information and statistics be consistent. Having consistent organization will not only make it easier for the intern to read, but also easier to update.

To ensure the consistency of each document I did the following:
• Ensured the content of each document was organized in a similar way
• Confirmed that all the important information and statistics were the same in all the intern’s reference documents

Document Organization

Just as with the Internship Guidebook, the Green VolunTeen Guidebook and Green Tour Guide also provide a breakdown of the zoo’s sustainability program by the following topic areas: water conservation, stormwater management, energy efficiency, waste management, green building, local food, and community. For all three manuals, I edited the format to ensure the topic areas occur in the same order and contain a brief overview of the main efforts the zoo has taken to address that topic.

Following these topics, I tailored each manual for the appropriate audience. For example, in the Internship Guidebook, each topic is followed by the intern’s weekly responsibilities, i.e. give Aquaponics Keeper Chats and interview local sustainability leaders.

Consistent Information and Statistics

Besides having a consistent organizational framework, I also checked to make sure the information was consistent across manuals. Since the intern will be seeing similar information in three different manuals, it would be problematic if a statistic from one document contradicted another. Also, consistency across all three manuals ensures that the zoo guests are receiving the same information from the intern, Green VolunTeens, and sustainability tour guides. I also spoke with the zoo’s vice president of facilities and sustainability coordinator to make sure each statistic in reference to the success of the zoo’s sustainability program was correct and up to date.

3.2 Integrating Ownership into the Sustainability Internship

One of the values the Cincinnati Zoo expects its employees to show is a strong personal ownership of the zoo and careful stewardship of its resources (Cincinnati Zoo and Botanical Garden (b) 2014). To ensure the internship and guidebook helped achieve this goal, I conducted a literature review on internship satisfaction.

Research on Internship Satisfaction

Studies have shown that for a temporary intern to feel commitment to an organization, the organization needs to treat them similar to permanent staff (Torka and Schyns 2007). One way to achieve this is for the intern to be given tasks that are both significant and autonomous (Hackman and Oldham 1980). This means providing opportunities that stimulate an intern’s interests and provide real-world experiences, while allowing the intern the freedom to be creative.

Research also shows that internships containing professional development opportunities increase internship satisfaction (D’Abate, Youndt and Wenzel 2009). Community involvement is a great way to help an intern network and develop a better understanding of the sustainability field,
while also serving as an excellent public relations opportunity for the zoo (figure 3.1) (D’Abate, Youndt and Wenzel 2009). Another way to help an intern develop professional skills is by allowing them to sit in on meetings and work with different departments. This allows them to learn about how a business makes sustainable decisions and how these decisions can have an effect on other departments (Nebraska Department of Economic Development 2013). For example, as the sustainability intern, I attended a meeting with the zoo’s vice-president of facilities, planning, and sustainability, the zoo’s facility project manager, the zoo’s construction consultant, and consultants from a green building consulting firm. The intent of this meeting was to brainstorm how to renovate one of the zoo’s buildings to LEED for Existing Building standards. I observed how these professionals from different areas and companies worked together to decide what parts of the building should be renovated, and what was not worth the effort and money to renovate to meet LEED standards.

Creating Significant Tasks for the Sustainability Internship

To provide the sustainability intern with potential projects that are both significant and autonomous, section 4 of the Sustainability Internship Guidebook outlines a variety of ongoing projects that would have a significant and positive impact on the sustainability program. These projects were either identified by me during my internship or suggested by the zoo’s sustainability staff.

A variety of these projects fit the need of the sustainability program and would also complement a wide variety of a student’s academic interests. However, the intern can also propose projects if the suggested projects does not fit with his or her academic interests. This helps to ensure that the project satisfies the intern’s academic needs, while also meeting the needs of the sustainability program.

The projects I suggested for the 2015 Sustainability Internship Guidebook include:

- Creating a sustainability master plan for the zoo: For this project the intern would develop a master plan that documents the zoo’s ongoing sustainability efforts, identifying future efforts, and planning how each effort will be conducted and financed in the future. These efforts include the zoo’s green purchasing program, green building program, composting program, and more.
• **Incorporating state educational standards into Green Tours:** This project involves understanding Ohio and Kentucky’s learning standards, and finding ways to incorporate these standards into the zoo’s Green Tour to increase the amount of schools that take the tour.

• **Engaging zoo employees to participate in more sustainable behavior:** This project involves the intern identifying ways to encourage employees to act more sustainably and ways to measure behavior change.

• **Create a teen and youth leadership program:** For this project, the intern would help create a hands-on leadership program for teenagers that focuses on local conservation.

• **Identify potential development for Bowyer Farm:** This project involves outlining new development for Bowyer Farm that would be both educational for guests and profitable for the zoo.

• **Create a self-guided Green tour:** This project would allow guests to visit green hotspots around the zoo and learn on their own.

• **Create a zoo Green Building Guide:** For this project the intern would create a guide of all the zoo’s LEED-certified buildings explaining what qualifies them to be LEED.

• **Create a List of Sustainability Initiatives by Year Implemented:** Zoo employees and guests often have questions about when certain sustainability initiatives at the zoo were implemented. To provide answers to these questions promptly, the intern would create a list that provides a year-by-year breakdown of when each sustainability initiative was implemented.

*Professional Development Opportunities for the Sustainability Internship*

Throughout my internship in 2014, I had the chance to meet with various staff members around the zoo and members of the community dedicated to promoting sustainability. I felt that these encounters were an important component of my internship, and helped me gain an insight as to how sustainability has affected different departments of the zoo and other organizations in Cincinnati. I decided to make these encounters a regular responsibility of the intern. Section 2 of the guidebook provides the intern with suggested contacts both within the zoo and in Cincinnati to learn more about different areas of sustainability. It’s suggested that the intern talk to one contact each week to better understand that topic area and facilitate professional development for the intern.

The zoo employees provided in the guidebook are from different departments allowing the intern to see how the zoo’s sustainability program has affected different jobs and benefited different departments at the zoo. Through these meetings, the intern will also get the chance to learn more about how different departments in the zoo operate.

To facilitate professional development for the intern, the sustainability internship provides opportunities to network with leaders from different sustainability areas in the Cincinnati region. These networking connections are people or companies that the zoo has worked with in the past or new connections that the sustainability coordinator has approved. Networking not only
benefits the career development of the intern, but also helps to promote the zoo’s sustainability program in a positive way throughout the community.

The types of organizations the intern will be contacting are:

- Sustainability managers at local universities, such as the University of Cincinnati and Xavier University
- Renewable energy companies, such as the Greater Cincinnati Energy Alliance, the Melink Corporation, and Dovetail Solar and Wind
- Green design and architecture firms, such as Emerson Design, Flourish, and HGC Construction
- Managers of local recycling companies, like Cohen Recycling
- Urban agriculture companies, like Waterfields LLC

The sustainability intern can also attend internal Sustainability Department meetings, such as those with the Green Team. The Green Team consists of zoo employees directly related to the sustainability program and employees and volunteers interested in sustainability. During these meetings, participants are updated on the zoo’s sustainability efforts. Thus the intern can better understand the zoo’s sustainability program, and participate in brainstorming sessions to solve problems and enhance the program. Besides the Green Team meetings, interns can attend meetings about new sustainability initiatives (i.e. meetings about LEED certification) and meetings with community members. Some examples of meetings that I attended as the intern included sessions about LEED certification, composting at the zoo and in Cincinnati, and increasing community support and participation at community parks. These meetings would provide the intern with a better understanding of the specific process of executing new sustainable initiatives in a business, and how to communicate and collaborate with different community members.

3.3 Identifying and Creating Community Partners

One of the main goals of the sustainability internship is for the intern to connect with members of Cincinnati’s green community who may or may not already be associated with the Cincinnati Zoo. It is important that any new community connections fit with the zoo’s mission and vision.

Mission and Vision of the Cincinnati Zoo & Botanical Garden

“The mission and vision of the Cincinnati Zoo & Botanical Garden is dedicated to creating adventure, conveying knowledge, conserving nature, and serving the community.”

“With the addition of our fourth pillar to our Mission Statement, Serving Community, we recognize the responsibility to partner with diverse and economically challenged communities in our daily work.”

Figure 3.2 The mission and vision of the Cincinnati Zoo and Botanical Garden (Cincinnati Zoo and Botanical Garden (b) 2014).
Partnerships with other sustainability organizations or leaders within the community can provide a framework to encourage individuals to become more active members of the community. Encouraging community involvement from community members involves having individuals form bonds with one another and become involved with local organizations (Loza 2004). Building these relationships will not only help the sustainability intern network, but it will also foster connections between the zoo and the community that promote the adoption of sustainable living.

Finding Partners

To identify organizations or individuals that the sustainability intern could connect with, I explored those that partnered with the zoo in the past and utilized the Green Umbrella network. Green Umbrella is a nonprofit organization made up of individuals, organizations, and companies dedicated to improving the Cincinnati region’s economy and quality of life through sustainability efforts (Green Umbrella 2013).

I then met with the zoo’s sustainability coordinator to discuss what individuals and organizations would be the best fit for the intern and the zoo. Together we generated a list spanning across multiple areas of sustainability.

Contacting Partners

After developing a list of potential partners and receiving approval from the zoo’s sustainability coordinator, I contacted each individual to ask whether they would be willing to network with the intern. Fifteen individuals responded that they were willing to participate. From these responses I generated a table for the Internship Guidebook with the names of the willing contacts, what organization they work for, whether they prefer a telephone call or a face-to-face visit, what area of sustainability they work in, and their contact information. This table is found in Section 2 of the Internship Guidebook under the weekly responsibilities of the intern.

3.4 Managing Teenage Volunteers

One of the main responsibilities for the sustainability intern is to train and supervise the Green VolunTeens. It is important for the intern to understand how to best work with teenage volunteers and how to facilitate the development of certain skills that will benefit the teens in the future. Because of this, I conducted research on teenage volunteers, especially in the nonprofit setting, to include tools to help the intern best manage the Green VolunTeen Program.

Research on Volunteers in a Nonprofit Setting

One of the most distinctive, critical, and advantageous features of the nonprofit sector is its volunteers. Nonprofits often have limited resources and volunteers help to meet a variety of needs while furthering the organization’s goals (Rehnborg, et al. 2009). Volunteers donating their time can also save nonprofits a lot of money. For example, volunteers contributed more than $150 billion worth of service hours to communities in 2006 (Corporation for National and Community Service 2007).
Volunteers decide to work for nonprofit organizations because these organizations provide a way for individuals to become an active member of their community and feel that they are making a difference (Walters and Bortree 2010). Since the 1990s there has been a growth in volunteering, in a large part due to an increase in teenagers who volunteer. According to one study, it’s estimated that 15.5 million teenagers volunteer over 1 billion hours yearly. Despite this, organizations have low teenage volunteer retention rates (Walters and Bortree 2010). This makes it important for volunteer coordinators to incorporate strategies that aid in retaining teenagers in their volunteer programs.

Volunteering is important for teenagers because those who volunteer display better understanding of social responsibility, are more empathetic, and are more prepared for the workplace (Lakin and Mahoney 2006, McGuire and Gamble 2006, Walters and Bortree 2010). Despite these positive outcomes, teenager volunteerism often depends logistically on where it is feasible for them to volunteer. A study by Sundeen and Raskoff (2000) found that that teenagers volunteer for several reasons, including satisfying school requirements, joining family or friends who are volunteering, giving back to an organization the teen has already been involved with, and also the desire to find their own opportunity to give back. Teenagers report reasons for not volunteering as lack of available opportunities, no interest in volunteering, volunteer program age restrictions, transportation restrictions, and not enough information about how to get involved (Sundeen and Raskoff 2000).

Due to the logistical problems that can keep teenagers from volunteering, it is very important for volunteer coordinators at nonprofit organizations to create volunteer programs aimed at increasing the retention rate of teenage volunteers. To do this, these programs should be focused on trust, commitment, and satisfaction. One study revealed that allowing volunteers to be a part of making decisions for the organization and keeping volunteers updated with information about the organization’s efforts resulted in the volunteers evaluating their relationship with the nonprofit as more satisfactory. Creating a more inclusive volunteer program helps to ensure a higher retention rate of teen volunteers who have a dedicated work ethic and are committed to improving and educating the community (Walters and Bortree 2010).

Green VolunTeen Program at the Cincinnati Zoo

Institutions accredited by the Association of Zoos and Aquariums (AZA) are visited by 175 million visitors annually, making them ideal locations to provide education about sustainability (Association of Zoos and Aquariums 2013). Visits to zoos have been shown to strengthen visitor’s connections to nature and prompt visitors to view environmental problems as problems they can help solve (Falk, et al. 2007). The Green VolunTeen Program is one way that the Cincinnati Zoo tries to increase visitors’ understanding of environmental problems and explain how they can help resolve the problems through living a more sustainable lifestyle.

The program was started in 2012 and is offered during the summer to teenagers ages 13-17 with a passion for the environment and sustainability. Throughout the summer the teens rotate across different interpretive stations throughout the zoo to share the zoo’s green story with the public.
and encouraging guests to go green (figure 3.3). These stations include the Go Green Garden, an exhibit dedicated to providing a snapshot about how the zoo has gone green; teaching vermicomposting at the Insect World Exhibit; informing guests about local food at the Aquaponics Greenhouse; and educating about waste management at the zoo’s Base Camp Café. Staffing these stations provide an opportunity for the teenage participants to develop skills such as public speaking, community engagement and education, becoming knowledgeable in sustainability, gardening, and leadership.

**Figure 3.3** The World of Insect exhibit and Aquaponics Greenhouse. These are two locations where Green VolunTeens are stationed throughout the zoo to teach sustainability concepts to guests (Zoocat 2009, ElementsPro LLC n.d.).

Teen volunteer programs at zoos, such as the zoo’s Green VolunTeen Program, have been shown to increase teen’s scientific proficiency and confidence. This study also showed that youth volunteers can effectively engage zoo visitors in accurate conversations about environmental issues (Matiasek, et al. 2013). This suggests that the Green VolunTeen Program at the Cincinnati zoo could be an effective tool for communicating sustainability messages to the public.

**Incorporating Interpretive Skills into the Internship Guidebook**

The sustainability intern has to ensure that each Green VolunTeen develops new skills, has a good understanding of sustainability, and is properly trained on each station. Thus, it is important for the sustainability intern to cultivate certain skills in the Green VolunTeens they are supervising. For example, there is a list of “21st Century Skills” that outline the skills indicative of student success in the current age of information. These skills include “critical thinking and problem solving, creativity and innovation, communication and collaboration, scientific and numerical literacy, cross-disciplinary thinking, environmental literacy, and leadership and responsibility” (Institute of Museum and Library Services 2009).

To help the Green VolunTeens develop these skills and learn more about the field of sustainability, the intern will teach the teens about a sustainability topic and model how to communicate this topic to the public at different exhibits throughout the zoo. Section 2 of the Internship Guidebook provides the intern with an overview of different sustainability areas and where throughout the zoo sustainability initiatives have been implemented. For example if the
topic is stormwater management, the Internship Guidebook provides an overview of problems related to stormwater management and the different places throughout the zoo there are visible stormwater management efforts. One of the places described in the guidebook is the stormwater retention tanks under the Africa exhibit (figure 3.4). At this exhibit, the intern can give a detailed explanation about Cincinnati’s stormwater problem and how the zoo has installed retention tanks under the Africa exhibit to manage and utilize stormwater runoff. This one-on-one coaching enables the volunteer to expand their knowledge about sustainability while also learning public speaking skills.

![Figure 3.4 Before and after photos of Cincinnati Zoo's Africa exhibit. The left picture shows the stormwater retention tanks installed underneath our Africa Exhibit that can harness 13 million gallons of rainwater per year. The right picture shows how the finished (Cifuentes 2013).](image)

Besides modeling different sustainability topics for the teens, the intern will also model each station where the teens will be located. During my time as the sustainability intern, the Green VolunTeens relayed that seeing someone model each station made them feel more confident about speaking with guests. With this in mind, Section 3 of the Internship Guidebook provides a breakdown of each station, how the Green VolunTeens are expected to manage each station, and the important supplies that should be at each station. This information allows for the intern to know how to properly train the Green VolunTeens and be able model the behaviors they are expected to portray to guests.
Chapter 4: Recommendations for the Enhancing the Sustainability Internship

My goal in creating the Internship Guidebook was to create a manual that outlined 1) learning objectives for the internship, 2) internship responsibilities, 3) information on how to network and connect with local sustainability leaders and the community, and 4) ideas for potential ongoing projects the intern could work on throughout the summer. While I feel I successfully incorporated these elements into the guidebook, I have created a list of recommendation aimed at ensuring the continued advancement and growth of the Cincinnati Zoo’s sustainability internship and sustainability program. These recommendations are based on my time as the sustainability intern and my experience creating the Sustainability Internship Guidebook. The recommendations include:

- Prioritize the potential ongoing projects the intern could work on based on the project’s ability to further the intern’s professional development and the development of the Cincinnati Zoo sustainability program
- Continue to develop the Green VolunTeen program
- Further develop the networking component of the sustainability internship
- Update the Internship Guidebook and other manuals at the end of each internship

4.1 Prioritize Potential Ongoing Projects

The additional projects the intern can choose to work on will help to enhance his or her experience, help them feel a sense of ownership of the zoo, and increase internship satisfaction. To help guide the intern in choosing a project, I recommend the projects are prioritized based on the substantiality of the project and how the project benefits the intern and the zoo’s sustainability program. Of the list of eight projects in Section 4 of the guidebook, there are three projects that I believe would best benefit the intern’s career development while also furthering the zoo’s sustainability program. The three potential projects I recommend include:

- Create a Sustainability Master Plan
- Motivate employee engagement in sustainability efforts
- Tailor Green Tours to incorporate state educational standards

Priority Project #1: Create a Sustainability Master Plan

The Cincinnati Zoo has created a very comprehensive sustainability program; however, there is not a written plan for future development. A sustainability master plan provides a guide for an organization and its partners to work on the completion of sustainability projects. The plan could be used to promote future sustainability initiatives to potential partners. It can also be used to plan out the management of sustainability projects for future years. This can include planning out what resources each project needs, identify the steps that need to be taken to ensure the sustainability projects continue to succeed, and identify the people needed to oversee the management of each sustainability project (US Department of Labor Employment and Training Division 2012).
A sustainability master plan for the Cincinnati Zoo could document the zoo’s ongoing sustainability efforts, identify future efforts, and plan how each effort would be conducted and financed in the future. These efforts include the zoo’s green purchasing program, green building program, composting program, and more.

Writing a master plan would allow the sustainability intern to understand the decision making process an organization goes through before executing a sustainability initiative and how the organization plans for the future. The intern will also further develop writing, communicating, and planning skills.

**Priority Project # 2: Motivate Other Employees to Participate in Sustainability Efforts**

Tackling environmental issues requires change at every level. For the zoo’s sustainability initiatives to be the most successful, they need the backing of the employees. For employees to change their behavior, they have to understand the reasons for the change, and believe it is worth it (Eccles, Miller Perkins and Serafeim 2012). If employees understand how the zoo’s sustainability program benefits them, the animals, and the community they will be more willing to participate in sustainability efforts and encourage guests to do the same.

One technique the zoo could use to encourage sustainable behavior from its employees is Community Based Social Marketing (CBSM). CBSM combines principles from psychology and marketing to promote sustainable behavior. These principles include:

- **Identify the Wanted Sustainable Behavior**: The zoo needs to identify what employee behaviors need to be changed to enhance the success of the sustainability program.
- **Identify the Barriers and Benefits of Sustainable Behavior**: To facilitate behavior change, first the zoo has to recognize what is preventing the employees from adopting sustainable behavior. They also need to identify how changing the employees’ behavior benefits both the zoo and the employees.
- **Develop Programs to Promote Sustainable Behavior**: Once the barriers and benefits are understood, then the zoo can begin designing a program aimed at convincing employees to adopt more sustainable behavior (McKenzie-Mohr 2011).

Adopting some of these strategies to communicate about sustainability efforts to employees, is one way to identify why employees are resisting sustainability efforts and help foster change.

Working on this project allows the intern to gain an understanding of how to create a communication plan that effectively targets the behavior of employees working in the nonprofit sector. It will also help them develop marketing and communication skills that generate discussion and promote information that helps to create a work place environment that is conducive to behavioral change.
Priority Project #3: Tailor Green Tours to Incorporate State Educational Standards

Green tours at the zoo are given to school groups of all ages. However, the tours could become more attractive to local schools if they were tailored to meet the Kentucky and Ohio state educational standards. The American Zoological Society promotes that accredited zoos actively align their programs to fit with national and state educational standards (Association of Zoos and Aquariums 2013). The Cincinnati Zoo has already incorporated Ohio and Kentucky educational standards into some of their educational programs (Cincinnati Zoo and Botanical Garden 2013). If the Green Tours were also adapted to incorporate some of the learning standards, schools would be more inclined to take field trips to the zoo for a green tour.

This project would be well suited for an intern that is interested in environmental education. Incorporating state educational standards is important for any program that involves grade school or high school students. Having a well-rounded understanding of these benchmarks is important for anyone considering a career in environmental education.

4.2 Continue to Develop the Green VolunTeen Program

The Cincinnati’s Green VolunTeen Program is an excellent way for teenagers to gain public speaking skills and learn more about community engagement and environmental sustainability. Currently, the teens rotate between three to four stations. However, there are a variety of exhibits around the zoo that are great opportunities to teach guests about sustainability. Adding new stations would be an excellent way to create more learning and development opportunities for the Green VolunTeens and educational opportunities for zoo guests.

In Section 4 of the Internship Guidebook I provided recommendations for 10 new stations. Of these 10 stations there are four that I believe would best present the opportunity to increase the Green VolunTeen’s skills. The four stations are swan lake/wetland trails, the painted dog exhibit, the cougar exhibit, and the American black bear exhibit (figure 4.1).

Three of these, swan lake/wetland trails, the cougar exhibit, and the American black bear exhibit, are all based in North America. Adding a sustainability component to these would allow guests to learn about...
sustainability across America. Using local examples to teach about sustainability helps people to view environmental and sustainability issues as more personal and relevant topics (Murray 2011). The fourth exhibit I recommend features African painted dogs. This would be an ideal exhibit because the building and outdoor exhibit space may soon be certified as a Living Building. A Living Building is a building that produces all its energy through renewable resources and captures and treats its water while maintaining an appealing aesthetic and operating efficiently (Gordon 2009). This makes it a good exhibit for the Green VolunTeens to explain to guests about the unique aspects of this exhibit and the success of the zoo’s sustainability program.

4.3 Further the Networking Component of the Sustainability Internship

Having networking be a primary part of the sustainability internship is beneficial both for the intern and for the zoo. Networking with other people in the sustainability field in the region allows for the intern to learn more about different areas of sustainability while also strengthening and making new connections for the zoo. The intern gets to experience other possible careers in the field and gain confidence in their ability to network with professionals. Networking is a learned skill, practicing how to talk with professionals is a vital skill that will help further the intern’s career development (Forret and Dougherty 2004).

The networking component is also an important opportunity for the zoo. The implementation of many sustainability efforts requires the efforts of more than one organization. The Cincinnati Zoo has partnered with other organizations like the Metropolitan Sewer District of Greater Cincinnati (see figure 4.2) and the Melink Corporation to fund and install stormwater and renewable energy efforts. Continuing to strengthen ties and create new ties with organizations in the region could become important connections in the future of the sustainability program.

4.4 Update the Sustainability Internship Guidebook

To ensure that the Internship Guidebook and other manuals remain up to date, each should be edited at the end of the internship. I recommend that the last week of the internship be dedicated to the intern updating the Internship Guidebook, Green Tour Guide, and Green VolunTeen Manual. This is also a good time to evaluate the intern’s time at the zoo. The zoo can provide the intern with feedback about their performance and the intern can provide recommendations about how to improve the internship for future years.
Chapter 5: Practicum Reflection

For this practicum project, I was responsible for creating a Sustainability Internship Guidebook for the Cincinnati Zoo and Botanical Garden. The zoo’s sustainability coordinator requested a guidebook that would outline the history and success of the zoo’s sustainability program, provide a structured framework of weekly responsibilities and goals for the intern, and create opportunities for networking and career development. I feel that the guidebook provides sufficient information and opportunities for the intern to accomplish these goals and for the sustainability internship to become a staple part of the zoo’s Sustainability Department.

Completing this practicum project provided me with a variety of experiences that helped me gain a deeper understanding of the sustainability field and develop skills that I will carry with me into my career. I gained extensive knowledge of the different types of currently available sustainable initiatives that can be implemented to reduce an organization's environmental impact and save the organization money. I also got to experience the decision making process an organization goes through when deciding whether or not implementing a new sustainability project will be a worthwhile investment. This includes evaluating whether the project will be financially feasible, increase operational performance, encourage sustainable behavior from employees, and improve the organization's reputation to stakeholders.

To create an Internship Guidebook that included all the necessary information and accurately reflects the zoo’s sustainability program, I worked closely with the sustainability coordinator. This allowed me to learn more about the job responsibilities of this type of position and the skills necessary to work in this type of position. The hands-on experience that went into creating and writing the Internship Guidebook helped me to develop some of these professional skills. I developed important networking skills as I identified contacts for the Internship in the Cincinnati region. I also learned how to write and organize a guidebook that is easy to follow while providing an adequate amount of information. Finally, I learned how to effectively manage volunteer programs and teach volunteers how to effectively communicate environmental issues to the public.

Being a part of the IES program and completing this practicum project has been very rewarding and provided me with a foundation of knowledge and skills that I will continue to develop. I will use this foundation to continue to educate others and promote sustainability.
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CINCINNATI ZOO AND BOTANICAL GARDEN
Sustainability Internship

Summer 2015
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Introduction to the Cincinnati Zoo and Botanical Garden’s Sustainability Program

Welcome to the Cincinnati Zoo!

We are excited to have you on board as a Sustainability Intern this summer. The Cincinnati Zoo is the “Greenest Zoo in America” and as the sustainability intern it is your responsibility to help educate volunteers, visitors, and the community about the zoo’s green story and encourage them to join us in going green. Throughout the summer, you will be responsible for a variety of tasks aimed at furthering the zoo’s sustainability program and educating visitors about the benefits of going green, while also furthering your understanding of the sustainability field and developing professional skills that will benefit you in your future career.

This guidebook is designed to assist you in successfully performing your responsibilities and duties as an intern in the Sustainability Department. Please read the guidebook carefully; it provides information and resources pertaining to the tasks that you are expected to complete over the course of the summer. We look forward to the summer with you and making this internship a beneficial experience for both you and the zoo!

Be Green,

Fia Cifuentes
Sustainability Coordinator
Cincinnati Zoo and Botanical Garden
Internship Expectations
The internship responsibilities and learning objectives include:

- Understanding all the aspects of the zoo’s sustainability program
- Learning how to communicate effectively about sustainability to different audiences
- Managing the zoo’s Green Teen Program
- Conducting Green Tours
- Giving Aquaponics Keeper Chats
- Editing and updating documents and website pages pertaining to the zoo’s sustainability program
- Writing for the zoo’s blog
- Aiding in the completion of larger sustainability projects
- Working with the local community to promote sustainable living and strengthen the zoo’s connection with the community
- Networking with local sustainability leaders to gain a better understanding of the different areas within the sustainability field

Over the course of the next 12 to 14 weeks you will gain an in-depth understanding of each area in which the Cincinnati Zoo has implemented sustainability initiatives. Every week of the internship will focus on a specific sustainability topic relating to the zoo’s sustainability program. These topics are:

- **Weeks 1-2**: Getting to know the Zoo and Sustainability Overview
- **Weeks 3-4**: Water Conservation and Stormwater Management
- **Weeks 5-6**: Energy Efficiency and Renewable Energy
- **Weeks 7-8**: Green Building and Transportation
- **Weeks 9-10**: Waste Management and Land Degradation
- **Weeks 11-12**: Local Food and Community Outreach

History of the Sustainability Program
Since its opening in 1875, the Cincinnati Zoo and Botanical Garden has been dedicated to the conservation of plants and animals. The zoo was founded on 65 acres in the middle of Cincinnati and had a very small original animal collection. Despite beginning with a small collection, the zoo has had a very successful at captive breeding program, beginning with endangered trumpeter swans and sea lions back in the 1880s and continuing with the establishment of the Lindner Center for Conservation and Research of Endangered Wildlife (CREW) in 1986. Now the zoo’s collection has grown to include over 200 animals and 3,000 species of plants\(^1\). We are also dedicated to the preservation of plants and species native to Ohio. Bowyer Farm is a 520 acre farm located in Mason, OH that was donated to the zoo in the 1990s and has since grown to 650 acres. We are currently restoring this former farm back to its native habitat,
including reclaiming 24 acres back to its natural wetland state. Already, the restoration has resulted in the reintroduction of 125 bird species and 200 native plants.\(^2\)

In 2006, we furthered our dedication to conservation by making a formal commitment to aggressively pursue environmental stewardship and develop a strong sustainability program. We recognize that the conservation of natural resources is critical to saving wildlife and their habitats. Today, we have a comprehensive and robust sustainability program that focuses on **energy efficiency, water conservation, storm water management, waste management, sustainable design and construction, and community outreach.** The program has been so effective that despite being the second oldest zoo in America, we were declared the “Greenest Zoo in America” in 2010.\(^3\)

Our sustainability efforts began with the designing of the Harold C. Schott Education Center (figure 1). To save money and minimize environmental impact the building was designed to Leadership in Energy and Environmental Design (LEED) Silver standards. The Harold C. Schott Education Center was not only the first LEED silver building at the Cincinnati Zoo; it was the first LEED silver project in Cincinnati.\(^4\) The success of this building prompted the commitment that all future buildings be constructed to at least LEED silver standards. From there, an inspired and ambitious facilities director was appointed who formed a “Green Team” composed of zoo volunteers with various backgrounds and expertise in project management, solid waste, engineering, and water, as well as key staff members involved in different areas of the zoo, and a new sustainability program was born. The Green Team meets every month to discuss projects and work out a plan to accomplish them. They tackle tasks like researching for grants, talking with keepers and other staff about their day-to-day habits, and doing the “dirty work” such as dumpster diving “audits” in an effort to stay up to date with our practices.

The goals for our sustainability program are straightforward. The aim is to reduce our carbon footprint and the use of natural resources, thus reducing costs, while maintaining world-class care for the animals and plants. We set out to achieve these goals by focusing on reducing water and energy consumption, become a zero landfill facility, ensure all new construction projects reach a minimum of LEED silver standards, and decreasing its carbon footprint.
Since the implementation of the sustainability program in 2006, we have seen remarkable results. We invested around $2 million into the sustainability program, but saved more than $5.6 million in the process. In 2013, we spent $350,000 less for utilities than in 2005, despite having 25% more buildings, 50% more visitors, and doubled water rates. There have been no detrimental effects of the sustainability initiatives to any of our systems (HVAC, electrical, Life Support). The program has also resulted in better water quality, better lighting, better space conditioning, and less waste.

Besides saving us money, improving our performance, and reducing our impact on the environment, the sustainability efforts have also led us to take action to promote sustainable living, strengthen relationships, and support the local Avondale community immediately surrounding the zoo. This area is recognized as a “food desert” (figure 2)\(^5,6\). Food deserts are urban or rural communities do not have easy accessibility to quality, healthy, affordable food\(^7\). To combat this problem the zoo has turned vacant lots into safe and vibrant parks and urban farms and partnered with a local community kitchen to provide a place where residents can obtain fresh, healthy and affordable food (figure 3). These efforts have not only addressed local food issues for the immediate community neighbors, but also allows us to have a tighter grasp on our own food sourcing for animals and guests.

![Food deserts](image)

**Figure 2** Map of Cincinnati indicating Avondale as a Food Desert
The sustainability initiatives described above are just one side of our sustainability commitment. The other side includes sharing this information with the 1.3 million annual people who visit the park each year. Through education programs, signage, exhibits, green tours, and their website, we provide as much information as possible about what they are doing, why they are doing it, how it affects the environment, and how visitors can be green at home or at school.

One key education exhibit is the Go Green Garden at the main entry – an exhibit dedicated to our sustainability efforts (figure 4). It not only highlights our sustainability efforts, but it also explains how individuals can do the same at home. During the summer months, the exhibit is staffed mainly by Green VolunTeens – a teen volunteer program. The program is designed to engage visitors with direct dialogue and provide the teens with leadership opportunities.

The key to the success of our program has been a common sense, no-excuses, practical approach coupled with dedication across all parts of the zoo’s staff, administration, and board. This resulted in a transformation of the entire institution – aesthetically, financially, and culturally.

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**Figure 3** Two of the Cincinnati Zoo’s efforts to combat the Avondale community’s lack of access to food. The left picture depicts volunteers turning a vacant lot in Avondale into a community park and garden. The right photo shows the hoop house and container garden.

**Figure 4** The Go Green Garden exhibit. At this exhibit guests can learn about the Zoo’s sustainability program and how to live a greener lifestyle.
Internship Topics and Weekly Schedule

Overview
In order for you to get an in depth understanding of different areas of sustainability, every week of the internship will be broken down by topics that correspond with the zoo’s sustainability program. For each topic, you will have the chance to:

- Learn about different sustainability areas and efforts
- Interview sustainability leaders and visit companies within the Cincinnati region that are successful in the topic area
- Speak with zoo employees to learn how sustainability initiatives have affected their jobs and the animals’ well-being
- Create informational materials and activities that increase the community’s knowledge about green living
- Write and edit documents pertaining to the zoo’s sustainability program
- Talk to visitors and members of the community about the importance of sustainability

Weekly Calendar
In order to help you understand our sustainability program, each weekly topic is outlined with a learning objective, an overview to that topic, the efforts we have implemented pertaining to this topic, and a map of where these efforts are located at the zoo or in the community. Following the introduction to each topic, information is provided about your weekly responsibilities. These responsibilities include conducting Green Tours, giving Aquaponics Keeper Chats, interviewing local sustainability leaders, and community engagement. The expectations for each responsibility are fully explained and there is a checklist and list of important supplies to help you complete your responsibilities.
Weeks 1–2: Get to Know the Zoo and General Sustainability

This is your time to get familiar with the layout of the Cincinnati Zoo and our sustainability program! The Green Teens first week isn’t until June, so this allows you to learn your way around the zoo and read about the program. The Green Tour Guide and Green Teen Guidebook (found in Section 5: Resource Documents) are two important resources for you to study during this time. They provide an in-depth look into the zoo’s Sustainability Program and the information that you will need to review with the Green Teens. Also, look at the Green Hotspot Maps (located in Section 5) to see where some of the zoo’s more visible sustainable initiatives are located.
Besides learning the layout of the zoo, you should also take some time to learn more about sustainability in general. Below are some readings that can help you learn more about the importance of sustainability and green living:

- *Ready, Set, Green* by Graham Hill and Meaghan O’Neil (Book)
- *Fostering Sustainable Behavior* by Doug Mckenzie-Mohr (Book)
- *A Slice of Organic Life* by Sheherazade Goldsmith (Book)
- *The Role of Organic Parks for the Sustainable City* by Anna Chiesura (Journal Article)
- *The Effect of Environmental Concern on Environmentally Friendly Consumer Behavior* by Ann P. Minton and Randall L. Rose (Journal Article)

All of these readings can either be found in Fia’s office or she can provide you access to them online.
Weeks 3–4: Water Conservation and Stormwater Management

The Cincinnati Zoo and Botanical Garden is a large consumer of water in Cincinnati. With over 3,000 plants and 200 animals that need water to survive, it’s easy to see why. In 2005, the zoo used over 220 million gallons of water. Consuming that much water is not only unsustainable, but it cost the zoo over $600,000 per year. In order to reduce water consumption, we became aggressive about fixing leaks, improving systems, and working with staff to change consumption behavior. These changes led us to consume only 52 million gallons of water in 2014, a saving of over 166 million gallons of water!

Not only is the zoo a large consumer of water, but also is a part of Cincinnati’s Metropolitan Sewer District. Cincinnati has the oldest sewer system in the country, operating on a combined sewer overflow. This means that everything from wastewater to tap water flows down the same drainage pipe. In times of heavy rain, the water treatment facility can’t handle the large influx of water. This results in an estimated 15 billion gallons of raw sewage flowing into the Ohio River each year! Recognizing that the zoo’s 69+ acres contributes to this significant environmental challenge, we work to manage our storm water as effectively as possible. We have partnered with the local sewer district to take a large amount of our acreage off the storm water grid. Captured rainwater is used for irrigation, lake level management, and specific water exhibits.

Water Conservation and Stormwater Management at the Zoo

At the Cincinnati Zoo, efforts both large and small have been employed to conserve water and reduce stormwater runoff. These efforts include the following:
Water Reduction Projects

- Fixing dozens of water line leaks
- Installing timer-activated valves on over 100 fill systems
- Upgrading all major water filtration systems
- Upgrade fixtures to low flow, as well as automatic in most restrooms
- Fixing leaking concrete pools
- Worked with staff to modify how and when they clean their animal facilities

Stormwater Retention Tanks

- 13 million gallon retention tanks located under the Africa exhibit
- 1 million gallon retention tank in the main entry
- The captured rainfall is filtered and reused in large water exhibits and for irrigation

Stormwater Projects

- Rain gardens can be found at the Go Green Garden, Education Center, and the Vine Street Parking Lot
- Rain barrels are located throughout the zoo
- More than 30,000 square feet of pervious pavement
- Two green roofs - a 2,400 square foot green roof on top of Giraffe Ridge Barn and one on top of the Primate Center
- Bioswales
Map of the Visible Water Reduction and Stormwater Management Projects

- Plumbing Upgrades
- Aquaponics Greenhouse
- Stormwater Retention Tanks
- Pervious Pavement
- Stormwater Retention Tank
- Rain Gardens
- Green Roof
- Pervious Pavement
Week 5 – Energy Efficiency
Objective: To become familiar with the importance of energy efficiency, how the Zoo has increased their energy efficiency, and practice communicating about energy efficiency to the public.

Week 6 – Renewable Energy
Objective: To understand different renewable energy sources, what renewable energy sources the Zoo uses, and how the Zoo partnered with other organizations to implement these sources.

Weeks 5–6: Energy Efficiency and Renewable Energy
Generating electricity to build and maintain buildings accounts for nearly 40% of the total energy used in the United States. At the zoo, energy is the second biggest cost after employees. In order to reduce this cost, we upgraded old, inefficient equipment and challenged the staff to rethink how they operate their buildings to be more sustainable. The process involved conducting an in-house energy audit - walking through each building with the staff members who work there on a daily basis to find out what equipment was used, what was not being used, what was needed, what could be changed or improved.

Not only have we taken steps to reduce the amount of energy used in buildings, but also, we have implemented advanced, renewable energy installations throughout our park. Collectively, the renewable energy capacity of the Cincinnati Zoo & Botanical Garden totals to more than all other Association of Zoos and Aquariums (AZA) institutions in the country combined…by a lot. Our commitment to clean, renewable energy is unsurpassed in our industry, and it is our hope that with our success, we can inspire others to follow suit.

Energy Conservation and Renewable Energy at the Zoo
The zoo has drastically reduced energy usage by taking a number of different energy efficient and renewable energy steps. These steps include:
Energy Efficiency Projects

- Upgraded to energy efficient light fixtures, and placing them on motion sensors
- Replaced old equipment with more efficient boilers, furnaces, water heaters, refrigerators and freezers
- Unplugged any equipment that was not in use on a regular basis
- Used heating, ventilating and cooling systems that employ energy management equipment and software
- Switched to incandescent lights to LED lights for our Festival of Lights, reducing energy usage by 75%

Renewable Energy Projects

- A 20kw solar photovoltaic (PV) array at our Education Center
- A 10kw solar PV array at our main entry
- 35 kw solar array at the African Painted Dog exhibit
- A 200,000-btu solar thermal unit for our main visitor restrooms
- A 1.2kw wind turbine at our main entry
- 40 geothermal wells at our main entry
- Geothermal wells at African Painted Dog exhibit

Melink Solar Array

- Our main parking lot has the largest urban, publicly accessible solar array in the nation at 1.6mw
- Covers 80% of the 14-acre parking lot
- Provides on average 20% of the zoo’s total electricity needs
- On cool, sunny days can actually produce more power than needed
Map of the Visible Energy Efficiency and Renewable Energy Projects
Week 7 – Green Building
Objective: To become familiar with the requirements of LEED and Living Building Challenge and understand what the Zoo has done/ is currently doing to green different buildings.

Week 8 – Transportation
Objective: To learn about different types of alternative transportation and identify what types of alternative transportation could be used by Zoo employees and guests.

Weeks 7–8: Green Building and Transportation

One of the most significant impacts that we can have on our carbon footprint and our long-term bottom line is the way we design, build, and maintain our buildings. The Cincinnati Zoo was the first zoo to publically commit to building all new projects to a minimum of LEED Silver standards and now has more third party-verified green buildings than any other American Zoological Association (AZA) institution. These projects showcase green building at its finest – advanced energy systems, exceptionally well insulated and efficient buildings, complete storm water capture and reuse, and much more.

Currently, we are pursuing an even more ambitious sustainability certification than LEED. We are attempting to certify our African Painted Dog exhibit as a Living Building through the Living Building Challenge. A Living Building is a building that produces all its energy through renewable resources and captures and treats its water while maintaining an appealing aesthetic and operating efficiently. This is one of the most advanced certifications of sustainability and it would make the exhibit one of the greenest buildings in the country.

Besides new construction, we also make sure our renovations and remodels have a sustainability focus to them as well. Any time we can update or replace old equipment and building materials with a more sustainable version, we do. Our main restaurant, Base Camp Café, was remodeled in winter 2013. After the remodel it received a 4-star Green Restaurant Certification, which has similar qualifications as LEED. Only 14 other restaurants in the country have a 4-star rating, and Base Camp Café earned more points than any other.

Being located in the middle of Cincinnati, the zoo has a limited amount of parking. This makes it important for the zoo to promote alternative transportation both for a healthy environment and efficient parking. A metro bus
stop is located directly across from the zoo and Cincy Red Bike, a bike share program, installed a station in the main zoo parking lot. The zoo is also brainstorming programs to encourage carpooling between employees and among guests.

Green Building and Transportation at the Zoo

At the zoo, we recognize that the majority of an organization’s carbon footprint lies in its buildings and utilities. Because of this, the zoo is committed to building all new projects to LEED Silver standards. We also recognize that transportation is the leading source of carbon dioxide emissions. Some of our efforts to reduce building and transportation emissions include:

**LEED Certified Buildings**

- Harold C. Schott Education Center – LEED Silver, 2006
- Historic Vine Street Village – LEED Platinum, 2009 (which includes the Go Green Garden Exhibit, the Welcome Center and Membership & Ticketing)
- Zoo Pavilion – LEED Gold, 2009
- Zoo Gift Shop – LEED Gold, 2010
- Cat Canyon – LEED Gold, 2012
- Distribution Center – LEED Silver, 2012
- Africa – anticipated LEED Gold
- African Painted Dog – anticipated Living Building Challenge certification
- Base Camp Café – 4 star Green Certified by the Green Restaurant Association

**Green Materials**

- No or low VOC paint
- Bamboo flooring
- 100% recycled carpet
- Strawboard countertops
- Recycled steel
- Recycled drywall
- Plastic lumber

**Alternative Transportation**

- Red Bike Station
- 7 electric vehicle car chargers in the Vine St. parking lot
- Metro stop next to the zoo’s main entrance
- Biofuel to fuel train
Map of the Visible Green Building and Transportation Projects

- Biofuel, Zoo Train
- LBC Certified, Painted Dog Exhibit
- GRA 4 Star, Base Camp Cafe
- LEED Gold, Africa
- LEED Gold, Historic Vine Street Village
- LEED Platinum, Historic Vine Street Village
- LEED Gold, Zoo Pavilion
- LEED Gold, Cat Canyon
- LEED Gold, Zoo Gift Shop
- LBC Certified, Painted Dog Exhibit
- Metro Bus Stop
- Red Bike Station and Bike Racks
- LEED Gold, Africa
- LEED Silver, Harold C. Schott Education
- LEED Gold, Africa
- LEED Gold, Cat Canyon
- LEED Gold, Zoo Gift Shop
Week 9 – Solid Waste Management
Objective: To understand what it takes to become a zero waste landfill facility and what the Zoo is doing to achieve this goal.

Week 10 – Land Stewardship
Objective: To learn about the responsible planning and management of land resources. To understand what the Zoo has done to preserve land at Bowyer Farm.

Weeks 9–10: Solid Waste Management and Land Stewardship

The Cincinnati Zoo is committed to diverting as much waste as possible from the landfill. Most recently, we began to examine every waste stream in the zoo and looked at how we could reduce that waste through reduction, reuse, recycling, or composting. We also have the goal of becoming a zero waste landfill facility. In the past, our animals have also contributed to our waste management program in a big way. We partnered with a local farm to compost all of our organic waste – sending approximately 10 tons of manure, bedding and food waste per week to this Class 2 composting facility. The composting program started in 2011 with just 3 main exhibits, and then spread to every area in the zoo. However, in the summer of 2014 the composting facility stopped accepting compost. This has presented us with a unique opportunity to try and begin composting on Bowyer farm located in Mason, Ohio. Completing this project is something we want to do right, meaning it will take some time. Until the new composting facility is completed, we are being as transparent with the public as possible and communicating openly about the issue of composting in Cincinnati.

The Cincinnati Zoo is also committed to land stewardship. On Bowyer farm, the zoo has restored 24 acres of farmland into its original state of a wet sedge meadow, or wetland, eventually returning the floral and faunal diversity that once was there. The main goal is to return the area to its original wildlife, with a rich array of plant and animal species that historically are naturally occurring to Warren County. Eventually, as the wetlands become established, walking trails and a small education center may be implemented, along with special events that offer educational programs and demonstrations, opportunities to explore the wetland, and much more.
The zoo also encourages the community to be land stewards by hosting native plant sales and talks to educate about how to best increase the diversity and functionality of native plants in yards and gardens.

**Solid Waste Management and Land Stewardship at the Zoo**

In order to reduce waste and preserve land, the zoo is committed to diverting waste from landfills and restoring native land. Solid waste management and land stewardship programs include:

### Recycling Programs

- Collect paper, plastics, and glass from over 150 recycling bins throughout the park
- Have special programs to recycle batteries, flat Styrofoam, all electronic-waste, motor oil, light bulbs, kitchen grease, printer cartridges, broken animal crates, and more
- Our Ecocell recycling program has recovered over 25,000 cell phones per year, while engaging students in elementary, middle and high schools to take action for conservation

### Composting Program

- Replaced 7 of the 12 dumpsters with our own “Organic Waste Only” dumpsters
- Almost everything served in the Café, including all plates, bowls, cups and cutlery are compostable
- Vermicomposting informational sessions are taught in Insect World

### Land Stewardship

- Wetland reclamation at Bowyer Farm
- Native plant education and sales
Map of the Location of Bowyer Farm in Relation to the Cincinnati Zoo
Local Food and Community Outreach

Week 11 – Local Food
Objective: To understand how sustainable food production and consumption can enhance the environmental and social health of a community. To learn about how the Zoo integrates sustainable food production into its practices and supports sustainable food efforts in the community.

Week 12 – Community Outreach
Objective: To learn how the Zoo provides outreach in the community. To develop skills associated with communicating and working with the community.

Weeks 11–12: Local Food and Community Outreach

The Cincinnati Zoo’s sustainability efforts have led to our taking action to promote sustainable living, strengthen relationships, and support the local Avondale community immediately surrounding the zoo. On grounds, we show our guests how easy it is to grow their own food through a variety of edible food gardens. Our restaurant (the greenest in America) sources all of its food locally, and our animals eat quality food in their nutritious diets. Off grounds, we support the community by helping them to get fresh food – through community gardens, marketplaces, education and awareness, and more.

The Cincinnati Zoo is seen as the unquestioned leader in sustainability in our region, and a lot of this has to do with the tremendous amount of time and effort that our organization puts into getting the word out. From hosting literally hundreds of “green groups” at our facility, to taking our show on the road, to partnering with just about every other regional sustainability group out there, to hosting the best Earth Day event in the city, we are constantly beating the drum, showing folks that this isn’t just about saving the earth, it’s about saving our collective wallets.

Local Food and Community Outreach at the Zoo

The Cincinnati Zoo is dedicated to raising awareness about local food, as well as ensuring its animals and people are eating as much local food as possible. We have programs dedicated to sourcing as much local food as possible and to educate the community about sustainability. These programs include:
Local Food

- An Aquaponics system is featured in the greenhouse next where fresh food is harvested for the Café
- Edible food gardens are located throughout the zoo and the food is harvested for the Café and for animal enrichment
- EcOhio Farm is a 600+ acre farm owned by the zoo, and connects with the mission of Adventure, Conservation, Education and Community in various ways
- Partnership with local hydroponics company, Waterfields LLC, to purchase local lettuce for our manatees

Community Outreach

- Northern-Larona Community Park was a vacant lot turned into a vibrant park by the zoo with the help of Avondale Avenue District Block Club, Avondale Community Council, Local Initiative Support Cooperation (LISC), Chase Bank and other community partners
- Gabriel’s Place is a community kitchen and garden, the zoo has been integral in assisting with the initial build and upkeep of the community garden and hoop house
- The zoo has been supporting Rockdale Academy not only with an Adopt-A-Class program, but with their composting program and Green Team as well

Map of the Location of Northern Larona Community Park, Rockdale Academy, and Gabriel’s Place in Relation to the Cincinnati Zoo
Map of the Visible Local Food Projects

- Chipotle Gardens
- Aquaponics Greenhouse
- Base Camp Cafe
- Edible Food Garden
Weekly Responsibilities

One of your weekly responsibilities is to give Aquaponics Keeper Chats to the public. The days and times are determined at the beginning of each new season. These chats are a great way to teach guests of all ages about Aquaponics while honing your public speaking skills and practicing speaking to different audiences. You will need the key for the greenhouse and Aquaponics sign, which are found in Fia’s office. You can also bring the Aquaponics Field Guide and Fact Sheet with you until you feel comfortable with the information.

The Chats are similar to an open house. You open the door to the greenhouse and invite guests to come in and learn more about Aquaponics. There are often people, especially children, looking through the glass at the fish, so don’t be shy about inviting them in! Once inside, briefly explain the process of Aquaponics to the guests and give them plenty of time to ask questions. Keep your audience in mind, older guests may be willing to hear a lot of detail and ask a lot of questions, but you might have to be more engaging with children. Try and make the learning process as fun as possible and keep them engaged by asking them questions. It’s also important to remind children not to stick their hands in the tank water or touch the plants.

It is also your responsibility to help keep the Aquaponics system clean and maintained. This involves pruning any plants, cleaning the drainage pipes, and filling up the tank water when it gets too low.
While the Cincinnati Zoo has a very extensive sustainability program, there are also many local businesses, organizations, and individuals that are dedicated to environmental sustainability. As a part of this internship, you have the opportunity to learn more about different areas of sustainability by speaking with and visiting different local companies and individuals. Each week you will have the opportunity to contact someone off a list provided on the next page that corresponds with your weekly topic. All of the individuals included in the list are more than happy to help you learn more about sustainability and are aware that you could be contacting them throughout the course of the summer.

You also have the option of attending various community meetings. Green Umbrella, a non-profit organization made up of individuals, organizations, and companies dedicated to improving the Cincinnati region’s economy and quality of life through sustainability efforts, hosts action team meetings. There are monthly meetings where anyone interested in a particular environmental topic can meet to share ideas, make connections to collaborate, and come up with strategies to promote sustainability in a certain field. The action teams include: Energy Conservation, Renewable Energy, Waste Reduction, Transportation, Land Management, Water, Local Food and Outdoor Recreation/Nature Awareness®. For a list of meeting times and locations visit Green Umbrella’s website and look at their monthly calendar: [http://www.greenumbrella.org/news-and-events/calendar](http://www.greenumbrella.org/news-and-events/calendar)

Besides talking with organizations and individuals in the community, you can also speak with zoo employees to understand how the sustainability program has affected their jobs, different exhibits, and the animals. A list of possible employees to speak with is located under the table of community organizations and individuals.
## Community Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Telephone Call</th>
<th>Site Visit</th>
<th>Area(s) of Sustainability</th>
<th>Contact Info</th>
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</thead>
<tbody>
<tr>
<td>Jeremy Faust</td>
<td>Greater Cincinnati Energy Alliance</td>
<td>X</td>
<td>X</td>
<td>Energy Efficiency, Renewable Energy</td>
<td><a href="mailto:jfaust@greatercea.org">jfaust@greatercea.org</a></td>
</tr>
<tr>
<td>Julie Jones</td>
<td>Dovetail Solar and Wind</td>
<td>X</td>
<td></td>
<td>Renewable Energy</td>
<td><a href="mailto:jjones@dovetailsolar.com">jjones@dovetailsolar.com</a></td>
</tr>
<tr>
<td>Greg Speidel</td>
<td>HGC Construction</td>
<td>X</td>
<td>X</td>
<td>Green Building</td>
<td><a href="mailto:gspeidel@hgcconstruction.com">gspeidel@hgcconstruction.com</a></td>
</tr>
<tr>
<td>Adam Dumes</td>
<td>Cohen Recycling</td>
<td>X</td>
<td>X</td>
<td>Waste Management/Recycling</td>
<td><a href="mailto:adumes@cohenusa.com">adumes@cohenusa.com</a></td>
</tr>
<tr>
<td>Michelle Anderson</td>
<td>Flourish</td>
<td>X</td>
<td>X</td>
<td>Green Building/Design</td>
<td><a href="mailto:michelle.andersen@gmail.com">michelle.andersen@gmail.com</a></td>
</tr>
<tr>
<td>Dean Violetta</td>
<td>Cincinnati Zoo architect, Cornette-Violetta Architects</td>
<td>X</td>
<td>X</td>
<td>Green Building/Design</td>
<td><a href="mailto:dean@cornettevioletta.com">dean@cornettevioletta.com</a></td>
</tr>
<tr>
<td>Dan Divelbiss</td>
<td>Waterfields, LLC</td>
<td>X</td>
<td></td>
<td>Water Efficiency, Stormwater Management</td>
<td><a href="mailto:divelbiss@waterfieldsllc.com">divelbiss@waterfieldsllc.com</a></td>
</tr>
<tr>
<td>Jeremy Chapman</td>
<td>Melink</td>
<td>X</td>
<td>X</td>
<td>Energy Efficiency, Renewable Energy, Green Building</td>
<td><a href="mailto:jchapman@melinkcorp.com">jchapman@melinkcorp.com</a></td>
</tr>
<tr>
<td>Heather Curless</td>
<td>Greener Stock</td>
<td>X</td>
<td></td>
<td>Green Building</td>
<td><a href="mailto:heather@greenerstock.com">heather@greenerstock.com</a></td>
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<tr>
<td>Ann Dougherty</td>
<td>Xavier University</td>
<td>X</td>
<td>X</td>
<td>Solid Waste Management</td>
<td><a href="mailto:doughertya@xavier.edu">doughertya@xavier.edu</a></td>
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<tr>
<td>Liz Tilton</td>
<td>TwoHones Bee Co.</td>
<td>X</td>
<td></td>
<td>Land Stewardship, Bee Conservation</td>
<td><a href="mailto:liz@twohoneys.com">liz@twohoneys.com</a></td>
</tr>
<tr>
<td>Patrick Sherwin</td>
<td>Go Sun Stove</td>
<td>X</td>
<td></td>
<td>Green Design and Innovation, Renewable Energy</td>
<td><a href="mailto:patricks@gosunstove.com">patricks@gosunstove.com</a></td>
</tr>
<tr>
<td>Chad Edwards</td>
<td>Emersion Design, USGBC Member</td>
<td>X</td>
<td>X</td>
<td>Green Design and Building</td>
<td><a href="mailto:chad.edwards@emersiondesign.com">chad.edwards@emersiondesign.com</a></td>
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## Zoo Employee Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Area(s) of Sustainability</th>
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<tbody>
<tr>
<td>Mark Fisher</td>
<td>Vice-President Facilities, Sustainability, Planning</td>
<td>All</td>
</tr>
<tr>
<td>Tony James</td>
<td>Facilities Project Manager</td>
<td>All</td>
</tr>
<tr>
<td>Greg Speidel</td>
<td>HGC</td>
<td>Green Building</td>
</tr>
<tr>
<td>Dean Violetta</td>
<td>Zoo Architect</td>
<td>Green Building</td>
</tr>
<tr>
<td>Don Ulrich</td>
<td>Life Support Staff</td>
<td>Water Conservation/Quality</td>
</tr>
<tr>
<td>Emily Margolen</td>
<td>Life Support Staff</td>
<td>Water Conservation/Quality</td>
</tr>
<tr>
<td>David Wardlow</td>
<td>Life Support Staff</td>
<td>Water Conservation/Quality</td>
</tr>
<tr>
<td>Larry Stroop</td>
<td>HVAC Team Leader</td>
<td>Energy Efficiency (Lighting and HVAC)</td>
</tr>
<tr>
<td>Steven Groves</td>
<td>Park Services</td>
<td>Solid Waste Management/Composting</td>
</tr>
<tr>
<td>Rhiannon Hoeweler</td>
<td>Senior Project Manager</td>
<td>Solid Waste Management/Composting (Cell phone recycling)</td>
</tr>
<tr>
<td>Paul Reinhart</td>
<td>Wildlife Canyon Keeper</td>
<td>Solid Waste Management/Composting</td>
</tr>
<tr>
<td>Raymond Ulrich</td>
<td>Director of Purchasing</td>
<td>Green Purchasing</td>
</tr>
<tr>
<td>Barbara Henry</td>
<td>Curator of Nutrition</td>
<td>Green Purchasing</td>
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<tr>
<td>Jordan Miller</td>
<td>Director of Horticulture</td>
<td>Horticulture/Land Stewardship</td>
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<tr>
<td>Steve Foltz</td>
<td>Manager of Horticulture (Native Plants)</td>
<td>Horticulture/Land Stewardship</td>
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<tr>
<td>Scott Beuerlein</td>
<td>Horticulturist</td>
<td>Horticulture/Land Stewardship</td>
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<tr>
<td>Scott Beuerlein</td>
<td>Service Systems Associate</td>
<td>Green Restaurant/Local Food</td>
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<tr>
<td>SSA General Manager</td>
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<td>Green Restaurant/Local Food</td>
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</table>
In order to help you practice educating about sustainability one thing you can do is complete an activity that corresponds to that week’s topic. Some potential activities include:

- Write a blog post about that week’s sustainability topic area
- Write a blog post about an interview you conduct with a local sustainability professional or zoo employee
- Create a new game/activity for the Go Green Garden
- Educate the Green Teens in depth about the topic, take them to places around the zoo that correspond to that week’s topic
- Edit/update sustainability documents or web pages pertaining to the sustainability program
- Write tweets or Facebook posts for PR and Marketing to share

You can also come up with your own idea for an activity.
The Cincinnati Zoo offers Green Tours for groups in the region interested in learning more about sustainability and the zoo’s sustainability program. These groups include school groups of all ages, local professionals, and a variety of types of clubs. It is important for you to read the Green Tour Guide (located in Section 5: Reference Documents) and understand where the green hotspots are around the zoo. There is a small charge for each tour, depending on the size of the group and length of the tour. The tours can be adapted to last from 30 min. to 2 hours depending on the audience’s preference and interest.

Before leading a tour, make sure to know how long the group wants the tour to last, if they are interested in a specific aspect of sustainability, where you are meeting, and if they are here just for the tour or not. Once again, keep your audience in mind and make sure to stop and see some animals along the way!

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**Checklist:**
- Read the Green Tour Guide
- Know the Green “Hotspots” at the Zoo
- Shadow a Green Tour

**Important Supplies:**
- Green Tour Guide
- Green Hotspot Map
- Greenhouse Keys
The Cincinnati Zoo partners with many community organizations to fulfill the fourth pillar of its mission, serving community. You will have the chance to volunteer with some of these community partners throughout the internship. Three partners you will actively have the chance to be involved with are Gabriel’s Place, Rockdale Academy, and Northern Larona Community Park.

**Gabriel’s Place** is a church on Reading Road that has been converted into a community garden, community kitchen, a meeting place and market. The zoo has been vital in assisting with the build and upkeep of the community garden and hoop house. Each Tuesday, Gabriel’s Place hosts a free community meal made from ingredients grown in their garden. For these meals, Gabriel’s Place needs volunteers to help prepare the food in the kitchen and serve the food to guests. This is a good time for you to practice talking about the benefits of local, organic food while getting to eat good food with great company.

Gabriel’s Place also has a marketplace where community members can buy fresh produce every Thursday. The community of Avondale is a food desert, so the availability of affordable, fresh produce is very important to the local community. The zoo helps to set up and run this marketplace. This involves setting up tables, organizing produce, managing the cash register, and educating the community about the produce.

Another community partner of the zoo is **Rockdale Academy**. Rockdale Academy is a local elementary school located only a few blocks from the zoo. The zoo has been supporting Rockdale Academy not only with an Adopt-A-Class program, but with their leadership program and Green Team as well. We have partnered with Keep Cincinnati Beautiful to work with Rockdale’s Green Team in clean up’s activities that help the students learn more about sustainability. You may assist with helping to educate Rockdale’s Green Team and help give them a tour around the zoo.
The zoo has also been active in creating community green spaces throughout the local community. One of these community spaces is the Northern-Larona Park. The zoo partnered with the Avondale Avenue District Block Club, Avondale Community Council, Local Initiative Support Cooperation (LISC), Chase Bank and other community partners to turn a vacant lot in the middle of Avondale into a safe and beautiful park. In order to keep the park maintained, the zoo continues to help with the upkeep of the park. This is a good opportunity for you to get outside and help keep the community beautiful!
Occasionally, the zoo is asked if someone from the Sustainability Department will set up a booth at local community events. These events could be for a variety of audiences including local school fairs, neighborhood events, or large environmental expos. You may be asked to attend one of these events during your internship and help organize and run the zoo’s booth. What you need to take will depend on the type of event. However, most of the materials can be found in the office or at the Go Green Garden.

The majority of the time these events are for children, which mean it is important to bring a lot of games or activities. Some activities you could bring include:

- The eat like an animal matching game (located at the Go Green Garden)
- The sustainability trivia puzzles (located at the Go Green Garden)
- The Recycling Race game (located at the Go Green Garden)
- The zoo sustainable materials matching game (located at the Go Green Garden and in office)
- A vermicomposting bin (weather dependent)
- Potential prizes (Gorilla fans or animal info cards)
- Sustainability brochures

You can also develop new activities to take to these events – either on your own or with the help of the Green Teens.
The next chapter is dedicated to explaining the Green VolunTeen Program and how to train and supervise the Green Teens. It is important to provide these teenage volunteers with opportunities to cultivate their interest in science and the environment while also developing skills that will benefit them in college and their future careers.

You have the opportunity to help cultivate these skills in the Green Teens. One way to do this is to model speaking about different sustainability topics for the teens and then have them practice speaking to each other. It’s also important to supervise them throughout the day. Visit the locations where the teens are stationed throughout the day in order to ensure they are comfortable speaking with the guests and relaying accurate information. Finally, encourage them to be creative and come up with their own projects that will help them succeed in school and prepare for college. For example, a teen could create a game for the Go Green Garden or create a brochure about the different sustainability efforts.

The Green VolunTeens

Checklist:

- Read the Green Teen Guidebook
- Know where the Green Teen stations are around the Zoo

Important Supplies:

- Green Teen Guidebook
- Go Green Garden cabinet keys
Green VolunTeen Program

Background
The Green VolunTeen Program began in the summer of 2012 seeking teenagers ages 13-17 with a passion, knowledge, and interest in green living. “Green Teens” are stationed around the zoo at green hotspots to interact with guests in order to answer questions pertaining to sustainability, offering tours of the Go Green Garden Exhibit, and sharing hands on activities.

To ensure the Green Teens feel comfortable with the zoo’s green topics and sustainability in general, we provide them with extensive training. Part of your internship responsibilities includes helping to manage the Green Teens and providing them with opportunities to develop new skills. This includes:

- Organize the Green Teens monthly schedule
- Create a daily rotating schedule
- Teach the Green Teens about the zoo’s sustainability initiatives
- Train the Green Teens on each station and how to communicate with the public
- Supervise the Green Teens throughout the day

Organizing the Green Teen Summer Schedule
The Green Teens have to work at least 100 hours throughout the course of the summer. This means that they will have to work at least two, four hour shifts a week. In order to ensure for consistency, the teens will work the same shifts each week throughout the summer. After their acceptance into the program, they request which shifts they would prefer to work. They can sign up for any day of the week for either a full day shift (9am-5pm) or a half day shift (9am-1pm or 1pm-5pm). We ask that they work the same shifts throughout the summer to make the program feel more like a job, while also helping them to feel like an integral part of the zoo.

Organizing the Daily Rotating Schedule
The creation of the daily schedule is based off which teens are scheduled to work that day, whether they are working half a day (9am-1pm or 1pm-5pm) or a full day (9am-5pm), and the stations around the zoo.
Depending on the number of teens scheduled for that day, it is possible that each station might not be staffed for the entire day. However, the Go Green Garden should be staffed by a teen or you for the majority of the day. The teens rotate between stations every two or three hours to keep them active and from getting bored. Also, try to overlap the teens occasionally to build a sense of camaraderie between the teens.

The daily teen schedule should be written on the white board located in the office as well on the back of the “Daily” sent out by email each morning by ticketing. The “Daily” includes important information that visitors could ask teens relating to events going on at the zoo and animals that will not be on display for the day. The “Daily” with the teens schedule written on it should be taken to the Go Green Garden each morning.

**Brief Explanation of Each Station and Teen Training**

The Green Teens go through an orientation at the beginning of summer, but it is your job to train the Green Teens in depth on each station. It’s best at first to pair a returning Green Teen with a new recruit, so the returnee can model each station and the new teen can become accustomed to the information. Each day spend some time checking up on the teens in order to see how they are doing and make sure everything is going well.
The Go Green Garden (GGG) is a snapshot of everything that the zoo does to go green. This makes it a great place for the teens to communicate about sustainability and the reason why it should be staffed as often as possible. It is the responsibility of the Green Teens to staff the interpretation counter, come up with new activities to use with guests, and keep the GGG clean.

At the beginning of the summer, it’s important to model tours for the teens and have them practice giving tours to you or each other. The more practice they have, the more comfortable they will be communicating to guests. The teens also need to keep a count of the number of people they interact with during each shift. These numbers are recorded on a sheet located within the GGG cabinets. You should also show them the resource guide and games/activities that are located in the GGG cabinets.

Each teen should begin every shift at the GGG; this allows you to hold a morning meeting where that day’s schedule is explained and any special events occurring at the zoo are gone over. Throughout the summer, there will be different themed weeks for the GGG. It may be a good idea for you to correspond the GGG’s themed weeks with your internship themed weeks. This will allow you to practice teaching the topics, while also allowing the teens to learn new sustainability concepts.
On slow days, shifts in the GGG can be tedious to work. On days like this, encourage the teens to think creatively and come up with new activities for the GGG or come up with projects that they could help with. These days are also good opportunities to take the teens to different locations throughout the zoo and talk more in depth about sustainability.
Teaching about vermicomposting at Insect World began in the summer of 2014 and was one of the most successful stations. Insect World provides a great backdrop to provide guests information about vermicomposting and how it works. The use of the two worm bins should alternate every other day. Each morning, check to make sure the worm bins look okay to use.

Shifts at Insect World should be not be scheduled all day (9am-5pm) as being handled for a long time period can be stressful for the worms. Schedule the shifts for four to five consecutive hours. The worm bin should NEVER be left unattended at Insect World. The teens should either wait to be replaced or put the bin away, either in the office or its designated spot at Insect World.

Since this station is in the lobby of Insect World, it is important to impress on the teens the importance of keeping this space clean and also let them know that the worms are not allowed inside the exhibit area. Make sure the teens know to put the worms and dirt on paper plates if they take them out of the bin. Also, as the space is located inside, we sometimes share it with Wild Encounters who bring animals to different parts of the zoo and interact with visitors. Make sure the teens know to be courteous to these interpreters and share the space equally. It’s also important to let the teens know that the worms shouldn’t be held by anyone who recently used hand sanitizer (the wild encounters interpreters have visitors use hand sanitizer after touching an animal).
The public can hold the worms. Just ensure that the teens know that if they feel a visitor is acting inappropriately, they have the right to not let a visitor hold a worm or can take the worm back. A record of how many visitors a teen interacts with during a shift should be recorded on a log sheet. You will then enter the total count of visitors into the zoo’s VIP system at the end of each day.
In addition to the Aquaponics Keeper Chats, the Green Teens are scheduled at the zoo’s Aquaponics Greenhouse throughout the day. Unlike Aquaponics Keeper Chats, which are given from inside the greenhouse, the teens are not allowed to open the doors unsupervised. Thus, the teens give the talks from outside. This station can be scheduled any time throughout the day and the shifts don’t need to be consecutive. If it is raining during a teen’s scheduled shift time, they should relocate to the GGG.

Aquaponics can be a difficult topic to explain if you are doing it for the first time. This makes it important to make sure the new Green Teens are comfortable with explaining the process. Take each new Green Teen through the greenhouse and explain the process to them in detail. Make sure the teens feel comfortable asking you any questions they might be unsure about. Also, make sure that they know to bring the Aquaponics fact sheet and field guide to each shift.

Since the Aquaponics Greenhouse is located next to the Basecamp Café, this is also a good opportunity for them to talk about recycling, help patrons sort their trash, talk about the green aspects of the restaurant, and share with guests why the zoo is invested in local food. The Basecamp Café is four star

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<tr>
<th>Checklist:</th>
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<tbody>
<tr>
<td>- Read the Aquaponics Fact Sheet and Aquaponics Field Guide</td>
<td>- Aquaponics Fact Sheet</td>
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<tr>
<td>- Learn what is grown in our Aquaponics system</td>
<td>- Aquaponics Field Guide</td>
</tr>
<tr>
<td>- Know how to enter the visitor count into the VIP system</td>
<td>- “Ask Me about Aquaponics” sign</td>
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<tr>
<td>- Understand the Green Restaurant Certification and the Zoo’s recycling and composting programs</td>
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certified by the Green Restaurant Association. The Café also has the highest point total of any green certified restaurant making it the greenest restaurant in America!
Potential New Stations

In order to create more opportunities for the Green Teens and provide new green learning opportunities for guests we are developing possible new green stations throughout the zoo. Cat Canyon is one area of the zoo where there is a lot of potential for new stations. Below are some potential sustainability issues that could be highlighted at each potential station.

Malayan Tiger Exhibit

- Sustainable palm oil
- Rainforest decline

The Malayan Tiger exhibit provides a great opportunity to talk to guests about sustainable palm oil and sustainable purchasing. Palm oil is a type of vegetable oil common in many consumer products. It comes from African oil palm trees found primarily in rainforests. The use of palm oil is controversial as the industry is connected to deforestation, habitat degradation, climate change, animal cruelty and indigenous rights abuses in the countries where it is produced, as the land and forests must be cleared for the development of the oil palm plantations[^10].

Cougar Exhibit

- Water scarcity in the western United States
- Forest fires due to drought – decreasing cougar habitat

With cougars being native to the western United States, this exhibit is a good place to bring attention to water conservation. In the Western U.S., there is not enough water to sustain the current lifestyle. The drought also effects wildlife by destroying habitat and forcing wildlife from natural habitat to seek water and prey. While we don’t want to speak negatively at the zoo, this is a good opportunity to promote water conservation.
Snow Leopard Exhibit

- Water scarcity
- Glacial melt

Freshwater from the mountains of Central Asia provide freshwater for one-third of the world’s population. These mountains also provide habitat for the endangered snow leopard. The effects of climate change include the rapid melting of glaciers and changes in the water availability. This results in pressure for the snow leopard species, communities depending on the freshwater from the mountain, and agriculture\textsuperscript{11}.

Swan Lake / Wetland Trails

- Wetland conservation
- The wetland restoration the zoo has done at Bowyer Farm
- Importance of wetlands for nutrient filtration, erosion control, species habitat etc.

Since the late 18th century, 90 percent of Ohio’s wetland resources have been destroyed or degraded through draining, filling or other modifications. Wetlands are important for filtering pollutants out of water, reducing flood flow, erosion control, and provide a haven for endangered plants and animals\textsuperscript{12}. Because of the valuable functions the remaining wetlands perform, it is imperative to ensure that wetlands are preserved in Ohio. The Cincinnati Zoo has helped contribute to wetland preservation by restoring 24 acres of land on Bowyer Farm back to its natural wetland habitat.

Polar Bear Exhibit

- Climate change
- The effect sea ice melting on artic habitat
- How to reduce our carbon footprints

Polar bears are often the poster animal for climate change. This makes the polar bear exhibit a good place to talk with guests about how to reduce their carbon footprint (which also helps save them money). This could include educating about car idling, alternative transportation, renewable energy, etc.
American Black Bear Exhibit

- Forest conservation
- Responsible camping

Camping is a great way to get outside and see nature, but it’s also important for people to realize that they are entering into habitat that is important for many animals and plants. The Leave No Trace principles are good principles to promote to guests about how to respect and maintain wilderness areas they visit. The principles of Leave No Trace seem unimportant to some until they consider the combined effects millions of outdoor visitors can have on the environment. One poorly located campsite or campfire may have little effect, but thousands of such campsites can seriously degrade the environment. Leaving no trace is an important principle for every camper to follow.\(^\text{13}\)

Spectacled Bear

- Habitat loss in South America (only bear species in SA)
- Land fragmentation

The spectacled bear is South America’s only bear species. However, its future faces uncertainty because of habitat loss. Currently, clearing land and trees and extraction of timber and firewood for farms are degrading their habitat. Another threat to spectacled bear habitat is infrastructure development, the advances in mining, petroleum exploitation, and the expansion of illegal crops. These practices have fragmented the original habitat of the spectacled bear into at least 113 patches of wilderness in the mountainous region between Venezuela and northern Peru.\(^\text{14}\)
Manatees

- Water pollution
- Eco-tourism and responsible boating
- Local food

One of the biggest threats to manatees other than boats is water pollution. Manatee die-offs in Florida are linked to algae outbreaks. These outbreaks are exacerbated by sewage, manure, and fertilizer runoff. While Ohio might seem far away from Florida, pollution runoff that occurs here does travel and have an impact on water quality in the Southern United States\(^\text{15}\). Thus, this is another great area to promote stormwater management practices.

Painted Dog Exhibit

- Living Building Challenge
- Green building

In keeping with our designation as the “Greeneest Zoo in America,” the Cincinnati Zoo is pursuing its most ambitious challenge in sustainable construction yet: the Living Building Challenge for the African painted dog exhibit in Africa. The Challenge asks the question, “What if every single act of design and construction made the world a better place?” At the Painted Dog exhibit, guests could be taught about green building and how this exhibit is on its way to becoming one of the greenest buildings in America\(^\text{16}\)!

Asian Elephant Exhibit

- E-waste disposal
- Land fragmentation

On average, 4000 tons (about 1000 elephants) of e-waste is generated in the world every hour. A large majority of this e-waste is disposed of in Asian developing countries such as India, Vietnam, and Myanmar – which are also all countries that Asian elephants inhabit. E-waste is a serious environmental problem for these countries. Toxic chemicals and heavy metals from e-waste can leach into soils in landfills, into air pollution, and into water caused by improper recycling techniques\(^\text{17}\). We can help by responsibly disposing of our electronics and promoting that zoo guests do the same.
Ongoing Projects

Overview
In addition to your weekly responsibilities, there are also larger projects that you can work on throughout the duration of the internship. These projects include ongoing projects within the zoo’s sustainability program and new projects that have been brainstormed by the sustainability staff. These projects are aimed at helping you to develop skills that will benefit you in your future career. If none of these projects fit with your academic interests or you have an idea for a project that could benefit the sustainability program, there is the possibility for you to design your own project.

This section contains brief overviews of potential projects. You can learn more detail about each project by talking with the zoo’s sustainability staff.

Potential Projects
- Teen and Youth Leadership Program
- Potential Development for Bowyer Farm
- Motivate Employee Behavior Change and Measure Success
- Tailor Green Tour to Meet State Benchmarks
- Create a Self-Guided Green Tour
- Create a Zoo Green Building Guide
- Sustainability Master Plan
Leadership Teen and Youth Program

**Project Overview:** Aid in the creation of a hands-on leadership program for teenagers that focuses on local conservation.

**Description:** This project entails helping to design a program that would teach local teenagers more conservation, serve the community, and give teenagers the opportunity to see conservation in action. The aim is to allow teenagers of different demographics and backgrounds to participate in opportunities that develop leadership skills, while also giving back to the community and protecting the environment.

The development of leadership skills is important in order for youth to work in tandem with adults. Having a leadership program allows youth to develop time management skills, learn to work as part of a team, set goals, contribute to conversations and meetings, and practice giving presentations.

You would brainstorm different conservation projects, help to iron out the logistics of how the program would work, and where in the region the teenagers could visit.

For more information about how to create a youth leadership program visit the National Resource Center for Youth Development’s website: [http://www.nrcyd.ou.edu/youth-engagement/youth-leadership-development](http://www.nrcyd.ou.edu/youth-engagement/youth-leadership-development)

They also provide toolkits for developing different aspects of a youth program on their website found here: [http://www.nrcyd.ou.edu/learning-center/publications/Youth%20Leadership%20Toolkit/All](http://www.nrcyd.ou.edu/learning-center/publications/Youth%20Leadership%20Toolkit/All)
Potential Bowyer Farm Development

**Project Overview:** Outline new development for Bowyer Farm that would be both educational for guests and profitable for the zoo.

**Description:** In 1995, a 529 acre farm called Bowyer Farm was willed to the Cincinnati Zoo & Botanical Garden under the policy that it couldn’t be developed unless it is to further the mission of the zoo. Since then, the property has grown to 600+ acres, and is connecting with the zoo’s mission in various ways. However, there is still a lot of potential for new activities to be developed.

Some potential activities could include ideas for habitat restoration, visitor education about native habitats and the farm, local food, and composting.

A good source for potential development ideas is the Stratford Ecological Center. The Stratford Ecological Center is a non-profit educational organic farm and nature preserve similar to Bowyer Farm. It is located on 236 acres in Delaware County, Ohio. Stratford farm encourages people to hike and explore 4 miles of nature trails; visit the gardens, greenhouses, and livestock; and explore the vast variety of water and land features including creeks, ponds, prairies, wetlands, or State Nature preserve. Visitors are also able to buy a vast variety of farm products depending on the season. The Center also offers different educational programs including workshops and classes for children and adults, annual festivals, farm tours, school tours, farm camp and family programs.

The Stratford Ecological Center’s concept is similar to what the zoo would like to accomplish at Bowyer Farm. More information about their programs can be found at the Stratford Ecological Center website: [http://www.stratfordecologicalcenter.org](http://www.stratfordecologicalcenter.org)
Tailor Green Tour to Meet State Benchmarks

**Project Overview:** This project involves understanding Ohio and Kentucky’s learning standards and finding ways to incorporate these standards into the zoo’s Green Tour in order to increase the amount of schools that take the tour.

**Description:** Green tours at the zoo are given to school groups of all ages. However, the tours could become more attractive to schools by incorporating learning standards that each grade is required to incorporate in order to be prepared for the end of the year standardized tests. If the school tours were adapted to incorporate some of the learning standards, schools would be more likely to take field trips to the zoo for a green tour.

Ohio’s learning standards can be found at the Ohio Department of Education website under Ohio’s new learning standards tab: [http://education.ohio.gov/Topics/Ohio-s-New-Learning-Standards/Ohios-New-Learning-Standards](http://education.ohio.gov/Topics/Ohio-s-New-Learning-Standards/Ohios-New-Learning-Standards)

Kentucky’s learning standards can be found at the Kentucky Department of Education’s website, search for core academic standards: [http://education.ky.gov/curriculum/docs/pages/kentucky-core-academic-standards---new.aspx](http://education.ky.gov/curriculum/docs/pages/kentucky-core-academic-standards---new.aspx)

The education department has already created activity ideas for schools that meet different standards; this list could give you a good idea of how to incorporate the standards into a green tour. The list can be found on the Cincinnati Zoo’s website under the plan your visit ➔ self-guided activities tabs: [http://cincinnatizoo.org/plan-your-visit/self-guided-activities/](http://cincinnatizoo.org/plan-your-visit/self-guided-activities/)
Create a Self-Guided Green Tour

**Project Overview:** Create a self-guided green tour so guests can visit green hotspots around the zoo throughout their visit.

**Description:** As the “Greenest Zoo in America”, the Cincinnati Zoo has a lot of interesting sustainability stories around the zoo that guests might not even know about. This self-guided tour would allow guests to learn more about sustainability as they visit different areas of the zoo.

You would create a pamphlet or brochure with map that lists where the green hotspots are around the zoo, the green story behind the hotspot, and ways guests can go green at home. Guests interested in learning more about sustainability and the zoo’s sustainability program could download the tour off the zoo’s website or access it on the zoo app and complete the tour on their own time during their visit to the zoo.

The Education Department has been working on self-guided activities. They might have some good input on how to create an effective self-guided green tour.
Motivate Employee Behavior Change and Measure Success

**Project Overview:** Identify ways to encourage employees to act more sustainably and ways to measure behavior change

**Description:** Tackling environmental issues requires change at every level. In order for the zoo’s sustainability initiatives to be the most successful, we need the backing of the employees. If employees understand how the zoo’s sustainability program benefits them, the animals, and the community they will be more willing to participate in sustainability efforts and encourage guests to do the same.

The purpose of this project is to identify ways to communicate about sustainability to our employees and encourage them to participate in sustainability efforts, while also measuring whether there have been any changes in their behavior. Community Based Social Marketing has many strategies that have been successful in fostering sustainable behavior and suggestions for ways to measure the success of programs.

Community-based social marketing is pragmatic. It involves:

- identifying the barriers and benefits to sustainable behavior
- developing a program to encourage employees to adopt the sustainable behavior
- evaluating whether the program was effective in eliciting sustainable behavior

For more information about Community Based Social Marketing visit the Community Based Social Marketing website: [http://www.cbsm.com/public/world.lasso](http://www.cbsm.com/public/world.lasso)

These websites also provide some information on why employees might be resistant to adopt sustainable behaviors and how to encourage them to change their behavior:

The Sustainable Business Toolkit – Getting Employee Green Team Management Right

Green Biz – Sustainability and Employee Engagement

Green Impact - Sustainability Employee Engagement: Emerging Best Practices
Cincinnati Zoo Green Building Guide

Project Overview: Create a guide of all the zoo’s LEED certified buildings explaining what qualifies them to be LEED

Description: The Cincinnati Zoo has more LEED certified buildings than any other zoo in the country and will have one of the only Living Building certified buildings in the country. Many people are interested in what qualifies a building to be LEED certified and would like to know more about the zoo’s green buildings. This project requires a guide that outlines each of the zoo’s green buildings, their certification, and the specifics of what makes the building green. These specifics include building materials, design, water efficiency, energy efficiency, and awareness.

For more information about LEED certification visit LEED’s website: http://www.usgbc.org/leed

For more information about the Living Building Challenge visit the Living Building Challenge’s website: http://living-future.org/lbc
Sustainability Program Master Plan

**Project Overview:** Develop a master plan for the Cincinnati Zoo’s sustainability program.

**Description:** A sustainability master plan provides a road map for an organization and its partners to work on the completion of sustainability projects. The plan is used to identify what resources are needed to support each sustainability project, plan out the steps needed to ensure the success of each project, and identify who is in charge of supervising each project.

This project involves documenting the zoo’s ongoing sustainability efforts, identifying future efforts, and planning how each effort will be conducted and financed in the future. These efforts include the zoo’s green purchasing program, green building program, composting program, and more.

Toolkits for how to create a sustainability master plan can be found at:

- Office of Community Services - CCF/SCF Tools Creating Your Sustainability Plan

- United States Department of Labor – A Sustainability Planning Guide

- Certified Sustainable LIVE – Writing a Sustainability Plan

- Community Foundation of Jackson Hole – Building Sustainability for Nonprofit Organizations
List of Sustainability Initiatives by Year

**Project Overview:** Create an outline of all the zoo’s sustainability initiatives by year.

**Description:** Often zoo employees or guests will ask specific questions about when a specific sustainability initiative was implemented. Having a list of the zoo’s sustainability initiatives by year would allow those questions to be answered promptly. For this project, you would create a comprehensive list of all the zoo’s sustainability initiatives and then order them by year implemented.

In order to figure out when each initiative began, you would work closely with the Facilities Manager and Sustainability Coordinator, Mark Fischer and Fia Cifuentes.
Resource Documents

Overview

This section provides you with documents that have been mentioned throughout this Guidebook and that you will need to reference throughout your internship.

Resource Documents

The documents in this section include:

- **The Green Teen Guidebook**: This manual provides the zoo’s Green Teens with general information about the zoo’s sustainability program and specific information about what they are expected to explain to visitors. You will need to reference this manual throughout the summer as they train and supervise the Green Teens.

- **The Green Tour Guide**: This manual provides adult volunteers who give green tours around the zoo with general information about the zoo’s sustainability program. This guide goes more in depth about the technical aspects and benefits of the program than the Green Teen Guidebook. This manual is important for you to reference, as you will be expected to lead Green Tours throughout the summer.

- **Aquaponics Fact Sheet and Aquaponics Field Guide**: These two documents provide general information about aquaponics and specific facts about the zoo’s aquaponics system. You will need to reference these documents as you train the Green Teens and since you will be giving Aquaponics Keeper Chats.

- **Go Green Garden Interpretive Guide**: This document provides information for anyone stationed at the Go Green Garden on how to interpret the displays in the garden to guests. This document will help you learn about the Go Green Garden and help you understand how to teach the Green Teens about interpreting the garden to guests.

- **Living Building Challenge Brochure**: This brochure provides information about how the zoo is perusing the Living Building Challenge for the African painted dog exhibit in Africa. This
brochure can help you better understand the Challenge and how to explain this major achievement to guests and the Green Teens.

2 Richardson, Rachel. "Mason's Natural Jewel." *Cincinnati.com*.


Appendix B: Green VolunTeens Guidebook

Pages: 96-111
Cincinnati Zoo & Botanical Garden

GO GREEN

Green VolunTeens Guidebook 2015
Welcome!

Hi Green Teens!

We are excited to be working with all of you this summer! The Cincinnati Zoo is the “Greenest Zoo in America”, and as a Green Teen volunteer we look to you to share our story with zoo guests, encouraging them to join us in going green. It is important that we continue to improve our own operation so that it remains as green as green can be. Throughout the summer, you will be doing a variety of projects that we hope you find to be fun, engaging and worthwhile. These projects will provide you with new skills such as public speaking, educating, becoming knowledgeable in green topics, sharpening your gardening skills, being independent, and taking initiative. You will be asked to be creative – your ideas are important and can be used to craft new projects and programs for guests throughout the summer. The Cincinnati Zoo & Botanical Garden has become a leader in sustainability not just for the Cincinnati Region, but nationally as well. Your role this summer as a Green Teen is essential to raising that awareness and reaching out to the community. Some of the responsibilities you will be taking on this summer include, but are not limited to:

- Staffing the Go Green Garden Exhibit
- Staffing the Insect World Exhibit to teach about Vermicomposting
- Assisting with the Base Camp Café Waste Sort/Zero Landfill Challenge
- Assisting with the Aquaponics System & Greenhouse
- Developing new activities for the Go Green Garden and other green programs
- Assisting with the Northern-Larona Community Park

Our hope is that this experience will spark a sustainability interest not only in your personal life, but maybe in your professional life as well. The field of sustainability is in high demand, with many green jobs out there that you may find exciting and rewarding. Sustainability also has a direct link to the conservation of the wildlife and wild places that may have drawn you to the Zoo in the first place. The plants and animals at the Zoo, as well as their wild counterparts, have been directly impacted by the steps the Cincinnati Zoo has taken to become the Greenest Zoo in America. Looking forward to a great summer with you all! Don’t hesitate to come to us at all with questions, comments, suggestions and great, green stories.

BE GREEN!

Fia Cifuentes, Sustainability Coordinator, and 2015 Sustainability Interns:
Roles & Responsibilities

General Information
- The most common form of communication will be through email, please make sure it is checked on a regular basis.
- Fia, Kaitlin, and Mary can be found on the first floor of Tree Tops.
- Fia’s Contact Info: sophia.cifuentes@cincinnatizoo.org; (513) 487-3355 (office), (513) 461-9033 (cell, good for calls and texts)

Scheduling & Check In
- The “Green Teen” Schedule will be created at the beginning of each month, and each teen will receive a copy via email. This schedule will be a calendar that shows who is scheduled for which date. **You are responsible for making sure to remember your own schedule.** Each Green Teen is asked to serve a minimum of 50 hours total. This is equivalent to about 4 hours per week, but you are always welcome to serve many more than that.
- You will be required to check in and out each time you work. The sign in sheet will be located in Fia’s office.
- If you cannot make it to the Zoo for your scheduled shift, it is your responsibility to call Fia, Kaitlin, or Mary to let them know.

Go Green Garden
- Staff the interpretation counter where you will engage with guests and encourage them to ask questions or take a tour of the Go Green Garden.
- Be creative! We encourage new activities and program ideas for garden guests.
- Weed the beds, wipe down the counter, pick up trash, in general, keep the GGG clean.

Base Camp Café
- The Zoo’s goal for becoming a zero landfill facility will not be reached unless we raise as much awareness and education as possible with both our guests and our staff.
- Your role at the Base Camp Café will be to staff the bins and help guests sort their waste into the appropriate container (landfill, compost, recycling). This is a great opportunity to interact with and educate zoo visitors that may not stop by the green gardens about sustainable living. It will also ensure that the waste is sorted correctly and the compost bins are not contaminated.

Northern-Larona Community Park
- Your responsibilities at the Park could include cleaning up litter, weeding the flower beds, laying down wood chips or mulch, and general yard work/maintenance. We will make sure you have garden gloves and all the tools you need.
- Northern-Larona Community Park is located off Zoo grounds, so teens will need a permission slip to be able to work in this Park. A staff member will always be with the teens when they go off grounds, and Security will always be notified.

**Insect World**
- Insect World provides a great backdrop to teach guests about vermicomposting and how it works. When scheduled for Insect World, you will bring the worm bin from Fia’s Office to the lobby of the insect house where you will then interact with and teach guests about vermicomposting.
- The worms are NOT allowed inside the Insect World exhibit space, nor are they allowed to leave the bins. Guests are welcome to hold the worms, but they must be returned to the bin.

**Café Greenhouse and Aquaponics System**
- The Greenhouse provides produce served in the café and catering kitchens.
- Your responsibilities at the Greenhouse could include assisting with routine maintenance, harvesting produce, and most importantly, sharing our guests about what aquaponics is and why the Zoo is so invested in local food.
The Greenest Zoo in America

In 2008, the Cincinnati Zoo & Botanical Garden’s leadership team made a formal commitment to aggressively and passionately pursue environmental stewardship and develop a strong sustainability program that includes energy efficiency, water usage, storm water management, waste management, sustainable design and construction, and education outreach. This strong commitment towards being green led to the 2010 proclamation by Governor Strickland that stated the Cincinnati Zoo & Botanical Garden as being the greenest zoo in America. The Zoo is doing its part to conserve natural resources that are critical to saving wildlife and wild places by greening its daily operations and reducing its impact on the environment.

Water Conservation

While 2/3 of the Earth’s surface is made up of water, less than 1% of it is available to us as clean fresh water in lakes, rivers and streams. We use up that water faster than it can be replenished by the natural water cycle. To make up the difference, we manufacture clean water at treatment plants, burning lots of energy and money in the process. The Cincinnati Zoo & Botanical Garden is a major user of water in the city, and it is easy to see why. As a botanical garden, we have over 3,000 plant species to water and care for. As a zoo, we have over 200 animal species to water and care for, including big water users such as polar bears, Asian elephants, rhinos, manatees and much more.

To give you an idea of how much water the Zoo uses, in 2005, the Zoo consumed 220 million gallons of water. If we included irrigation, it would be almost a quarter of million gallons more. Using that much water not only consumes a natural resource, but it also cost us $600,000 per year to pay for it. In order to reduce our water consumption, we became aggressive at fixing leaks, upgrading systems and changing behaviors. By 2009, we reduced our water usage to just 135 million gallons per year, and in 2010 it reached 98 million gallons per year. By 2014, last year, we were able to only consume 52 million gallons of water for the entire year. Our goal is to reach 50 million gallons per year, including irrigation. By saving that much water, we are also saving a lot of money that can be reinvested back into the buildings to make them more efficient and comfortable for both the animals and their keeper staff.

How was the Zoo able to realize millions of gallons of water savings?

- Fixing a large number of leaks
- Upgrading systems so that they were operating correctly
- Changing behaviors of the keepers, including how they cleaned exhibits
- Filled in some exhibit pools that were not needed
- Upgrade fixtures to low flow, as well as automatic in most restrooms
- Harness rainwater
Storm Water Management

The City of Cincinnati has the oldest sewer system in the country. The city operates on a combined sewer overflow, or CSO, which is illustrated in the diagram below. This means that anything that goes down a drain, whether it is in your kitchen, bathroom, laundry room or street, ends up in the same pipe. During heavy rain events, the water treatment facility is not able to handle all of that water, so instead of it being treated, it flows into the Ohio River. Cincinnati’s Metropolitan Sewer District, or MSD- estimates that about 15 BILLION gallons of raw sewage gets dumped into the Ohio River each year. This is the single most significant environmental challenge that the City of Cincinnati faces. The Zoo recognizes that its 69+ acres contributes to this city wide challenge, and is doing everything it can to get as close to being off the stormwater grid as possible. This means any rain that falls on the Zoo’s property will be reclaimed. Throughout the Zoo, stormwater management systems have been put into place including pervious pavement, pervious concrete, rain gardens, bioswales and green roofs.

Pervious Pavement/Concrete – In cities like Cincinnati, up to 30 percent of the land surface is covered with pavement, giving us places walk, drive and park. However, when it rains, that pavement causes water to run off of roads and parking lots into sewer drains, contributing to flooding and pollution. Unlike traditional pavement, pervious pavement allows rainwater to seep through it, instead of forcing water off the edges into sewer systems. Tiny holes in pervious concrete or spaces between pervious pavers allow water to pass through, recharging our groundwater system or saved to be reused later.

Pervious Pavement/Concrete At the Zoo, more than 30,000 square feet of pervious pavement allows thousands of gallons of stormwater to be stored at a time. Pervious concrete can be found in the Vine Street Parking Lot and Go Green Garden, and pervious pavement can be found in the Vine Street Village and Go Green Garden.
**Green Roofs** – Instead of covering a roof with shingles, why not top it with living plants? Growing a green roof has many advantages, especially reducing stormwater runoff, retaining up to 75 percent of rainwater instead of allowing it to drain through the sewers. The plants on a green roof are very busy, filtering out pollutants as well as taking in carbon dioxide from the air and releasing oxygen. A common plant used with green roofs is sedum, a very water thirsty and drought resistant plant. And because these plants are covering the roof, they are reducing the urban heat island effect by retaining heat, rather than absorbing the sun's energy and re-emitting it as heat. This urban heat island effect causes cities to be up to 7 degrees hotter than rural areas. A green roof can insulate a building from heat, cold and sound as well as increases the lifespan of the roof by two or three times. They are very easy to care for and create a beautiful habitat for local wildlife.

**Green Roofs At the Zoo**, a 2,400 square foot green roof grows on top of Giraffe Ridge Barn. The Primate Center is also topped with a green roof, including a variety of plants, bushes, and even trees! A sample of a green roof is houses in the Go Green Garden exhibit allows you to see up close what a green roof is planted with.

**Rain Gardens** – In a rain garden, plants suited for wet areas are grown in a low spot designed to temporarily collect rainwater from downspouts and pavement. This strategic placement of a garden helps reduce storm water runoff, pollution, erosion and flooding. A rain garden also purifies the fallen rainwater as the root systems of the plants filter out dirt and other particles before releasing it deeper into the soil. Like other gardens, a rain garden provides a beautiful landscape as well as a good habitat for wildlife.

**Rain Gardens At the Zoo**, rain gardens can be found at the Go Green Garden exhibit, in front of the Harold C. Schott Education Center and in the Vine Street Parking Lot. The Zoo has some of the most visible and diverse rain gardens in the region, providing a model for other institutions. The information from these test gardens will help determine the best practices for creating other rain gardens in our area.

**Africa** – Our new Africa exhibit is a significant piece to the Zoo’s stormwater runoff reduction. 17 acres of the Zoo’s watershed drains into the area where the Africa exhibit is. Thanks to MSD, large retention tanks have been placed underground and can hold up to 13 million gallons of water per year. This water is saved and reused in the exhibit for irrigation and water features such as the lion moat and polar bear pools.
Energy Efficiency

Burning fossil fuels to produce electricity and power cars accelerates climate change, a serious threat to all life on Earth. Generating electricity to build and maintain buildings accounts for nearly 40% of the total energy use in the United States. Implementing green building practices and technologies that are already available could significantly reduce energy costs and carbon emissions.

Energy is the Zoo’s second biggest cost, after employees. In 2006, we performed our own energy audit and really scoured our buildings to see what was in use and what wasn’t, and found that there were a lot of areas that could be improved. In 2005, we used 9.5 million kw, and in 2009 that number came down to 8.5 million kw, despite adding many new buildings. Over the course of 7 years, we invested $2 million in utility upgrades, and saved over $5.5 million.

The Zoo has been able to drastically reduce its energy usage by taking a number of different steps, including:

- Upgrading to energy efficient light fixtures, as well as placing them on motion sensors so the lights automatically turn off when no one is in the room
- Replacing old equipment and appliances with more efficient boilers, furnaces, water heaters, refrigerators and freezers
- Unplugging any equipment that was not in use on a regular basis
- Using heating, ventilating and cooling systems that employ energy management equipment and software
- Harnessing renewable energy through solar panels, geothermal wells, a wind turbine and biomass
- Switching to incandescent lights to LED lights for our Festival of Lights, reducing energy usage by 75 percent

Renewable Energy

The Cincinnati Zoo recognizes how easy it can be to harness energy from renewable sources such as the sun, the wind and the Earth’s constant, core temperature. If you take all of the renewable energy sources located in all other zoos in the American Zoological Association, it does not add up to the amount we utilize right here in Cincinnati through solar panels, a wind turbine and geothermal wells.

**Solar Energy** – What do green leaves, alligator scales, and solar panels have in common? They all harness the sun’s energy! Green leaves use the sun's energy to make food. Crocodile scales harness the sun's energy to stay warm. Solar panels convert sunlight into electricity. Solar, or photovoltaic, cells are made of silicon, a semi-conducting element. These cells absorb sunlight and convert it into electricity without releasing carbon dioxide into the air like burning fossil fuels does. Carbon dioxide is the primary culprit of climate change, which is already threatening wildlife and their habitats around the world. Not only is solar energy clean, it comes from an unlimited, renewable, and free resource. Generating solar energy reduces our
dependence on fossil fuels, which are limited, non-renewable, and costly. **At the Zoo**, solar panels have become a regular sight.

- A 20kw solar array adorns the roof of the Harold C. Schott Education Center, providing up to 25 percent of the energy needs to operate the building.
- 10kw solar panels are at the Go Green Garden Exhibit. These panels, along with the wind turbine, are providing more than a third of the power demands of the Membership and Ticketing Building.
- Solar thermal panels are on top of the Welcome Center roofs, providing hot water for the restrooms in Vine Street Village.
- The Melink Solar Canopy is the latest solar panel project –
  - At 1.56 megawatts, it is the largest, urban, publicly accessible array in the nation.
  - 6,400 panels make up the solar canopy.
  - It was installed and operating as of April 2011.
  - Provides an average of 20% of the Zoo’s total energy needs. On days when it is sunny and cool, the Zoo is completely off the grid.
  - $11 million project, $0 by the Zoo.
  - Melink Corporation are the owners, operators and maintainers of the canopy.
  - Reduces 1,775 tons of CO2 emissions per year.
  - Provides shade to 80% of the parking lot.
  - Zoo has a power purchase agreement, or PPA, with Melink and are in a locked in energy rate for the next 7 years.
  - The entire project took 15-16 months to complete, most of it was financing.
  - The panels were made in Oregon, everything else (steel structures, concrete pouring, electrical work, etc.) was all done Cincinnati local, boosting the local economy.
  - Cincinnati State was able to offer 10 scholarships for students for solar installations.
  - Solar panels have an average life span of 25 years.

**Geothermal Energy** – Geothermal energy comes from the natural heat of the Earth, and can be used to generate electricity or heat and cool buildings without burning fossil fuels and accelerating climate change. To produce electricity from heat radiating from the center of the Earth, wells are drilled and water is pumped through pipes hundreds or thousands of feet into the ground. There the heat turns water into steam. As it returns to the surface, the force of the steam turns the turbines to create electricity. Geothermal energy can also naturally heat and cool buildings. Geothermal heat pumps, which use very little electricity, circulate water though a continuous loop of piping that goes just several feet underground where the temperature is about 55°F all year round. In winter, the water picks up the heat in the earth and carries it back to the geothermal heat pump which heats the building. In summer, the water picks up heat from the building and takes it underground, thus cooling the building.

**Geothermal Energy At the Zoo**, 36 geothermal wells use this geothermal heat transfer to contribute significantly to the heating and cooling of the buildings located in
Historic Vine Street Village. There are also wells located in Africa, helping to heat and cool the African Painted Dog exhibit building.

**Wind Energy** – Wind energy is the fastest-growing and least expensive energy source. The way wind energy, or power, works is pretty simple. The sun shines, creating wind as the air warms and rises. Like a helicopter seed blowing in the breeze, the blades of a turbine spin round in the wind, which powers a generator to produce clean energy.

**Wind Energy At the Zoo**, a 1.2kW wind turbine is installed in the Go Green Garden Exhibit. In 11 mph average winds, it can produce enough energy to run your dishwasher and refrigerator for an entire year (2000 kilowatt hours). Our Windspire® wind turbine, along with the solar panels in the Go Green Garden, are meeting approximately one third of all of the power demands for the Membership and Ticketing Building. However, southwest Ohio is not an ideal location for wind turbines because of all the valleys and hills, which block the wind.

**Biomass Energy** – Biomass energy is harvested from organic materials made from plants and animals that contain stored energy from the sun. These materials include wood, crops, manure and other organic waste. Biomass can be converted into usable forms of energy such as methane gas (released from rotting garbage and animal waste) or transportation fuels such as ethanol and biodiesel.

**Biomass Energy At the Zoo**, several options related to biomass energy are being explored, including a small scale anaerobic digester that will generate energy from elephant waste. The train and other diesel vehicles have been converted to using biodiesel.

**Green Building**
In the United States, buildings are the main contributor to our carbon footprint, from electricity, water, materials used in the building as well as where the building is located. Green building is an eco-friendly way to construct structures, using processes that are environmentally responsible as well as resource-efficient not only during construction, but through the entire life of the building. The U.S. Green Building Council has developed a rating system that is an industry-recognized, voluntary standard for sustainable building design. This rating system is the Leadership in Energy and Environmental Design rating system, or LEED, and has four levels of certification – Certified, Silver, Gold and Platinum.

**At the Zoo**, we recognize that the majority of an organization’s carbon footprint lies in its buildings and utilities. Because of this, the Zoo is committed to building all new projects to LEED Silver standards, the first Zoo in the country to make this commitment publicly. The Zoo currently has more LEED buildings than any other Zoo in the nation, with three more projects underway:

- Harold C. Schott Education Center – LEED Silver, 2006
- Historic Vine Street Village – LEED Platinum, 2009 (which includes the Go Green Garden Exhibit, the Welcome Center and Membership & Ticketing)
- Zoo Pavilion – LEED Gold, 2009
- Zoo Gift Shop – LEED Gold, 2010
- Cat Canyon – LEED Gold, 2012
- Distribution Center – LEED Silver, 2012
• Africa – anticipated LEED Gold
• African Painted Dog – anticipated Living Building Challenge certification

All the materials used to build each of our LEED projects are sustainable as possible. Some features of these projects include no or low VOC paint, bamboo flooring, 100% recycled carpet, strawboard countertops, recycled steel, recycled drywall and plastic lumber. The Zoo has also gone through existing buildings to green them up as much as possible.

Solid Waste Management

The average American generates about 4.5 pounds of garbage per day. That is equal to 1,643 lbs of solid waste every year! With a population as large as the United States, just imagine what that would be equivalent to. What is happening to all of that garbage? About one-third is recycled, while the rest is sent to landfills, burned in combustors or finds its way into the natural environment. The Cincinnati Zoo is committed to diverting as much waste as possible from the landfill, either by making less waste in the first place, or through composting and recycling waste. Our goal is to become a Zero Landfill facility, which means that less than 1% of our waste is headed to the landfill.

Composting

Yard trimmings and food scraps make up about 25 percent of the trash produced in the United States. Why throw all that waste away and take up landfill space when it can be composted into nutrient rich, organic material for your garden? Composting is nature’s way of recycling! For 165 years, the Zoo had to send all of their organic waste to the landfill, which increases pollution, reduces wildlife habitat and increases carbon emissions. We tried to compost the waste on grounds ourselves, but for the amount of organic waste we had, we did not have enough room to compost. There was also no place in southwest Ohio where you could legally drop off organic waste, such as animal waste and leftover hay, until 2010 when Marvin’s Organic Gardens became a certified Class II Composting Facility thanks to a partnership with Wal-Mart. Marvin’s started composting all of the organic waste from 160 Wal-Mart stores, and agreed to accept the Zoo’s organic waste as well.

Composting At The Zoo, The Zoo replaced 7 of the 12 dumpsters that we had picked up by Rumpke with our own “Organic Waste Only” dumpsters. Before, each of the dumpsters was picked up by Rumpke for a $15 fee EACH. Now, Rumpke only has to pick up one bin once a week for a flat fee. Our Zoo Keepers are the ones that empty the bins from each animal area into one collective bin at the back of the Zoo. Starting in January 2011, the Zoo was able to divert 8 tons of organic waste PER WEEK and have it composted at Marvin’s Organic Gardens in Lebanon, Ohio. Organic waste from the Zoo includes animal waste, leftover bedding and leftover food from herbivorous animals such as the elephants, rhinos, giraffes, zebra, okapi and more. Since the Composting Program started in January 2011, we have had almost all animal departments join and compost their waste as well. The Base Camp Café is also on board, and you can compost all
waste from the Café include ALL foods, compostable plates, cups, cutlery and much more. Now, we are diverting 9-10 tons of organic waste from the landfill each week.

**Vermicomposting** – Vermicomposting, or worm composting, is a method of composting that uses worms to turn your food scraps and other organic waste into rich soil. This is a method that is simple and can help you drastically reduce the amount of waste you send to the landfill while also producing rich soil. This is an ideal solution for small spaces and can be done indoors or outdoors, as it just requires a medium sized (12-25 gallon) opaque plastic bin.

**Teaching Vermicomposting at the Zoo**, vermicomposting is a topic that you will talk to guests about at Insect world. If guests have questions about setting up their own vermicomposting bin, here are some tips you can tell them to get them started:

- Red worms are the best worms for vermicomposting. One will need about 1 pound red worms (about 1,000) to start a worm bin.
- To set up a worm bin you will need:
  - A 12-15 gallon opaque plastic or wood container. This bin should have a tight fitting lid and you will need to drill holes in the bottom for drainage (you can place a tray underneath if using bin indoors)
  - A layer of bedding will be needed to help with initial set up; this can be made of strips of newspaper or shredded cardboard. Moisten the bedding with water and then add your worms
- Examples of what you can put in your worm bin for composting:
  - Fruit and vegetable waste, stale bread, old rice or pasta, coffee grounds, yard waste (leaves, grass), and paper
  - Avoid dairy and meat products

**Recycling** – Recycling may be one of the easiest of the three “R’s”. But reducing and reusing are just as important for diverting trash from entering the landfill. The best way to deal with trash is to make less of it in the first place.

**Recycling At the Zoo**, a recycling bin always accompanies a trash bin. This makes it easy and convenient for our guests to recycle their plastic bottles, aluminum cans and paper. Other items like cardboard, batteries, cell phones, electronics, light bulbs and Styrofoam are also recycled rather than thrown in to the trash. Many Zoo animals receive enrichment items made from cereal boxes, old, clean blankets and sheets, cardboard tubes, even kitty litter buckets, giving these items a second or third use. The Zoo is also heavily invested in our cell phone recycling campaign. Within cell phones is a mineral called coltan, and that coltan is mined in gorilla habitat in Africa. By recycling our cell phones, we can reduce the need to mine for new coltan and other minerals.

**Local Food**

The Cincinnati Zoo is dedicated to raising awareness about local food, as well as ensuring its animals and people are eating as much local food as possible. Food and sustainability go hand in hand. Think about all of the energy, chemicals, water, and packaging that go into growing and transporting food across the States, and even across countries. The more we can grow
food locally, the less we are using these resources unsustainably. Local food not only tastes better, but promotes biodiversity, energy conservation, use less packaging, and helps to support local farmers. Supporting local farms today helps keep these farms in the community ensuring that we have access to nourishing and abundant food in the future.

**Aquaponics** – Simply stated, aquaponics is growing fish (aquaculture) and vegetables (hydroponics) together, where wastes from the fish are food for the plants, and the plants clean the water for the fish. This is an example of a zero waste scenario, where both the fish and the plants can thrive and all waste is utilized. This system consists of a fish tank, two grow beds for vegetables, a pump, an aerator, solids filter, and a biofilter. Water flows through the system continuously in a closed-loop allowing nutrients and water to be cycled and recycled. **At the Zoo:** An aquaponics system is featured in the greenhouse next to the Base Camp Café. The current plants growing in the aquaponics system include basil, swiss chard, cucumber, and tomato. Each day, our SSA chefs harvest what they need for catering and restaurant meals, staying true to their commitment to providing our guests food that is as fresh and as local possible.

**Edible Food Gardens** – There are edible food gardens throughout the Cincinnati Zoo, and are great examples of how you can grow a lot of food in a small amount of space. Some of the food is harvested for our Base Camp Café, while the rest is given to our Zoo animals as enrichment.

**EcOhio Farm** – The Cincinnati Zoo has been dedicated to sustainability not only on-grounds within its Avondale location, but at its off-grounds property as well. In 1995, a 529 acre farm called Bowyer Farm was willed to the Cincinnati Zoo & Botanical Garden with the guideline that it could never be developed unless it is to further the mission of the Zoo. Since then, the property has grown to 600+ acres, and is connecting with the Zoo’s mission of Adventure, Conservation, Education and Community in various ways. In 2012, 50 acres of the Bowyer Farm was leased to **Green BEAN Delivery**, a company that delivers organic produce and natural groceries to Midwest homes and workplaces. With this new space in Ohio, Green BEAN Delivery can grow and harvest fresh, local foods that they will distribute as a part of their business, just as they do in Indiana with their Feel Good Farm. The EcOhio Farm LLC was born, and in the spring of 2012 was planted with a variety of commodities including cabbage, squash, broccoli and pumpkins that was used primarily for purchase by Green BEAN Delivery customers. The company has already begun working on its agricultural strategies for year two, and will have the land certified organic by the USDA in the spring of 2014. While the majority of the crops, such as cabbage, squash, broccoli and pumpkins, will be available for purchase by Green BEAN Delivery customers, some of it will be harvested and donated to local charities, including the Marketplace at Gabriel’s Place in Avondale, sold to local retail outlets and ultimately used to feed Zoo animals and guests. As the partnership grows, there is hope to use this farm as an education resource for local youth so they can learn and experience agriculture firsthand. This partnership is another way to not only decrease its ecological footprint, but build a sustainable local food system for the community, making its green efforts more tangible for everyone involved. This new, sustainable ecosystem will possess multiple facets of agriculture and serve as an educational platform for community members to enjoy for many generations to come.

- **Wetland Reclamation** – Across the street from the 50-acres of land that Green BEAN Delivery is leasing, is 24-acres of land that has been determined to have been a natural wetland at one time. Overtime, this portion of land has been used as farmland producing soybeans and corn. Through support and funding from the U.S. Department of Agriculture (USDA), the Zoo is now able to take that 24 acres and reclaim it as its
original state of a wet sedge meadow, or wetland, eventually returning the floral and faunal diversity that once was there. To get started, we conducted a tile search as well as completed dike work and excavation during the summer of 2012. A “bioblitz” was conducted to establish a baseline for current species residing in the area, and determine what species could be attracted to return. During the winter of 2012-2013, bird boxes are being built by an Eagle Scout and vernal pools are being constructed. In the spring of 2013, tree plantings and warm season grass seeding will occur. Establishment of the prairie buffer may take up to 3-4 years, allowing time for these perennial plants to root themselves and grow against the annual weeds.

Long term, the possibilities for EcOhio are endless. The main goal is to return the area to its original wildlife, with a rich array of plant and animal species that historically are naturally occurring to Warren County. Some of these species include, but are not limited to, upland passerines, bobwhite quail, tree swallows, bluebirds, prothonotory warblers, American kestrels, purple martins, screech owls, saw whet owls, various waterfowl, snakes, salamanders and butterflies such as Zebra swallowtail, spicebush and monarchs. Eventually, as the wetlands become established, walking trails and a small education center may be implemented, along with special events that offer educational programs and demonstrations, give aways, opportunities to explore the wetland, and much more. Ideally, EcOhio will become a green oasis in a sea of suburbia.

**Community & Outreach**

The Zoo is committed not only to greening its own operations, but also engaging its community to do the same. The fourth pillar of our Mission Statement is “Serving Community”, which recognizes our responsibility to partner with diverse and economically challenged communities in our daily work. By providing our community with the resources and tools they need to go green, we not only strengthen our relationship with them, but empower them to save money, save resources and instill pride within their homes and neighborhoods.

**Green Space & Community Gardens** – Community green spaces are more than just lots with grass and a few flowers; they are meeting spots for neighbors, recreation areas for youth, refuges for wildlife. They bring a part of the natural world into the urban environment- to contrast the harshness of the concrete jungle and stimulate the senses. Community spaces foster connections not only with wildness, but between residents, making friends from strangers. Community green spaces can be as simple as a grassy lot, but they can be more: parks, playgrounds, gardens and more.

Community gardens can be found just about anywhere. While providing spaces for residents to gather and connect, community gardens can provide healthy foods. Food deserts are areas where healthy, affordable food cannot be obtain. Food deserts can occur anywhere, though are most common in urban settings. These communities do not have the same accessibility to quality, healthy, affordable food. Throughout Avondale, the Zoo has assisted with many projects that encourage green space and community gardens, contributing healthy food environments in the middle of a food desert.

- **Forest and Vine Gateway:** The corner of Forest Avenue and Vine Street was the site of three vacant and deteriorating houses. With the help of the Cincinnati Zoo, local
company Building Value deconstructed these three homes. Approximately 85% the material from the homes was salvaged to be reused or recycled. The site is now a welcoming gateway into Avondale.

- **Northern-Larona Community Park:** The Zoo teamed up with the Avondale Avenue District Block Club, Avondale Community Council, Local Initiative Support Cooperation (LISC), Chase Bank and other community partners to turn a vacant lot in the heart of the Avenue District into a safe and vibrant park. Future features of the park could include a community garden with raised beds, a shelter built from deconstructed materials, and a walking path.

- **Gabriel’s Place:** A church on Reading Road has been converted into a community garden, community kitchen, a meeting place and market. The Zoo has been integral in assisting with the initial build and upkeep of the community garden and hoop house. As Gabriel’s Place grows, the Zoo will stay involved to assist with programs, garden tasks and other projects.

**Home Weatherization** – The Zoo and its community partners have reached out to their surrounding neighborhoods to provide the education, awareness and resources needed for homeowners to save money and energy and to create healthy, comfortable living environments through home weatherization projects. Some of the home weatherization projects include:

- **Avondale in Action:** In August 2011, the Zoo, People Working Cooperatively (PWC), the Greater Cincinnati Energy Alliance (GCEA) and Local Initiative Support Corporation (LISC) worked together with community volunteers to offer six Avondale, making them more energy efficient and more comfortable for residents.

- **Green Your Home Contest:** In the summer of 2011, residents of the five Uptown neighborhoods had a chance to win a grand prize of $7,500 of home energy upgrades made possible by the Zoo, the GCEA and the Uptown Consortium. Additionally, one winner from each neighborhood received a free home energy audit.

**School Programs & Partnerships** – The Zoo is working hard to develop and maintain positive relationships within the schools in its community. The Education Department already does a great job of providing outreach programs to many schools throughout the region, with a focus on wildlife and wild places. Within the Avondale Community, we are focusing a lot on sustainability projects and programs.

- **North Avondale Montessori School:** The Zoo is supporting a greenhouse project at this elementary school by purchasing the greenhouse, assisting with the build of the greenhouse as well as providing support with curriculum development and other sustainability programs for the students and teachers to engage in.

- **Rockdale Academy:** The Zoo has been supporting Rockdale Academy not only with an Adopt-A-Class program, but with their composting program and Green Team as well. In the 2011-2012 school year, Keep Cincinnati Beautiful was able to start a program in the school to help reduce their food waste through a composting program. The Zoo has been assisting with the cafeteria waste sort throughout the past two years. We have also partnered with KCB to work with Rockdale’s Green Team in clean up’s activities that help the students learn more about sustainability.
Possible Activities for the Go Green Garden:

- Teach a Composting Class: (explain why you should compost, what you can compost, methods of composting) *Can do a adult version and a children’s version
- Create banners or posters with reminders to turn off the lights and to recycle
- Scavenger hunt (to find the alternative energy options within the garden)
- Sorting game where they decide what can be recycled, composted, or thrown away
- Carbon Foot Print Children’s Craft: trace outline of Childs shoe, cut out of paper or contact paper, decorate with flowers leaves ect, write “what is your carbon footprint” to help raise awareness
- Teach about the importance of nitrogen in soil: in terms of maintaining healthy and fertile soil, and explain how most plants deplete nitrogen and what you can do to improve nitrogen levels (grow plants from the legumes family) *geared more to adults
- Make a pizza box solar cooker (using tin foil and a piece of black paper on the inside) and cook s’mores to demonstrate how solar energy works
- Make a poster showing the cycle of animal-manure-compost-soil-plants-food for animal-animal (use pictures and have kids glue them on)
- Pervious versus non-pervious examples use different examples over a bin pour water through so people can see the difference
- Make a garbage dump pizza- Kids create a pie chart pizza topped with trash that reveals the different types of garbage we throw away. In the process, they’re likely to discover that lots of things tossed in landfills could have been recycled or reused instead.
- Reusable bag decorating- Kids learn about reusing resources instead of tossing them into the garbage bin. They’ll decorate a reusable bag that their families can take to the supermarket
- Create a sustainability quiz game – Possibly create a spin game wheel, and read that # sustainability question
Background Information

Why should the Zoo go green? As a conservation organization, it is significant to not just talk the talk, but walk the walk as well. As we are raising awareness about conservation programs around the globe, endangered species and their challenges, and connecting more and more people with nature, we also need to be aware of how our own actions at the Zoo affect the environment. Going green means that we are practicing what we preach. It is good for the environment, and it is economically responsible. By going green, we are able to save a lot of money and reinvest those dollars right back into the Zoo. We are making the connection between our everyday actions, environmental sustainability, conservation, and our plants and animals.

As the second oldest zoo in the country, we have a rich history, dedicated staff, and a diverse animal collection and exhibits. We also have old, inefficient buildings and staff that are set in their ways. While we have always been a conservation organization, there was a strong push to be green in 2006. In 2010, we were declared greenest zoo in America by Governor Strickland. However, this achievement wasn’t easy. We had to change mindsets, go through growing pains, and really show our staff what sustainability means. There is a long tenure average at the Zoo, which means most employees have been doing the same thing since the 1980’s. Our sustainability program has helped improve employee mojo and change behaviors. We have an active, efficient, and effective Green Team comprised mostly of volunteers who have been working together with key staff members to accomplish green projects.

In 2010, the Cincinnati Zoo hosted the very first green summit where every zoo in the nation was invited to hear our green story as well as share their sustainability practices. Over 100 people attended, with at least 45 zoos and aquariums represented. It was a great moment for our industry to really hone in on sustainability and focus all conversations around the topic. Best practices, tough challenges, and strong resources were exchanged. Now sustainable practices are more and more visible and talked about within our industry. There is the annual AZA Green Award (which the Zoo won in 2013), the Green Scientific Advisory Group (Green SAG), and the Green Summit, which occurs every year during the AZA conference.

Sustainability fits every part of our mission. It has improved employee morale, strengthened our connection with the community, saved us money, and exemplifies our leadership.

SAVING RESOURCES

Water

Despite ¾’s of the Earth being water, less than 1% of it is fresh and available for use. Water is such a valuable resource. Any way we can conserve it, we will.

- Our challenge with water for a long time was that it is free, so people didn’t think about saving it. We had to change that mindset and behavior to encourage people to save this precious resource.
- Stories that highlight these challenges and infrastructure needs:
  - Dump and fill pools at Gorilla World
  - $10,000 leak by cat canyon/grotto and its “natural spring”
  - In 1990, Manatee Springs opened with their UV system on but not really working
  - These examples show how we had to start changing the mindset and practices of staff, while at the same time really examine our infrastructure for leaks, necessity, frequency of use, etc. As we starting fixing these challenges, money saved was reinvested to other areas of the Zoo that needed upgrades or changes in infrastructure, which led to more savings and more reinvesting.
In 2005, our average annual water use was 218 million gallons, not including irrigation. If you include irrigation, add another ¼ million gallons.

- $600,000 on water each year up to that point (2005)
- $70,000 was the water bill Mark got his first week on the job. The Zoo used 20 million gallons that month. Sewer bill is based on free water usage. 18-20% a year sewer bills going up because CSO problem.

By 2010, we lowered water usage to 98 million gallons for the year. If we stayed at old numbers, cost difference is $700,000. Just in water, we realized that much in savings.

By 2012, we made it to 74 million gallons.

By 2013, the water usage was reduced to 54 million.

By 2014, we reduced usage to 52 million.

Our goal is to reach 50 million gallons of water per year.

Had to change behaviors with keepers. For every dollar you save us, we’ll put it right back into your facility. Keepers have been reacting pretty positively, once they saw the reinvestment back into their building.

Storm Water
Cincinnati has the oldest sewer system in the country. Storm water management is a huge environmental concern, especially in Hamilton County where the Zoo is located. It is arguably the biggest environmental challenge the region faces. Operating on a combined sewer overflow, or CSO, all of the region’s rainwater and sewage are going to the same pipe, and that pipe is too small. The age old system can’t handle the amount of rainwater and sewage, so Cincinnati has certain discharges of raw sewage going into the Ohio River several times a year. At least 15 billion gallons of mixed feces, prescription drugs, oil, and anything else going down the drain or flushed down the toilet – end up in our drinking supply annually.

The Zoo’s rainwater runoff ends up in the Mill Creek, so we are doing everything we can to help be a solution to the problem. When we build new buildings, we incorporate as many green engineering features as we can, including:

- Green Roofs – These planted roofs can harness a reasonable amount of rainfall that is absorbed and collected by the vegetated roof. The roofs reduce the volume of rainwater going into the sewer system and what does come off that roof has a much lower velocity. As water passes through vegetation, it gets filtered, reducing the amount of pollutants. A green roof isolates a home from heat, cold, and sound, and the lifespan of the roof is twice that of a conventional roof.

- Rain Gardens – Rain gardens are a simple solution people can implement in their homes, schools, churches, and places of work. Water comes off your roof, draining into your gutter, downspout and into your storm water piping system. Rather than having the downspout connected to the storm water piping system, the downspout can be connected to a rain garden. A plot of earth is dug out and filled with a mixture of sand, soil and gravel and plant it with native and adaptive plant species. When it rains, that water goes into rain garden where it is soaked up – same concept as green roofs. It absorbs water, decreases flow and improves quality while at the same time providing natural habitat for wildlife and reducing the amount of lawn that needs care and maintenance.

- Pervious Pavement/Concrete – Unlike traditional pavement or concrete where water runs off and into the sewer system, pervious pavement and concrete allows water to seep through it – either through spaces in between the poured concrete due to the absence of sand in the concrete mixture, or through space in between the brick pavers. The water that seeps through can recharge the ground water, or be saved in a retention tank to be reused.
The Zoo has partnered with the Metropolitan Sewer District on new projects to catch any rainfall and reuse it. Currently, 20 acres of our Zoo is off the stormwater grid (16 acres at Africa which can hold 13 million gallons of water and 4 acres at Main Entry Village which can hold 1 million gallons of water).

- For every gallon we reuse, we won’t have to buy. This will have big impact not just in Cincinnati, but all the way down the line. There is a dead zone in the Gulf of Mexico from a combination of this issue and poor farming practices.
- We’re in a concrete jungle. Our stormwater reduction will have an effect on our community – no more sewage in people’s basements, especially along Vine Street.
- It’s been a painful process, but we have fought through it.

**Energy Conservation**

The Zoo’s electricity usage is down despite adding much more square footage to the Zoo’s campus. We weren’t wasting as much as we were wasting water, but there were still opportunities to make changes and save energy. We focused first on behavioral issues which don’t cost a dime, but take time, energy, and dedication.

- Stories that highlight staff challenges and infrastructure needs:
  - Dehumidifier in the basement of Jungle Trails
  - Jungle Trails chest freezer
  - Volunteer at CREW example
  - Primate center with huge boilers installed USED in 1972.
  - Those are just examples, but saw issues and mindsets like these in every building at the zoo, even every zoo in the country or our homes has this as well. Common answers include “I don’t know, it’s always been there” or “We’ve always done it this way.”

- Some changes made include:
  - Walked thru each building literally room by room, went into buildings that felt in their gut were the worse offenders and had conversations with the people that used that equipment and were in that building on a daily basis.
  - When keepers see investment being made in them and their buildings, they are more than willing to help
  - Energy was 10 million kwh a year when Mark got here in 2006. Now energy use down 11% despite adding all the extra buildings.
  - Switched the lights used during Festival of Lights which lead to a $30,000 savings
  - 2006-2013 utilities we saved 5.6 million dollars, while investing 2.2 million dollars

- Investing in infrastructure makes sense – good for zoo, good for animals, morale, etc.

**Green Building**

We are the first zoo in the country to publicly commit to building all new projects to a minimum of LEED Silver standards. LEED stands for Leadership in Environmental and Energy Design. It is U.S. Green Building Council’s rating system that looks at every aspect of a construction project, from the day construction starts through the life of the building/exhibit. There are four levels of certification (certified, silver, gold, platinum). We acknowledge that the biggest thing we can do to impact our environmental footprint here at the Zoo is how we design, build, and maintain our buildings. 70% of greenhouse gas emissions in the city of Cincinnati come from buildings, so everything we can do to make buildings as efficient as possible, from energy and water to the types of materials that are used to construct our buildings. Everything we need to do, we will do.

The Zoo currently has more LEED buildings than any other Zoo in the nation. All the materials used to build each of our LEED projects were as sustainable as possible. Some features of these projects include no or low VOC paint, bamboo flooring, 100% recycled carpet, strawboard
countertops, recycled steel, drywall and plastic lumber, incredibly efficient insulation, renewable energy, water conservation strategies, and more.

- How you design, build and maintain your buildings has the largest impact on your organization’s carbon footprint. At the Zoo, 78% of our footprint is utility. Since 2005, carbon footprint down 12%.
- Our LEED Projects:
  - Harold C. Schott Education Center – LEED Silver, 2006
  - Historic Vine Street Village – LEED Platinum, 2009
  - Zoo Pavilion – LEED Gold, 2009
  - Zoo Gift Shop – LEED Gold, 2010
  - Cat Canyon – LEED Gold, 2012
  - Distribution Center – LEED Silver, 2012
  - Africa – projected – LEED Gold
- Living Building Challenge
  - The Living Building Challenge is an international sustainable building certification program created in 2006 by the non-profit International Living Future Institute. It is described by the Institute as a philosophy, advocacy tool and certification program that promotes the most advanced measurement of sustainability in the built environment. It can be applied to development at all scales, from buildings – both new construction and renovation - to infrastructure, landscapes and neighborhoods, and is more rigorous than green certification schemes such as LEED.
  - The Challenge is comprised of seven performance categories called Petals: Place, Water, Energy, Health & Happiness, Materials, Equity and Beauty
  - Our goal is to have the Africa Painted Dog exhibit certified in the Living Building Challenge. We will get petal certification at minimum, but hopefully also receive full building certification. There are only 10 buildings that have petal certification in the US. Only 5 have full certification.

Composting/Zero Waste

- For 136 years we had been sending poop, hay, etc. to Rumpke Landfill, which cost us money, burned fuel, and took up landfill space. It used to cost us $15 per bin, per day to have our bins to be picked up. That really adds up.
- At the same time, we were paying to bring in compost for our gardens. We knew we needed to solve this challenge however, nowhere in SW Ohio was certified to accept food and animal waste, until 2010.
- In 2010, Marvin’s Gardens was finally certified as a Class II composting facility and we had a place to bring our organic compost. Keepers and maintenance staff jumped in – taking 1-2 hours of their day, in the morning, no overtime, and figured out how to make our composting program work. In January of 2011, we started composting all herbivore organic waste, food waste from restaurant and catering areas, and food waste from staff kitchens/break rooms, about 10 tons per week.
- Once composting became such a success, we decided to start the journey towards becoming a zero landfill facility. This means that less than 1% of our total waste stream would be sent to the landfill. Everything else will be composted, recycled, reused, or reduced. To start gathering baseline data of what we are already throwing away, we conducted a series of dumpster dives and literally looked through our trash to see how much we were throwing away, and what could have been recycled, composted, or reused.
- Composting in SW Ohio has been a roller coaster ride of ups and downs. We have gone through a few different commercial composters in the region, and in July 2014, we unfortunately no longer have a place to bring our organic waste. We are working on a
solution to this challenge, but for now, we have to send all of our waste (except for recycling) to the landfill.

Local Food
In today’s fast pace world, there is a disconnect between the food on our plates, where it comes from and how it is grown. It takes a lot of resources to grow or raise food, and even more to package it, ship it, and store it on grocery shelves and in refrigerators. By growing food locally, or purchasing locally grown food, we can help make the connection between how that food is grown and when it makes it to our plates. We can also link local food and sustainability – using organic practices to protect our environment and conserving water and energy to grow crops or raise meat. Food is our common denominator, and it can create communities and strengthen relationships.

We have been heavily involved with local food issues because of the environmental impact our food industry has. On grounds, we show our guests how easy it is to grow their own food through a variety of edible food gardens. Our restaurant (the greenest in America) sources all of its food locally, and our animals eat quality food in their nutritious diets. Off grounds, we support the community any way we can in helping them to get fresh food – through community gardens, marketplaces, education and awareness, and more.

Avondale is a national recognized food dessert. Food deserts are areas where healthy, affordable food cannot be obtain. These communities do not have the same accessibility to quality, healthy, affordable food. Throughout Avondale, the Zoo has assisted with many projects that encourage green space and community gardens, contributing healthy food environments in the middle of a food dessert.

- Gabriel’s Place (Sept 2011 was official opening): A church on Reading Road has been converted into a community garden, community kitchen, a meeting place and market. The Zoo has been integral in assisting with the initial build and upkeep of the community garden and hoop house. We also volunteer during their Share-a-Meal program and in the Market Place.

EcOhio
The Cincinnati Zoo has been dedicated to sustainability not only on-grounds within its Avondale location, but at its off-grounds property as well. In 1995, a 529 acre farm called Bowyer Farm was willed to the Cincinnati Zoo & Botanical Garden with the guideline that it could never be developed unless it is to further the mission of the Zoo. Since then, the property has grown to 600+ acres, and is connecting with the Zoo’s mission of Adventure, Conservation, Education and Community in various ways, becoming “EcOhio Farm”.

- Local Food – In 2012, 100 acres of the Bowyer Farm was leased to Green BEAN Delivery, a company that delivers organic produce and natural groceries to Midwest homes and workplaces. With this new space in Ohio, Green BEAN Delivery can grow and harvest fresh, local foods that they will distribute as a part of their business, just as they do in Indiana with their Feel Good Farm. The EcOhio Farm LLC was born, and in the spring of 2012 was planted with a variety of commodities including cabbage, squash, broccoli and pumpkins that was used primarily for purchase by Green BEAN Delivery customers and our Zoo. Now, as of summer 2014, the land is certified organic by the USDA. This partnership is another way to not only decrease its ecological footprint, but build a sustainable local food system for the community, making its green efforts more tangible for everyone involved. This new, sustainable ecosystem will possess multiple
facets of agriculture and serve as an educational platform for community members to enjoy for many generations to come.

- **Wetland Reclamation** – Across the street from the 50-acres of land that Green BEAN Delivery is leasing, is 24-acres of land that has been determined to have been a natural wetland at one time. Overtime, this portion of land has been used as farmland producing soybeans and corn. Through support and funding from the U.S. Department of Agriculture (USDA), the Zoo is now able to take that 24 acres and reclaim it as its original state of a wet sedge meadow, or wetland, eventually returning the floral and faunal diversity that once was there.

Long term, the possibilities are endless. The main goal is to return the area to its original wildlife, with a rich array of plant and animal species that historically are naturally occurring to Warren County. Eventually, as the wetlands become established, walking trails and a small education center may be implemented, along with special events that offer educational programs and demonstrations, give aways, opportunities to explore the wetland, and much more. Ideally, EcOhio will become a green oasis in a sea of suburbia.

**Community**
The Zoo is committed not only to greening its own operations, but engaging its community to do the same. The fourth pillar of our Mission Statement is “Serving Community”, which recognizes our responsibility to partner with diverse and economically challenged communities in our daily work. By providing our community with the resources and tools they need to go green, we not only strengthen our relationship with them, but empower them to save money, save resources and instill pride within their homes and neighborhoods.

- **Green Space & Community Gardens** – Community green spaces are more than just lots with grass and a few flowers; they are meeting spots for neighbors, recreation areas for youth, refuges for wildlife. They bring a part of the natural world into the urban environment- to contrast the harshness of the concrete jungle and stimulate the senses. Community spaces foster connections not only with wildness, but between residents, making friends from strangers. Community green spaces can be as simple as a grassy lot, but they can be more: parks, playgrounds, gardens and more.

  - **City Barn Community Garden**, green space/gardens on Vine/Ruther/Glenmary, community garden on Beldare (not sure of time frame): The Zoo helped turn vacant lots or rundown areas along Vine Street into vibrant, healthy, green places. Volunteers and community members now take care of the upkeep and maintenance of the City Barn Community Garden and the Hilltop Community Garden on Beldare, as well as the garden beds on the corner of Ruther/Vine and Glenmary/Vine.

  - **Forest and Vine Gateway (October 2010)**: The corner of Forest Avenue and Vine Street was the site of three vacant and deteriorating houses. With the help of the Cincinnati Zoo, local company Building Value deconstructed these three homes. Through Building Value and the Easter Seals/Building Ability program, they learned valuable construction skills and all were hired on full time to various construction companies around the city once the project was finished. Approximately 85% the material from the homes was salvaged to be reused or recycled, such as glass block windows, floorboards, windows, banisters, pocket doors, bricks, and much more. The site is now a welcoming gateway into Avondale with a beautiful stone wall, native plants, and green grass.

  - **Northern-Larona Community Park (started 2010)**: The Zoo teamed up with the Avondale Avenue District Block Club, Avondale Community Council, Local Initiative Support Cooperation (LISC), Chase Bank and other community partners to turn a vacant lot in the heart of the Avenue District into a safe and vibrant
park. The Avenue District is the neighborhood located next to the Zoo. The Zoo has helped tremendously with establishing beds, planting trees, taking out old fencing, providing and laying down mulch and wood chips, and more.

- **Home Weatherization** – The Zoo and its community partners are reaching out to their surrounding neighborhoods to provide the education, awareness and resources needed for homeowners to save money and energy and to create healthy, comfortable living environments through home weatherization projects. Some of the home weatherization projects include:
  
  o *Avondale in Action*: In August 2011, the Zoo, People Working Cooperatively (PWC), the Greater Cincinnati Energy Alliance (GCEA) and Local Initiative Support Corporation (LISC) worked together with community volunteers to offer six Avondale, making them more energy efficient and more comfortable for residents. 6 different homes in Avondale had work done such as sealing ducts, installing weather stripping, replacing light bulbs, wrapping water heaters, replacing dryer vents, insulating basements, etc. PWC provided the crew leaders to walk us through many of the tasks, and provided us with a great background as to what we were doing and why.
  
  o *Green Your Home Contest (August 2011)*: The Zoo, Uptown Consortium and the Greater Cincinnati Energy Alliance (GCEA) worked together to bring the Green Your Home Contest to the Uptown Community in Cincinnati. Homeowners from each community were given the opportunity to register to win up to $7,500 worth of energy efficient upgrades to their home. One semi-finalist from each of the 5 Uptown communities was given a free home energy audit, and one grand prize winner was given the energy upgrades including new windows, duct sealing, insulation, and more. Vesta Cox from Corryville won based on her energy usage and contest entry essay.

- **Neighborhood Outreach & Education**
  
  o *Habitat For Humanity (2013)*: The Zoo is working with Habitat for Humanity to renovate an existing home on Larona Ave. The home will be built to LEED for Existing Building standards, and will receive Platinum certification, the highest level you can get. The Zoo’s staff will do most of the inside work, and once the home is complete, will stay in close contact with the family to keep them involved with the Zoo.
  
  o *Rockdale Green Team (started 2012-2013 school year)*: The Zoo works with Keep Cincinnati Beautiful to meet weekly with the Green Team at Rockdale Academy, the elementary school just 3 blocks away from the Zoo. The team consists of 4th-7th graders, and activities and program included recycling, school yard clean up, water conservation, eco-friendly holidays, and more.
  
  o *Rockdale Adopt-a-Class (ongoing since 2009)*: Zoo employees adopt a 3rd grade class from Rockdale every year. Each student in the class is paired up with a zoo employee. Throughout the school year they write letters to one another, and twice a year the kids come to the Zoo to meet their adopters in person and to celebrate.
  
  o *Avenue District Block Club*: The Zoo works closely with the Avenue District Block Club to help with events such as the Block Parties, neighborhood clean ups, and more.
  
  o *North Avondale Montessori Greenhouse (July 2012)*: In the spring of 2012, the Zoo donated a greenhouse to North Avondale Montessori.

**Other Green Initiatives**
Green fuel - B20 is run through our stuff. UC students built biofuel reactors to take French fry oil and make our own B30. This didn’t cost us anything and should generate 500 gallons a year at $3.50/gal for diesel. We also work with UC. North Carolina Zoo who makes their own as well.

Green purchasing policy – We started this policy to ensure that everything coming into the Zoo is as green as possible. This includes FSC certified paper and using green cleaning products when applicable.

Habitat destruction is due to natural resource consumption, in the end comes to improving employee morale, leader in community, improving zoo aesthetically, saves money, raise awareness

**SEE THE GREEN AROUND THE ZOO:**

**Common Tour Stops**

**Harold C. Schott Education Center**
- Opened 2006
- First LEED certified Silver building at the Zoo and in the City
- 31,000 sq feet; largest building on Zoo’s campus, lots of traffic
- Building features include 20kw solar array, rain gardens, bamboo stage, strawboard counters/cabinets, eco-friendly paint, carpet made from recycled plastic, flooring made from plants, recycled cement, recycled steel, low flow toilets, low flow faucets, automatic faucets/toilets, recycling center, etc.

**Edible Food Gardens**
- Outside Education Center – Our small edible garden, located near the Schott Education Center, is meant to demonstrate how easily and compactly a productive vegetable garden can be built. It was designed and constructed by Zoo Horticulture Staff in collaboration with Peter Huttinger of the Civic Garden Center of Cincinnati and Tracy Williams of Greensleeve Designs of Louisville, KY. Featured are raised vegetable beds, which will rotate between legumes (beans and peas), cold crops (kale, cabbage, cauliflower), tomatoes, peppers, and more. From vertical window boxes, we will harvest a rich diversity of nutritious lettuces, other greens, and herbs. A small orchard of trees and assorted berries will provide fruit. All the plants are watered with an irrigation drip line system. Produce is harvested by Horticulture, and then delivered to the Commissary where the keepers divvy it out as enrichment for the animals.
- Chipotle Gardens – when in season, there is a container garden in the Vine Street Village Main Entry, and 2 in the beds in Children Zoo and by Bird House.
- Greenhouse – we may be the first Zoo in the country to use an aquaponics system.

**Elephant Reserve**
- Compost story/zero landfill initiative
- Goal is to become a zero landfill facility where less than 1% of our total waste stream goes to the landfill

**Go Green Garden**
- Opened in 2009 with the Vine Street Village
- 7,000 sq foot exhibit that highlights everything the Zoo does to go green, and encourages our guests to join us in going green
• Features include: 10 kw solar canopy, 1.2 kw wind turbine, rain garden, rain barrel, pervious pavement, geothermal wells, green roof sample, cell phone recycling, and native plants
• Staffed in the summer to have conversations with guests, answer questions, give mini tours, etc.

**Historic Vine Street Village**
• Opened in 2009 and features 3 LEED projects
  o Vine Street Village – LEED Platinum, 2009
  o Zoo Gift Shop – LEED Gold, 2010
  o Transit Pavilion – LEED Gold 2010
• Features include: highly insulated buildings, geothermal heat exchange which completely heats and cools the buildings, solar thermal panels providing hot water for the restrooms, green building materials, pervious pavement

**Solar Canopy**
• Installed in 2011
• $11 million dollars (Zoo paid zero)
• 6400 panels; everything was made in the USA
• Provides 20% of the Zoo’s total electricity needs. On days when it is sunny and cool, we are completely off the grid
• Largest urban, publically accessible array in our industry
• 1.56 megawatts – could supply power to 200 homes per year. It provides 20% of zoos power for the whole year. When it’s sunny and cool it can provide more energy than needed and the zoo is off the grid.
• Melink owns, operates and maintains the system for 7 years
• 12x10 ½-inch steel, base is concrete, 15 ft in ground. Could handle 1 inch hail at 55mph, 42 foot array
• We buy power back at market rate (locked in rate) year 8 we have the option to continue or to buy systems, values of that power -$7million, conservatively.
• Ave life span of solar panels is about 25 years
• Solar world is manufacturer – Germany based, but these panels built in Oregon. Only 2 manufacturers in US. 100% of contractors are Cincinnati. Partnered with cinci state – 10 scholarships have students work on this project for 1 of the 2 jobs needed to get certificate

**Cat Canyon**
• Opened in 2012
• LEED Gold – our first LEED project that is an animal exhibit. LEED features include:
  • Protecting and restoring the existing natural habitat.
  • Using non-heat absorbing materials on the roof and pathway to reduce heat island effect.
  • Reducing water usage for irrigation by 50%.
  • Reducing water usage within the building by 30%.
  • Optimizing energy performance within the existing building with new HVAC equipment and new insulation on the roof.
  • Reusing and maintaining over 95% of the existing building shell
  • Diverted over 75% of the construction waste away from landfills
  • Over 20% of the new materials used were post-consumer recycled.
  • Over 40% of the new materials used were from regional sources (within 500 miles).
  • Interior materials such as adhesives, sealants, paints, and carpets had low VOC contents
Gorilla World
- Cell phone recycling

Manatee Springs
- Improved operations for significant water savings
- Installed solar tubes so the manatees have natural light
- Compost leftover lettuce

Zoo Café
- 4 star Green Restaurant through Green Restaurant Association
- SSA great partners in sustainability
- Food sourced locally as much as possible
- Really helping with our zero landfill goal
- Greenhouse and aquaponics

Africa
- Africa will be a LEED certified project; significant stormwater savings with tanks underneath the exhibit harnessing up to 13 million gallons of rainwater per year that will be reused in the exhibits
- Africa – kind of a valley, 17 acres drain into that area
- Africa tanks 300,000 gallons at any given time
- Shooting Living Building Challenge with the African Painted Dog exhibit

Giraffe Ridge
- Giraffe Ridge opened in 2007 – has 2400 sq. foot green roof

Friendly Reminders:
Make sure your group is not looking into the sun
Make sure your group can see/hear you
Pause when a helicopter, siren, other loud noise comes through. You don’t want to compete with them.
Be passionate, energetic, inspiring.
Share personal “green” stories as you have them and they fit into the conversation.
Encourage questions and comments from the group. Keep it a conversation, not just a lecture/tour.
Aquaponics

How the system works:

- Aquaponics is a combination of hydroponics and aquaculture
  - **Hydroponics** - growing plants in water without soil
    - Expensive and can be difficult to apply the needed nutrients
  - **Aquaculture** - the farming of fish in tanks
    - Fish produce toxic waste, new water has to be pumped in daily
      - If this water is emptied into waterway it can pollute streams
  - However, combining hydroponics and aquaculture helps to solve these problems
- Aquaponics is a closed-loop, self-regulating system that is also an example of a zero waste system
  - Fish are grown in a tank
    - We have two, 200 gallon tanks containing catfish and blue gill
    - Air is pumped into the tank to ensure that there is plenty of oxygen throughout the system. It also helps prevent excess algae bloom
  - The fish are fed each morning, these fish then produce waste high in ammonium
    - This water is pumped into the bio-reactor (the two trash can looking things in the back)
    - In the bio-reactors there is bacteria that process the ammonium into nitrate and other nutrients, which are fully edible by plants
  - The water now containing nitrate is pumped from the bio-reactors into the plant grow beds and growing trays
    - Grow beds are simple containers filled with gravel and which have plants planted in them on top
    - 2 beds, constructed from materials that can be found at Lowes
    - One grow bed contains regular gravel- cost about $20 to fill – Does better!
    - The other grow bed contains clay- cost about $300 to fill
    - The plants absorb the nitrate and nutrients through their roots in order to grow which also effectively cleans the water
  - The clean water then ends up back in the fish tanks!
- 1 gallon of water = ½ to 1 square foot of grow space
- 1 pound of fish needs 1 to 2 gallons of water
- Fish are happy because their water is clean, plants are happy and grow quickly because they are receiving nutrients 24/7, and people are happy because they have access to home-grown, organically produced food

How the system is sustainable:

- Creates an ecosystem where one would usually not be able to exist
• **Closed loop** ("it’s only waste if you waste it")
  o Utilize the fish waste as food for the plants
  o Eliminates expensive filters, frequent water changes, and chemical cleansers
• **Energy efficient**
  o The only energy input needed is for the water and air pumps that ultimately provides lots of fresh food and protein
  o Aquaponics energy usage is from 70% to 92% less than a conventional or organic farm
• **Conserves water**
  o Generally uses 90% less water than soil based agriculture because the water recirculates within the system rather than seeps away
  o The only water loss is through evaporation and transpiration from plant leaves
• **Local Food**
  o Allows for fresh, organic, and nutritious food to be grown locally or even at your home
  o Reduces *food miles*, now we’re talking *food feet*

**How YOU can do aquaponics:**

• Where does aquaponics fit? :
  o In homes- to enhance self sufficiency
  o In schools- to empower a growing generation
  o Commercial production for communities- to create resilience
  o Urban agriculture
• Aquaponics is ideal for urban environments where space is a valuable commodity
  o Can have a small system that sits on your desk or inhabits a window sill
  o Can have a full greenhouse system like the one at the Zoo
  o All the way up to commercial scale urban farms that occupy underutilized land and warehouses

**How the Zoo uses aquaponics:**

• Grows plants that are harvested to be used in the restaurant and to feed some of the Zoo’s animals such as: Tomatoes, Cucumbers, Squash, Swiss Chard, Grains, Basil, Oregano, Cilantro

**How to Get Started- References**

• If you want to buy one or want one custom created for you the Cincinnati Aquaponics Project can build them – contact them at 513-535-4432 or at bsorsch@gmail.com
• For creating your own, there are many different types, sizes, and ways to create a system
  o Most all materials can be bought from a hardware store like Lowes
  o Here is a good website with detailed videos of how to build different types of systems: [http://aquaponicpeople.com/diy-aquaponics-system-design-build/](http://aquaponicpeople.com/diy-aquaponics-system-design-build/)
  o The Cincinnati Aquaponics Project can also provide more information/designs if you would like to construct the system yourself.
Appendix E: Aquaponics Field Guide

Pages: 128-145
Aquaponics is an exciting way to grow fruits, vegetables, and plants using waste water from raising fish. It combines the best components of growing of plants without soil (hydroponics) and raising fish (aquaculture) to create an organic, sustainable system. Aquaponics can be done indoors or outdoors, on a small scale or a large scale. It is completely free of dirt, weeds, and uses significantly less water than traditional gardening.

In an aquaponics system, fish are housed in tanks and the water from the fish tank is pumped into grow beds where beneficial bacteria convert the waste into nutrients perfect for plant growth. Plants filter the water by consuming the nutrients from the fish waste. The now cleaned water is then pumped back into the fish tank. This system is not only extremely sustainable, but benefits everything involved. The plants grow quickly because they are receiving nutrients 24/7, the fish live in water that is constantly cleaned, and people get to have access to home-grown, organically produced food.
Ammonia can be taken up directly by plants. However, most of the ammonia produced is converted into nitrites by nitifying bacteria.

This is a two step process:
- Bacteria - Nitrosomonas oxidize NH₃ to nitrites (NO₂⁻).
- Bacteria - Nitrobacter oxidize the nitrites to nitrates (NO₃⁻).

By this process the nitrogen from the fishwaste is made available to the roots of the plants.

Plants take up the nitrates as nutrients for growth.

Purified water returns to the fish environment.

Fish excrete ammonia NH₄⁺ / NH₃.
FISH: TILAPIA

- Rugged, resistant to disease and parasites
- Can handle a wide range of water quality and temperature challenges
- Thrive in water temperatures between 60-80 degrees
- Easy to breed and can grow to 2.5 lbs. in seven months
- Omnivorous

What to look out for:

- System can become overrun because they breed and spawn so quickly
FISH: CATFISH

- Can handle extreme temperature changes, ideal 60-90 degrees
- Easy to feed as they are omnivorous
- Co-exist well with bluegill
- Can take extremely high stocking density

What to look out for:

- Relatively slow growth rate compared to tilapia
- Their fins are connected to a venom gland
- Have skin, not scales which can make them more susceptible to water quality challenges
FISH: BLUEGILL

- Ideal water temperature 65-80 degrees
- Omnivorous
- Do well living with catfish, catfish prefer the bottom of tank while bluegill occupy the top

What to look out for:

- Generally smaller than both tilapia and catfish
- Bluegill grow at different rates
PLANTS: TOMATOES

In garden:

- Plant late spring early summer
- Make sure not to overcrowd the plants
- Need 5-8 hours of sun
- Need temperatures between 55-85 degrees
- Need fertile, well-drained, deep soil
- Water regularly
- Most varieties can be harvested around 60 days

Recommended varieties:

- Amish paste, Brandywine, Matt’s Wild Cherry
PLANTS: CUCUMBERS

In garden:

- Prefer warm conditions, growing best at around 75-95 degrees
- Grow in two forms: vining and bush
- Grow fast without a lot of care
- Keep the soil moist, not wet
- Can harvest when they are big enough to use, about 6-8 in
- Don't wait too long cucumbers become overripe and bitter

Recommended varieties:

- Sweet Success, Straight Eight, County Fair
PLANTS: ZUCCHINI

In garden:

- The soil needs to be warm (at least 60° at a two-inch depth)
- Outside planting site needs to receive full sun
- Soil should be moist and well-drained, but not soggy
- Plant seeds about one-inch deep and 2 to 3 feet apart
- Water deeply once a week, applying at least one inch of water
- Harvest when small and tender for best flavor

Recommended Varieties:

- Goldbar, Cocozelle, Butterbush, Cream of the crop
PLANTS: BEETS

In garden:

- Prefer cooler temperatures, can be planted in March/April as long as temperature doesn't exceed 75 degrees
- Plant seeds ½ inch deep and 1-2 inches apart
- Mulch and water well
- Most varieties can be harvested between 50 and 70 days

Recommended varieties:

- Detroit Dark Red, Formanova
PLANTS: PEPPERS

In garden:

- Start seeds indoors 8-10 weeks before last spring frost date
- Temperature needs to be at least 70 degrees
- Transplant seedlings outdoors, 18 to 24 inches apart
- Water one to two inches per week
- Harvest as soon as peppers reach desired size

Recommended Varieties:

- Green to Red: Lady Bell, Gypsy, Bell Boy, Lipstick
- Yellow: Golden California Wonder
PLANTS: **BASIL**

**In garden:**

- Ensure site gets 6 to 8 hours of full sun daily
- Soil should be moist and well-drained
- Plant the seeds/seedlings about 10 to 12 inches apart
- Soil should be around 70°F for best growth
- The best time to harvest is right when the plant starts to bud

**Recommended Varieties:**

- Cinnamon Basil
- Purple Basil
- Thai Basil
PLANTS: CILANTRO

In garden:

- Plant cilantro in the spring after the last frost date or in the fall
- Plant the seeds in light, well-drained soil and space them 1 to 2 inches apart
- Choose a sunny site that will allow cilantro to self-seed as it is ought to do
- Water the seedlings regularly throughout the growing season

Recommended Varieties:

- Slow-bolting varieties, such as 'Costa Rica', 'Leisure', and 'Long Standing' are the best choices for harvesting the leaves
PLANTS: OREGANO

In garden:

- Does best in full, strong sunlight
- Plant the seeds/cuttings in well-drained soil any time after the last spring frost
- Plant 8 to 10 inches apart
- Only water when the soil feels dry to the touch
- Harvest the leaves as needed. The most flavor-filled leaves are found right before the flowers bloom

Recommended Varieties:

- Greek oregano for cooking
- Common oregano for decoration
PLANTS: **SWISS CHARD**

**In garden:**

- Set out plants 2 to 4 weeks before the date of the last frost in spring
- Tolerate heat well as long as kept properly watered
- Grows best in rich, moist soil
- Can begin harvesting outer leaves anytime that they are large enough to eat

Recommended Varieties:

- Rhubarb, Fordhook Giant, Bright Yellow and Silverado
PLANTS: CHIVES

In garden:

- Prefer full sun
- Soil needs to be moist, fertile, rich, and well-draining
- Before planting, incorporate 4 to 6 inches of well-composted organic matter
- Sow as soon as the soil is workable in the spring
- Plant seeds ¼ inch deep and final plant spacing should be 4 to 6 inches apart
- Harvest chives 30 days after you transplant or 60 days after seeding

Recommended Varieties:

- Garlic Chives
PLANTS: LETTUCE

In garden:

- Cool-season crop that grows well in the spring and fall
- Temperatures between 45 F and 65 F are ideal
- Loose, fertile, sandy loam soils, well-supplied with organic matter are best
- Make sure soil remains moist but is well-drained
- Should be harvested when full size, but just before maturity

Recommended Varieties:

- Crisphead: 'King Crown', 'Mission'
- Cos (Romaine): 'Wallop', 'Paris White Cos'
- Loose Heads: 'Burpee Bibb'
Interpretive Guide
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Cincinnati Zoo & Botanical Garden, 2009
An Interpreter’s Role

Studies show that personal interaction with interpreters is a highly effective way to reach visitors with a particular message. While signage that introduces the exhibit’s theme and supporting concepts will be present, the success of the Go Green Garden really relies on conversations.

Interpreters are tasked to engage visitors through a variety of activities including informal chats, 10-minute talks, tours, and play facilitation. Interpretation should focus on the exhibit theme of how the Zoo is going green and how you can, too.

Good interpreters are friendly, welcoming, well-informed, enthusiastic, and passionate. Interpreters are not expected to know the answer to every question, but should be able to point visitors to a resource for more information.

Keep in mind that this exhibit, and your role as an interpreter, is ever-changing. As new green discoveries are made and the Zoo adds new green elements to its initiatives, the exhibit may evolve along with them. This guide serves as an introductory resource on the Go Green Garden, providing background information on certain green elements and guidelines for interpretation.
What is the Go Green Garden?

The Zoo is going green, and you can, too! The goal of the Go Green Garden, presented by Duke Energy, is to increase visitor awareness of how the Zoo is going green and inspire visitors to go green in their own homes. The exhibit highlights the Zoo’s green efforts in terms of green building design, energy efficiency, water conservation, storm water management, solid waste management, and land stewardship. Go Green Challenges throughout the exhibit present tangible suggestions for how visitors can address the same issues at home.

Visitors enter the exhibit off of the main path across from the Asian Elephant Reserve entrance into an open-air, roofed structure, built in the same style as the Historic Vine Street Village. The structure serves as both an entry and exit space. The entry wall features colorful signage that introduces visitors to the theme of going green. An interpretive counter in the structure serves as a communication hub where interpreters can engage visitors in conversation, answer questions, and direct them to resources for additional information. This space serves as the information center for botanical and horticultural topics as well as green efforts. Interpreters will be able to guide visitors to particular web sites of interest and offer to email links at a computer station. Other tools include various bio-facts and printed materials. A daily activity board will announce upcoming tours, talks, and so on within the exhibit. At the far end of the structure, along the exit path, wall-mounted signage focuses on green building.

Walking through the structure into the exhibit, visitors then follow a looped path (made of pervious pavement) along which they encounter various green elements, including a rain garden, rain barrel, solar panels, geothermal wells, pervious pavement, recycled art mural, wildlife garden, trees, compost bin, and a green roof demonstration. Each element is accompanied by interpretive signage that includes suggestions for how to incorporate the same idea at home called Go Green Challenges. Visitors can engage with interpreters and participate in various activities including informal chats, 10-minute talks, tours, and kids’ play activities. Several benches are available for visitors who choose to rest and relax in the garden.

Along the way out, visitors are encouraged to stop at the interpretive counter to ask questions and get more information on green elements and horticultural topics. The Go Green Garden acts as the hub for botanical information in addition to its emphasis on going green. Here, interpreters share botanical information with visitors. Brochures, handouts, and maps are available for visitors. The final sign as visitors exit challenges them to consider how they can green their impact on the planet.
Going Green

What Does it Mean to Go Green?
Going green is about making choices in our daily lives that promote a healthy planet, from what you eat to what you wear to how you get from here to there.

Why Go Green?
Going green is crucial to maintaining a healthy planet and its natural resources upon which both people and wildlife depend. It is also good for your health, pocketbook, and quality of life.

How is the Zoo Going Green?
The Zoo is doing its part to conserve natural resources that are critical to saving wildlife and wild places. The Zoo is committed to greening its daily operations and reducing its impact on the environment through the use of rain gardens, recycled building materials, solar panels, and more.

How Can I Go Green?
Take a close look at the choices you make in life and identify the opportunities you have to select greener options. Start with a couple of quick and simple changes. Once you’re comfortable with those, pick out a few more to pursue, and you’ll be well on your way towards a greener lifestyle.

"You must be the change you wish to see in the world."
- Mahatma Gandhi

"When we heal the earth, we heal ourselves."
- David Orr
Green Initiatives

Green Building

In the United States, buildings use one-third of our total energy, two-thirds of our electricity, one-eighth of our water, and alter land that provides valuable ecological resources. From purchasing construction materials locally to cut down on carbon emissions during transport to choosing carpet made of recycled plastic bottles, there are many green options when it comes to reducing the impact buildings have on the environment.

LEEDing the Charge

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the industry-recognized, voluntary standard for sustainable building design. LEED promotes green design in six major categories.

Sustainable Sites
When choosing a building site, the protection and restoration of natural areas should be considered.

Water Efficiency
Buildings should incorporate features that minimize water consumption.

Energy & Atmosphere
To minimize the impact on the atmosphere, buildings should run as efficiently as possible.

Materials & Resources
Eco-friendly materials and resources should be used and surplus should be salvaged or recycled.

Indoor Environmental Quality
Buildings should offer a healthy and productive environment for employees as well as visitors.

Innovation & Design Process
Green building design should demonstrate a commitment to innovation and sustainability.
What Does the Zoo Do?
The Zoo pledges to pursue LEED certification on all new construction projects, and is the first zoo in America to make such a commitment. The first LEED-certified building at the Zoo was the Harold C. Schott Education Center, which opened in 2006. The Historic Vine Street Village was also built to LEED-certification. The Zoo also works to retrofit existing buildings with green features whenever possible.

Examples of the Zoo’s green building efforts include:

- Light-colored roofs reflect sunlight and prevent hot spots that disturb the natural climate.
- The giraffe barn’s green roof and rain gardens (Go Green Garden, Education Center, Parking lot) reduce the rate and volume of storm water that enters the sewer system.
- Two water retention tanks (12 feet in diameter and 144 feet long) are buried beneath the Vine Street parking lot to collect rainwater runoff from the lot and slowly release it into the city’s storm water system.
- Water main repairs, finely tuned filtration systems, waterless urinals, and low-flow faucets and toilets reduce water consumption.
- We upgraded our three largest boilers to new, 90+ efficiency systems.
- The Education Center was the first LEED Silver certified building in Cincinnati.
- A portion of the energy needs for the Education Center and Membership and Ticketing Building are generated by solar panels (20kW and 10kW arrays, respectively).
- A solar water heating system provides warm water to the Vine Street Village restrooms.
- Light fixtures contain energy-efficient T8 fluorescent lamps and compact fluorescent light bulbs (CFL).
- Building materials include renewable bamboo and strawboard (made of sunflower seed shells and wheat straw), composite wood (made of recycled plastic and wood waste), and recycled carpeting, steel, and drywall.
- Low-emitting adhesives, sealants, paints, and carpet minimize the release of potentially harmful gases, or volatile organic compounds (VOCs), into the air.
- The METRO bus hub incorporated into the Vine Street Parking Lot is the first LEED certified bus hub in the nation, with solar panels on the roof and LED lighting.
- The Zoo educates visitors on green building design and encourages them to go green at home.

Bamboo is a fast-growing, highly renewable, and durable alternative to wood used for flooring and furniture.
Energy Efficiency

Burning fossil fuels to produce electricity and power cars accelerates climate change, a serious threat to all life on Earth. Generating electricity to build and maintain buildings accounts for nearly 40% of the total energy use in the United States. Implementing green building practices and technologies that are already available could significantly reduce energy costs and carbon emissions.

The Zoo is committed to increasing energy-efficiency, including:

- Upgraded light fixtures that contain energy-efficient light bulbs and sensors that automatically turn off the lights when no one is in the room
- Highly efficient replacement boilers and water heaters
- Heating, ventilating, and air conditioning systems that employ energy management equipment and software
- Renewable energy sources such as solar panels, geothermal wells, and biomass
- Have converted the train, shuttle, and other diesel vehicles to biodiesel

Go Green Challenge: Energy-Efficiency in Your Home

It’s smart to be energy efficient. Just by making a few simple improvements, you can make your home a little greener and save 10 to 50 percent on your home energy bills.

Windows & Doors

Gaps between windows and doors can collectively add up to big energy losses. By sealing those leaks and installing proper insulation, the Alliance to Save Energy estimates Ohio households can reduce home heating costs by up to $190 to $325 per year, depending on the fuel used.

Thermostat

According to Energy Star, a programmable thermostat could save up to $150 per year on energy bills.

Electronics

The average home has two televisions, a VCR, a DVD player and three telephones. If these items were replaced with Energy Star qualified models, it would save more than 25 billion pounds of greenhouse gas emissions, the equivalent of taking three million cars off the road for a year.

Shower

Showering represents approximately 17 percent of residential indoor water use in the United States. A 10-minute shower uses about 25 gallons of water. Install a new 2.5 gallon per minute low-flow...
showerhead to conserve water and save up to $145 each year on electricity.

**Appliances**
Households that replace existing equipment with Energy Star qualified products can cut annual energy bills by 30 percent, or more than $600 per year.

**Light Bulbs**
Replacing incandescent light bulbs is an easy and inexpensive way to save energy and money. According to Energy Star, each CFL you install saves an average of 51 kilowatt hours, $5.41, and 78 pounds of carbon dioxide emissions per year.

**Computers**
The Environmental Protection Agency estimates that if all computers and monitors in the United States were set to sleep mode when not being used, the county could save more than 44 billion kWh or $4 billion worth of electricity and avoid the greenhouse gas emissions equivalent to those of about five million cars each year.


A society is defined not only by what it creates, but by what it refuses to destroy.

— John Sawhill, Former president/CEO of The Nature Conservancy
Solar Energy
What do green leaves, crocodile scales, and solar panels have in common? They all harness the sun’s energy. Solar panels convert sunlight into electricity without releasing climate-changing carbon dioxide into the air.

Clean Energy
Solar, or photovoltaic, cells are made of silicon, a semi-conducting element. The cells absorb sunlight and convert it into electricity without releasing carbon dioxide into the air like burning fossil fuels does. Carbon dioxide is the primary culprit of climate change, which is already having devastating impacts on wildlife and ecosystems around the world.

It Makes Cents
Not only is solar energy clean, it comes from an unlimited, renewable, and free resource (at least for the next five billion years before the sun begins to fade). Generating solar energy reduces our dependence on fossil fuels, which are limited, non-renewable, and costly.

Sunny Days at the Zoo
The solar panels in the Go Green Garden generate about 25% of the energy needed to power the Membership and Ticketing building. That’s enough energy to power 100 standard incandescent light bulbs or 400 compact fluorescent light bulbs. Solar panels on the roof of the Harold C. Schott Education Center also produce clean energy.

Go Green Challenge: Go Solar
Harness the clean, renewable, and free energy of the sun to heat and power your home. As the world turns its attention to solar power, the initial costs of purchasing and installing solar panels in homes is becoming more and more affordable, and tax credits may be available.

The Sun, the hearth of affection and life, pours burning love on the delighted earth.
- Arthur Rimbaud, French Poet
Geothermal Energy
Geothermal energy comes from the natural heat of the Earth, and can be used to generate electricity or heat and cool buildings without burning fossil fuels and accelerating climate change.

Core Power
To produce electricity from heat radiating from the center of the Earth, wells are drilled and water is pumped through pipes hundreds or thousands of feet into the ground. There the heat turns water into steam. As it returns to the surface, the force of the steam turns the turbines to create electricity.

Hot and Cold
Geothermal energy can also naturally heat and cool buildings. Geothermal heat pumps, which use very little electricity, circulate water through a continuous loop of piping that goes just several feet underground where the temperature is about 55°F all year round. In winter, the water picks up the heat in the earth and carries it to the surface where it heats the building. In summer, the water picks up heat from the building and takes it underground, thus cooling the building.

Go Green Challenge: Find the Geothermal Wells
Find eight discs on the ground, which represent the eight geothermal wells beneath the exhibit that heat and cool the Membership and Ticketing Building. Each disc features an animal or plant that is directly affected by climate change.

- The Arctic sea ice from which polar bears hunt seals is melting and bears are going hungry.
- Warmer seas mean there is less algae for krill to eat, less krill for fish and squid to eat, and less fish and squid for king penguins to eat.
- Higher temperatures speed up the metabolism of cold-blooded animals, such as salmon, which burns more energy than the salmon has to spare.
- The golden toad has disappeared from Costa Rica’s cloud forests where increasing temperatures enhanced the spread of fatal chytrid fungi infections.
- Global warming threatens to push the Ohio buckeye, Ohio’s state tree, out of Ohio and north into Michigan.
- Ruby-throated hummingbirds are returning north several weeks earlier than they did 30 years ago, likely due to changes in climate.
- The stress of higher ocean temperatures can cause staghorn corals to expel the algae they host and feed on, called coral bleaching.
- Checkerspot butterflies are disappearing from the southern portion of their range where it’s getting too hot and dry for the plants they feed on to survive.
Biomass Energy
The Zoo is currently engaged and jointly funded by the Ohio Department of Development and Duke Energy to explore the feasibility of generating biomass energy from elephant waste. Energy derived from converting our organic waste stream, including manure, food waste, paper, and horticulture waste, into electricity will support the energy needs of the elephant house and Education Center.
Water Conservation

Water is everywhere. In fact, two-thirds of the Earth’s surface is covered with water. Only a tiny percentage of it—one hundredth of one percent—is available as clean, fresh water in lakes and rivers. We use that up faster than it can be restored through the natural water cycle. To make up the difference, we manufacture clean water at treatment plants, which burns a lot of energy and money.

Reduce Your Use

The average person uses 80 gallons of water a day. For example, a single bath uses up to 20 gallons of water. Brushing your teeth twice a day uses about 4 gallons of water. Each person flushes about 25 gallons of water down the toilet in a single day. Drinking eight 8-ounce glasses of water a day equals about ½ gallon.

Here are just a few ways we can reduce our use of water:

- Take short showers and turn off the faucet while shaving or brushing your teeth.
- Place a brick in your toilet tank to cut back on the amount of water that gets flushed.
- Only run the dishwasher and washing machine for a full load.
- Landscape with plants that require little watering, and when you do water the plants, do it early in the morning.
- Use a broom, not a hose, to clear off driveways and sidewalks.
- When replacing water in pet bowls and fish tanks, give the old water to your plants.
- Wash your car at a commercial car wash that recycles its water.
- Affix water-saving aerators to your faucets.
- Newer dishwashers can clean dishes without pre-rinsing.

Recycle the Rain

Household water use skyrockets in the summer as we water our gardens and lawns. Capture rain water from your roof in a rain barrel to use for irrigation, which is better for your plants than chemically-treated water. This also cuts down on the amount of rain that washes into streams, rivers, and sewers. Using a rain barrel can save more than 1,000 gallons of water over a single summer.

Water Use at the Zoo

By fixing old water main leaks, upgrading water filtration systems, and using water conservatively, the Zoo is significantly reducing water usage.
**Storm Water Management**

Working in conjunction with the Metropolitan Sewer District, the Zoo is working to reduce its storm water discharge through the use of pervious pavers, green roofs, rain gardens, and bio-retention. For example, a large retention tank buried beneath the Historic Vine Street Village collects and stores up to 10,000 gallons of rainwater at a time.

**Pervious Pavement**

In big cities, up to 30% of the land surface is covered with pavement. We walk on it. We drive on it. We park on it. When it rains, water from traditional roads and parking lots runs off into the landscape and sewer drains, causing water pollution and flooding.

Pervious pavement allows rainwater to seep through it instead of forcing it off the edges. Water passes through tiny holes in pervious concrete or spaces between pervious pavers and is temporarily stored in a gravel layer below.

**Zoo Pavement**

More than 30,000 ft$^2$ of pervious pavement was laid in the Historic Vine Street Village, which can store about 500,000 gallons of storm water at a time. Overflow is directed into our elephant moat, which essentially acts as a large retention basin. Pervious concrete and pavers were also used to create the Go Green Garden path.

**Go Green Challenge: Pervious Patio**

If you renovate or create a patio, path, or driveway, use pervious pavers or concrete to reduce rainwater runoff.
Rain Gardens
In a rain garden, plants are grown in a low spot designed to temporarily collect rainwater from downspouts and pavement. Rainwater that the ground does not soak up runs off into streams and sewers, picking up dirt and other pollutants along the way. Runoff can cause flooding, sewer overflow, and polluted water. By collecting rainwater, a rain garden reduces the amount of runoff that goes directly into streams and sewers. A rain garden also purifies the water as the root systems of the plants filter out dirt and other particles before releasing it deeper into the soil.

As the first city in the country to have a sewer system, Cincinnati deals with an outdated design that directs rainwater runoff and sewage into the same system, making it more likely to overflow after a storm.

Like other gardens, a rain garden provides a pleasing landscape as well as a habitat for wildlife.

The Zoo’s Rain Gardens
Check out the Zoo’s rain gardens in the Go Green Garden, in front of the Harold C. Schott Education Center, and in the Vine Street parking lot. Rain gardens are a relatively new method of storm water management in our region. The Zoo has some of the most visible and diverse rain gardens in the region and is a teaching garden and provides a model for other institutions. It is also a test garden, information from which will help determine the best practices for creating rain gardens in our area.

In parking lots, as heavy rains fall, water rushes across the lot, picking up grease, oil, and antifreeze along the way, and into the landscape. To prevent the runoff from flooding sewers and polluting streams, it is captured by a commercial-style bioretention area (rain garden). The water infiltrates (moves through) a thin layer of topsoil into a layer of open-graded gravel. Equal-sized stones create empty spaces that collect the water. A filter fabric separates the gravel layer from the surrounding clay to maintain the voids. Plant roots extend into the gravel layer and over time take up much of the water. The water that does eventually seep to the bottom of the gravel layer passes through the filter, leaving behind any contaminants.
Go Green Challenge: Grow Your Own Rain Garden
For help creating your own rain garden, consult Rain Gardens for Southwest Ohio: A Practical Handbook for Home Gardeners (which was co-authored by our very own Director of Horticulture, Stephen Foltz) found on the Hamilton County Soil & Water District’s web site at www.hcswcd.org.

Here’s the basic idea:

1. **Choose an appropriate site.**
Locate your rain garden at least 10 feet away and downhill from your house. Make sure there are no utility lines underneath the area.

2. **Dig out the bowl.**
The size of the garden does not matter as much as the depth. To soak up the water within 24 hours, most rain gardens are 4 to 8 inches deep.

3. **Prepare the soil.**
Till at least a foot of the soil. If it’s clay or hard, remove some soil and mix in compost to make it easier to soak up rainwater.

4. **Pick your plants.**
Choose attractive, hardy plants suited to the amount of sunlight the garden will receive. Pick some that can tolerate wet conditions. Consider a variety of plants to attract wildlife to your garden.

5. **Plant the garden.**
Transplant potted plants into the garden, which take root quicker than seeds. Place plants that thrive in moist soil in the bottom of the garden, and plants that like drier conditions at the top. Including trees and shrubs in a rain garden will cut down on the time and effort it takes to weed and maintain the garden.

6. **Help it grow.**
Water the garden regularly until the plants have established. Mulch, weed, and care for the rain garden as you would any other garden.
Green Roof
In place of traditional roofing, a green roof is topped with live plants. Growing a green roof has many advantages.

Reducing Runoff
Retaining up to 75% of rainwater, a green roof reduces the amount of water that picks up pollutants as it flows across the land and into natural bodies of water, known as storm water runoff.

Flood Control
Another benefit of retaining water is the prevention or reduction of the impact of flooding.

Cleaner Water
A green roof filters pollutants from the water, which is returned to the atmosphere through transpiration and condensation.

Cooling Off the City
Traditional roofs absorb the sun’s energy and re-emit it as heat, making the city up to 7°F hotter than rural areas. Green roofs reduce this urban heat island effect by retaining the heat.

Cutting Down on Heating and Cooling
A green roof insulates the building during winter and keeps it cool during the summer, reducing heating and cooling loads by about 25%.

Keeping it Quiet
Acting as a sound insulator, a green roof reduces the amount of outside noise that is heard inside the building.

Cleaner Air
A green roof takes carbon dioxide out of the air and releases oxygen.

Longer Lifespan
A green roof protects the underlying structure from UV radiation, heat, and puncture damage, increasing its life span by two or three times.

Easy to Care For
Just the occasional weeding and watering is all it takes to maintain a green roof.

A Place for Wildlife
Many birds and insects will take advantage of the habitat provided by a green roof.

It’s Pretty
A roof covered with plants is much more visually appealing than a traditional roof.
Components of a Green Roof

1. **Roof deck, insulation, and waterproofing**
   Made from concrete, wood, or metal, the roof deck provides the foundation of the green roof, which is then topped with insulation and waterproofing layers.

2. **Protection and storage layer**
   A protection and storage layer, often made of PVC, prevent roots from infiltrating and compromising the roof’s foundation.

3. **Drainage layer**
   A later of gravel or stones drains the excess water the plants did not take up to prevent root rot and plant death.

4. **Filter layer**
   A semi-permeable filter cloth separates the growing media from the drainage layer to avoid clogging and prevent the media from washing down the drain.

5. **Growing media**
   The plants grow in a layer of mostly inorganic materials such as sand or pebbles, mixed with a small amount of organic compost.

6. **Vegetation**
   The best plants for a green roof are hardy, low-growing, shallow-rooted, perennial, and rely less on nutrients than typical garden plants.

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**Giraffes Gone Green**
The Zoo’s Giraffe Ridge building has a 2,400 square foot green roof, planted with a variety of sedum and other plants. It is one of only a few commercial green roofs in the city. The roof is a test garden in that we are studying which plants are the most appropriate to plant on a green roof in our region. By reducing the rate and volume of storm water that enters the sewer system, the green roof helps alleviate the city’s sewer overflow problem. (Primate Center is also topped with a green roof.)

**Go Green Challenge: Encourage the Green Roof Movement**
Encourage companies and businesses in your region to plan a green roof into any new construction plans.
**Solid Waste Management**

In 2007, Americans generated 254 million tons of solid waste, that is, trash. That breaks down to about 4.5 pounds of garbage per person each day. What happens to all of that trash? About one-third of it is recycled. The rest of it is sent to landfills, burned in combustors, or finds its way into the natural environment where it can cause problems for wildlife.

**Reduce, reuse, and recycle!**
The best way to deal with trash is to make less of it in the first place. For example, buy products made of recycled materials and that use minimal packaging and store leftovers in reusable containers instead of disposable plastic baggies.

Find creative ways to reuse resources. For example, save packing peanuts, boxes, and bubble wrap to use next time you ship a package, and offer used items, such as furniture, clothes, and electronics, to a friend or charity instead of throwing them away. Zoo visitors created the one-of-a-kind recycled art mural displayed in the Go Green Garden using bottle caps. (Designed by Jessica Bechtel and Jana Douglass)

Turn trash into treasure by recycling materials that would otherwise become waste into valuable resources. Everybody knows they can recycle paper, aluminum, glass, and plastic bottles, but did you know that you can also recycle electronics, sneakers, light bulbs, and many other more uncommon wastes? If you don’t already have a recycling bin, get one from the Hamilton County Solid Waste District Management at www.hcdoes.org.
Compost: Let Nature Recycle It

Yard trimmings and food scraps make up about 25% of the trash produced in the United States. Why let these organic wastes go to waste and take up landfill space when they can be composted and turned into nutrient-rich mulch and soil?

Composting is easy. Just pile your grass clippings and leftover veggies together and let nature take its course. Over time, bacteria and other microorganisms will break down the organic matter into compost.

To help the process along, follow these simple tips:

- Use a bin to keep the compost warm, moist, and orderly.
- Turn the pile over every once in awhile to give the microorganisms the oxygen they need.
- Only compost plant matter as animal waste can get stinky and attract pests.

When the compost is dark brown, crumbly, and earthy-smelling, use it as a potting soil supplement, garden fertilizer, or mulch for plants in the yard.

Compost this:
- Leaves & pine needles
- Shrub & tree trimmings
- Grass clippings
- Green plants & flowers
- Fruit & vegetable scraps
- Coffee grounds
- Tea bags
- Sawdust & wood chips
- Shredded newspaper
- Hay & straw

Worms at Work

Let worms recycle your kitchen scraps, called vermicomposting. Worms eat decaying organic matter and leave behind castings, i.e. worm poop, which are full of beneficial microbes and nutrients and make a great fertilizer.

Be sure to get red worms, not earthworms, for composting, either from a garden center or order online. Place the worms in a plastic or wooden bin along with damp shredded paper and food scraps. Keep the bin at 55 to 77°F. Collect the castings and use them to enrich your potted plants or garden.
Land Stewardship

We must be good stewards of our environment. Land stewardship is the practice of carefully managing how we use the land to ensure natural systems are maintained or enhanced for future generations.

A land ethic reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity.

- Aldo Leopold,
  
  *A Sand County Almanac*

Horticulture

Horticulture is the study and cultivation of plants, which includes home landscaping and gardening. Enhancing green spaces and natural landscapes and growing our own fruits and vegetables are of great value to our quality of life and to the health of our planet, as long as it is done sustainably. Responsible horticulturists and gardeners use water conservatively, pick plant species that are regionally appropriate, minimize the use of chemicals, and avoid planting invasive species (non-native species that tend to spread and take over an area).

Cincinnati Zoo & Botanical Garden, 2009

At the Zoo

As visitors enter the Zoo they are in the Botanical Garden, a living museum of over 3,000 varieties of plants from around the world. Our naturalistic-style landscapes and demonstration garden areas represent the complexity and diversity of nature, its beauty, and its excitement and highlights the vital relationships of plants, animals, and people. The overall purpose of the Botanical Garden collection is to demonstrate the diversity of plants and their relationships with animal life, to establish attractive and educational naturalistic settings for animal exhibits, to promote conservation, to create beautiful garden displays and an attractive park setting, and to grow and display a wide diversity of outstanding plants for the educational and cultural benefit of people in the Tri-state region.

As one of the first public display gardens in the United States (1875), the Garden has been renowned for its extensive landscape and gardens for more than a century. The early Garden was planted as an experimental garden with a large number of exotic trees and shrubs.
from around the world. Some of the historic 19th century trees still stand today. Visitors can see the two hundred-year-old red oak in the central lawn and the big catalpas along Swan Lake. It is a leading regional botanical garden with an outstanding plant collection and a unique blend of gardens, landscapes, and exotic animal exhibits.

Accredited by the American Association of Museums, the Garden collection includes over 3,000 different varieties of trees, shrubs, bulbs, annuals, perennials, ornamental grasses, and tropical plants arranged both in extensive landscaped gardens and in naturalistic settings that simulate animal habitats. Many of the plants are labeled to provide identification and educational information creating an outdoor lab for universities and garden enthusiasts. As an integral part of the Zoo’s mission, the Horticulture Department develops and maintains immersion habitats representing ecosystems from around the world.

Beginning in 2002, the Garden began the Annual Trials in a cooperative effort with the Cincinnati Flower Growers, The Ohio State University (OSU) Extension Horticulture Program in Hamilton County, and the OSU Master Gardener Program. Over the past few years the program has grown significantly with the support of major flower and seed companies including BallFlora Plant, Proven Winners, and PanAmerican Seed. Each year over 150 varieties of annuals are planted throughout the Garden. The annuals are labeled and incorporated into display beds so visitors can easily identify the varieties and see how they are used in the landscape. Evaluations are made through the summer based on quality and performance and the top performers are selected. The information is made available through brochures and classes. The Plant Trial Programs now include trees, shrubs, perennials, spring bulbs, and native plants along with collections of native wildflowers, plants for rain gardens, green roofs and deer resistant plants. The expansion of the Trial Program offers a larger and more comprehensive horticultural benefit for the region. Check out the Zoo’s suggestions for the best plants to use in your landscape at www.cincinnatizoo.org/plants.

In addition, demonstration gardens are located in various areas throughout the Zoo educating visitors on topics like green roofs, rain gardening, attracting birds and butterflies and the value of urban forestry. Our Gardens also include rare and endangered plants, and plants for research. The Horticulture Department maintains records of all plant accessions, locations, origins, evaluations.

Zoo Blooms, the Garden’s spring kickoff, is one of the Midwest’s largest spring floral displays, featuring over a million spring bulbs (more than 80,000 tulips planted yearly), along with thousands of blooming trees and shrubs.
In an effort to further promote conservation and education of native flora, the Horticulture Department’s instituted a Native Plant Program. Working with government, nurseries, and conservation organizations, the Horticulture Department is working with propagation and growing of select native species to introduce and promote to the public and to encourage nursery growers to develop and work with native plant species to market for the general public. These plants will be certified as being from a sustainable, commercial source.

The Horticulture Department also offers classes throughout the year including a 10 week landscape series, seasonal garden tours, and a variety of workshops and classes specific to gardening including pruning, wildflower gardening, and more. Plant displays are promoted throughout the year including the Southwest Ohio Daffodil Society’s spring show and the African Violet Society Show & display in Jungle Trails.

The Go Green Garden acts as the hub for botanical information in addition to its emphasis on going green. Here, interpreters share botanical information with visitors. Brochures, handouts, and maps are available for visitors.
Gardening for Wildlife
Give the animals and plants in your neighborhood a helping hand by going green in your backyard.

Backyard Buffet
Grow native flowers, shrubs, and trees that provide animals with pollen, berries, and seeds. When natural food sources are scarce, put up feeders for birds, squirrels, and butterflies.

Clean Water
Offer a source of fresh, clean water for drinking and bathing. Create a pond or set up a bird or butterfly bath, making sure to change out the water frequently.

A Safe Haven
Make sure your yard has plenty of hiding spots and covered shelter. Use trees, bushes, brush piles, and bird houses. Keep your housecats indoors to protect wild critters from these non-native predators.

Reduce Water Use
Grow native plants, such as purple coneflower and spicebush, which are adapted to the climate to minimize the need to water them. Capture rain water in a rain barrel to use for necessary irrigation.

Remove Invasive Plants
Replace non-native plants, such as Japanese honeysuckle and garlic mustard, which threaten to take over and push out local plants.

Green Riddle
What is green, covers more than 20 million acres, consumes about half of our fresh water, and requires 67 million pounds of pesticides and $25 billion to maintain every year?

Grass! In the United States, lawn takes up more space than any single agricultural crop and you can’t even eat it!

Eliminate Lawn
Lawn provides little benefit to wildlife and negatively impacts the environment when fertilizers, herbicides, and gas-powered mowers are used to maintain them. Plant trees, shrubs, wildflowers, and groundcover instead.
Non-toxic Pesticides
Instead of using toxic chemicals, protect your plants from bugs with natural repellants such as garlic, onion, and marigolds.

Natural Fertilizer
Use organic mulch and compost to nurture plant growth instead of commercial fertilizers that introduce chemicals.

Go Green Challenge: Certify Your Yard
Join thousands of homeowners across the country to certify your yard as wildlife-friendly through the National Wildlife Federation's Certified Wildlife Habitat™ program at www.nwf.org.
The Benefits of Trees
The tallest and oldest living things on Earth are trees. These leafy-crowned, woody pillars of strength provide many valuable, green services that help sustain a healthy planet.

Go Green by planting and protecting trees that...
- Absorb ozone and other airborne pollutants, giving off oxygen in return.
- Take up water through their roots, reducing the amount of rain water that runs directly into streams and drains.
- Take in and store carbon dioxide, curbing climate change.
- Cut energy costs by naturally cooling homes with shade and insulating homes from the wind.
- Increase property values by creating a pleasant and serene green scene.
- Provide shelter and food for wildlife.
- Ease stress and help us relax, among other healthy, feel-good benefits.

Forests are the lungs of our land, purifying the air and giving fresh strength to our people.
— President Franklin Delano Roosevelt

Go Green Challenge: Value Your Tree
According to the National Tree Benefit Calculator, a large red oak is worth more than $150 per year in terms of the green benefits it provides, which include intercepting 15,000 gallons of rain water runoff and reducing atmospheric carbon by 1,580 pounds. Calculate the environmental and economic value of a tree in your front yard at www.treebenefits.com/calculator.

Ask Yourself
The late visionary, R. Buckminster Fuller, asked:

“If the success or failure of this planet, and of human beings, depended on how I am and what I do, how would I be? What would I do?”
Interpretive Activities

Interpreters are tasked to engage visitors through a variety of activities including counter conversations, informal chats, 10-minute talks, tours, and play facilitation. Ideally, there will be at least two interpreters present at any given time. There should always be at least one interpreter at the interpretive counter in the entry structure. A second (or third) interpreter is then able to rove through the exhibit converse with visitors, present 10-minute talks, lead brief tours, and facilitate kids’ play activities. Rather than having a set schedule of talks and tours, it is up to the interpreters to determine their own schedule each day. This allows interpreters to choose topics and presentation style with which they are comfortable. Wipe erase boards will be available to advertise the talks and tours interpreters plan for the day.

Counter Conversations

While at the interpretive counter, interpreters have several duties:

1. Welcome visitors as they enter the exhibit and let them know they can ask you any questions.
2. As visitors exit, ask whether they have any questions about the green elements or plants in the Zoo, and suggest what else they should do while at the Zoo today.
3. Respond to visitor questions and point them to resources for more information. A computer station will be set up so that you can show visitors the Go Green section of the Zoo’s web site from which they can follow links to appropriate information web sites on the various green topics (see Resources at the end of guide). Visitors can also enter an email address to which a link to the Zoo’s green page will be sent. Various brochures and printed materials may be available for distribution (e.g. Duke Energy brochure, Natura green paint cards, Rare Plants Tour brochures, etc.)
4. Collect visitor comments and questions along with contact information if they would like a response.
5. Interpret! You will have a variety of interpretive items to use as tools. (see Interpretive Activity Ideas below)

What It’s All About

Keep in mind that through interpretation we are hoping to impact values, attitudes, and behavior, not just give out information. We want to foster emotional connections and inspire people to make a difference in their own daily lives.
Informal Chats
As long as one interpreter stays at the counter, the other one can rove around the exhibit to be available for questions and engage visitors in conversation. Feel free to take any of the interpretive items from the cart with you (see Interpretive Activity Ideas that follow). Try to end each conversation with a green suggestion or direction to where to find more information on a certain topic.

Here are some examples of great conversation starters:

Hi! My name is __________. Do you have any questions about the exhibit (or the solar panels, or the green roof, and so on)?

Are you having a good time at the Zoo today? What do you think about the exhibit (or the solar panels, or the green roof, and so on)?

To someone looking at the Trouble with Trash sign: Isn’t it amazing how much waste we create? I’ve been trying to get better at making less trash. For example, I try to put leftovers in reusable containers instead of plastic baggies.

To someone looking at the compost bin: Do you have a garden at home? Compost makes a really great fertilizer. Here’s how it works.

To someone looking at rain garden or green roof: Have you ever thought about where all the rainwater that falls on our roofs and driveways goes? There are lots of ways we can keep that rain from washing contaminants into our streams and flooding our sewers.

To someone looking at the plants: Aren’t those flowers gorgeous? The butterflies love them. Would you like to know more about the best plants to use to attract wildlife?

To someone looking at a tree: Have you ever thought about how much a tree is worth? Having a big shade tree on the side of your house can actually help you save money on your heating and cooling bills.

To someone looking at the pervious concrete fountain: Isn’t that neat? Who knew that we could make roads that let the rain soak through!

To a child: Do you want to see something really cool? Look at what happens when the sun shines on this cricket toy. What’s making it jump around like that? (Use the solar crickets from the cart.)
10-Minute Talks
Take the informal chats a bit further by offering 10-Minute Talks on different topics in different parts of the exhibit. Decide which topic you’d like to focus on (make sure it fits within the Go Green theme) and advertise it with a time on one of the wipe-erase boards. You can set the board up right there in the entry structure or even on the main path just outside the exhibit entrance.

Here are some helpful tips for a successful talk:

- A few minutes before your presentation, let visitors in the area know that you’ll be giving a talk soon and where to go if they are interested.
- Begin by welcoming the audience and introducing yourself. Let them know what you’ll be talking about.
- Know the main points you’d like to make, but be open to the interests of your audience.
- Be friendly, enthusiastic, and positive. Show your passion for going green!
- Try to engage the audience in more of a conversation rather than giving a lecture by asking questions.
- Make it interactive by doing a demonstration (show how to turn compost with the pitchfork) or incorporating an activity (trash or recycle quiz).
- Use interpretive tools as aids to make concepts more tangible and clear. For example, let visitors pass around the building material samples.
- Be sure to relate the topic to their personal lives. Why should they care about it? How can they apply it at home?
- Make the wildlife connection. Why is going green important to saving wildlife?
- Let visitors ask you questions. If you don’t know the answer, suggest how they could find out.
- End the presentation by reinforcing the main idea, thank them for coming, and suggest what else they should do at the Zoo today.
Garden Tours
On busier days, you might be interested in offering a brief tour of the exhibit that lasts no more than 20 minutes or so. Stick with the theme of “The Zoo is going green, and you can, too.” You can choose which exhibit elements you’d like to stop and talk about. You probably won’t have time to touch on everything. Advertise it with a time on one of the wipe-erase boards. You can set the board up right there in the entry structure or even on the main path just outside the exhibit entrance.

In addition to all of the tips for giving a successful 10-Minute Talk, here are some things to keep in mind when giving a tour in particular:

- Try to limit your tour groups to fewer than 20 people. Much larger groups are difficult to manage. If a large group has gathered, perhaps you can offer to give a second tour when you complete the first.
- When you stop at an exhibit element, make sure the entire group has gathered and everyone is focused before you begin speaking.
- Be sure not to block the visitors’ view of the exhibit element to which you’re referring.
- Take advantage of any shade for the audiences’ comfort on hot, sunny days. Also be sure not to stop where the sun will be shining in their eyes.
- Use a conversational voice but make sure everyone can hear you.
- If a visitor makes a comment or asks a question, repeat it to make sure everyone hears it before responding.
- Use transitions between stops to keep them engaged. Ask a question or give a hint as to where you’re going next, for example.
Interpretive Activity Ideas

**Rain Garden Demonstration**
Pour an equal amount of water into an empty plastic cup and a mini-rain garden in a cup (dirt, mulch), each with holes drilled in the bottom. Which one drained more slowly? The mini-rain garden slows down the rainwater flow rate, which curbs erosion and sewer overflow.

**Pervious Concrete Demonstration**
Hold the section of pervious concrete above ground and pour water onto it. As water filters through it, talk about how this decreases the amount of rainwater that would otherwise rush across impervious pavement, causing erosion, sewer overflow, and contamination of our lakes and rivers.

**Guess the Source**
Let the visitors examine samples of various building materials and guess what each is made of.

- Bamboo flooring—Bamboo is a fast-growing, highly renewable, and durable alternative to wood used for flooring and furniture. (It’s actually a grass.) Show them a stalk of bamboo.
- Recycled carpet—Recycled carpet is often made of recycled plastics, such as pop bottles.
- Strawboard—Made of sunflower seed shells and wheat straw, strawboard uses waste products to create durable building material.
- Composite decking—Recycled plastics and wood waste compressed to create durable, low-maintenance composite decking.
- Linoleum flooring—Linoleum is made of solidified linseed oil (from the flax plant), which eliminates the chemical emissions of a vinyl floor.

**Solar Play**
Demonstrate how sunlight is converted to energy through solar panels with solar cricket toys. With a tiny solar panel on its back, the cricket vibrates madly in sunlight, making a realistic chirruping sound and waggling its feelers in a hilariously wild dance. Be sure to keep your eyes on these toys so they don’t hop into someone’s pocket and get away.
Look at Light Bulbs
Set out standard incandescent, compact fluorescent (CFL), and light-emitting diode (LED) light bulbs as visual aids while you discuss the energy-efficiency of each type. As LED technology advances, LED light will become more commonly used in households, saving energy and costs in the long term. The Zoo has upgraded to energy-efficient light bulbs, and has even replaced all the traditional holiday lights with strings of LEDs.

Standard incandescent light bulb
- Cheapest cost per bulb at $1.35
- Can be dimmed
- Single bulb only lasts 1,500 hrs

Compact fluorescent light bulb (CFL)
- Single bulb lasts 10,000 hrs; more than 6 times longer than standard bulb
- Uses 75% less energy than standard bulb
- Bulb cost is twice that of standard bulb
- Contain mercury (but not much and can be recycled)
- Cannot be dimmed

Light-emitting diode (LED)
- Single LED lasts 60,000 hrs, rarely requires replacement
- Uses significantly less energy than others
- Used in stoplights, Times Square ball
- Less bright than other bulbs
- Light is more directed and not as good at illuminating a large area (but they’re working on this issue)
- Cost up to $100 per bulb

Live Animal Encounter
If you are a trained animal handler, you are welcome to include an animal encounter in your interpretation. Live animals can really strengthen a visitors’ emotional connection. Be sure to explain how going green is important to wildlife. If the animal you bring can more directly tie into one of the green topics, even better. For example, you can relate alligator scales to solar panels or a cockroach to solid waste and composting.
Reduce, Reuse, & Recycle Quiz
Hold up various waste items and quiz the visitors on which can be recycled and which cannot.

Recyclable
- **Soda can** – Aluminum soda cans are used to make new cans.
- **Plastic bottle** – Lots of things can be made from recycled plastic from clothing to sleeping bags to the benches you see out in the exhibit.
- **Plastic grocery bag** – Return plastic bags to bins at the store to be recycled into plastic lumber.
- **Glass bottle** – Glass is recycled into new containers or fiberglass.
- **Cereal box** – Paperboard boxes, such as cereal boxes, are recyclable as long as they do not have a waxy coating.
- **Junk mail, magazines, phone book** – Mixed paper can be recycled as long as it is clean, dry, and free of food, most plastic, wax, and other contamination.
- **CD/DVD** - For a small fee, you can send them (and various other “technotrash”) to GreenDisk (www.greendisk.com) to be recycled.
- **Old sneaker** - Send them in to ReUse a Shoe (www.letmeplay.com/reuseashoe), and they will be recycled into safe playground substrates.
- **Eyeglasses** - They can be reused through programs such as the Lions Club International’s Recycle for Sight (www.lionsclub.org).
- **Paint, motor oil, fire extinguishers** - Hazardous waste should be recycled through the Hamilton County Hazardous Waste Collection Program (www.hamiltoncountycycle.org).
- **Compact fluorescent light bulb (CFL)** – Take burned out CFLs to Home Depot for recycling.
- **Juice pouch** (e.g. Capri Sun) - Sign up for juice pouch recycling at www.terracycle.net. The charity of your choice will receive $0.02 for each Capri Sun or Honest Kids pouch you recycle.
- **Newspaper** – Newspaper is remanufactured into insulation, paper tubes, and packaging.
- **Carpet** - Bring the used carpet to CPT Carpet Recycling (www.cbtrecycling.com) where it will be recycled (for a small fee) into new carpet, plastic lumber, or roof shingles.
- **Printer ink cartridges** - Recycle your empty ink cartridges at your local Staples or Office Depot.
- **Tire** – Recycled rubber from tires can be made into all kinds of products including soft playground surfaces, sandals, and door mats.
- **Cell phone** – Drop off your old cell phone at the Zoo, and we’ll recycle it through our partnership with Eco-Cell. Recycling cell phones reduces demand for coltan, an ore used in phones that is mined in gorilla habitat.
Non-recyclable (or very difficult to recycle)

- **Styrofoam (polystyrene)** – Polystyrene can be recycled, but not easily. If you’re interested, contact the Alliance of Foam Packaging Recyclers at [www.epspackaging.org/info.html](http://www.epspackaging.org/info.html).

- **Milk cartons** – Made of a mix of plastic, metal, and paper, drink cartons are difficult and expensive to recycle.

- **Aluminum foil** – Foil can be recycled, but many programs will not accept it because it’s generally contaminated with food. You can, however, buy aluminum foil that is made of 100% recycled content.

- **Photos** – The chemicals used in the paper and the thin layer of polythene that coats it prevents photos from being recycled. Use your old photos for craft projects instead.

- **Stickers** – The adhesives in stickers and labels can gum up the recycling process, causing damage to machinery and contaminating recycled pulp.

- **Pizza box** – The grease contaminates the cardboard.

- **Saran wrap (polyvinyl chloride, PVC)** – It’s nearly impossible to find anywhere that recycles plastic film wrap.
To Compost or Not to Compost?
Use a pitchfork to turn the compost bin. Let visitors give it a try. Add appropriate waste to the compost bin, such as leaves and banana peels. Discuss which kinds of organic waste should be composted, and which should not.

Compostable
- Wine bottle corks
- Leaves & pine needles
- Shrub & tree trimmings
- Grass clippings
- Green plants & flowers
- Fruit & vegetable scraps
- Coffee grounds
- Tea bags
- Sawdust & wood chips
- Shredded newspaper
- Hay & straw

Do not compost
- Inorganic waste
- Coal ash (harmful to plants)
- Meat, dairy, fats (gets stinky and attracts pests)
- Colored paper (some inks contain toxins)
- Pet waste (can introduce bacteria, parasites, etc.)
- Yard waste treated with chemicals (toxic to composting organisms)
- Diseased plants
Kids’ Play Activities

Play activities are important for several reasons. It is important to engage the whole family. While you are talking with the adults about the specific elements of a green roof, for example, the kids could be learning about what plants need to survive by playing the Feed a Flower bean bag game. Play is more than just a fun way to pass the time and burn off energy (although these are wonderful benefits, too). Active play can enhance a child’s interpretive experience, resulting in increased knowledge and emotional connection to wildlife. Positive experiences with nature nurture a child’s feeling of belonging and connection to a greater world. It’s that connection to nature that creates respect and concern for wildlife as well as a sense of responsibility to practice environmentally good manners. Play also helps children develop physical coordination and imaginative skills.

Here are some tips for interpreting to kids:

- Be friendly and patient.
- Shed your inhibitions. Be animated!
- Create a sense of adventure.
- Appeal to all of the senses.
- Come down to their eye level, if you can.
- Keep things short and sweet to accommodate short attention spans.
- Provide creative opportunities—art, song, dance, and so on.
- Encourage movement, active play, and hands-on activities.
- Involve them in inquiry and investigation.
- Ask “what if” questions and play pretend to engage their active imaginations.
- Keep messages positive and focus on developing a care for the Earth.
Here are some fun play activity ideas:

**Digging Garden**
There will be small digging area where kids are encouraged to practice their gardening skills. You will have some kid-sized gardening tools available for them to use. Please keep an eye on these items so they don’t walk away. As they dig, ask them what they are doing. Are they planting a garden? What are they planting? What will they need to do once the seeds are planted? Do they see any critters in the soil? How might these critters help the plants grow? If you’re willing, get down in the dirt and dig with them!

**Feed a Flower Bag Game**
There should be boards with flowers painted on them and a hole in the middle. Set up a board (or two boards opposite each other several feet apart if you want to play the game just like corn hole). Hand out the bean bags. Each bag has a word printed on it that represents something the flower needs to grow such as sun, soil, and water. Encourage the kids to try to throw the bags into the hole from several feet away. You can let smaller kids move closer to the board. As they throw each bag, talk about what the bag represents.

**Pollination Ping Pong**
Ask the kids if they know what the word pollination means. In simple terms, it is the way some plants make new plants, or reproduce. Pollen grains carry the male information from one flower to the female part of another flower. Sometimes animals might carry pollen from one plant to another, but some plants rely on the wind. Let’s be the wind and try to pollinate the flower painted on the board. The center of the flower is Velcro and the ping pong balls are also covered with Velcro. Have the kids throw the balls, or pollen grains, and try to get them to stick to the center of the flower.

**I Spy**
Play I Spy with the kids to encourage their observation skills and get them to notice plant details. Pick out a particular plant in your mind that you want the child to find, and give him hints such as:

- I spy a flower with a prickly stem.
- I spy something blue.
- I spy a leaf with three points.

**Recycled Crafts**
During special events or seasons, you might facilitate craft activities using recycled materials such as bottle cap art, egg carton flowers, envelopes from old calendar pages, cardboard tube binoculars, or paper making.

Cincinnati Zoo & Botanical Garden, 2009
Facilitate an Investigation
People love making their own discoveries! Guide kids through the QUEST inquiry process:

1. *Question and observe*
   Encourage visitors to look closely at the garden. What questions come to mind?

2. *Uncover a comparative question*
   Choose a question that they can answer by collecting data in the garden. Try to make it comparative (comparing two things) and meaningful.

3. *Explore predictions*
   What do they think the answer is? Why?

4. *Start action plan and gather data*
   How can we find out the answer?

5. *Think hard about findings and share discoveries*
   What did they find out? Did it match their prediction? How can they share their results with others?

Here are some investigations you could do:

- **Do butterflies and bees have a favorite color flower?** Pick two different colored flowers and count how many butterflies and bees visit each in three minutes.

- **How do the plants in the middle of the rain garden compare to the ones on the edge?** Pick three plants in the middle and three plants on the edge and collect data such as leaf size, height, texture, and so on. Any patterns?

- **Which birds are in charge at the bird feeder – big or little ones?** Each time a new bird lands on the feeder when another bird is already there, mark down whether the bigger or smaller one flies away, or whether they both stay.

- **Do more people use paper, plastic, or fabric bags when shopping?** Ask five different visitors which kind of bag they use most often when shopping and why.

- **Where do visitors spend most of their time in the Go Green Garden?** Choose three visitors to observe. Write down where they stop and time how long they stay in each place.
Resources

Go Green section of the Cincinnati Zoo & Botanical Garden web site at www.cincinnatizoo.org. Click on Saving the Earth, and then on Going Green.

Plants & Gardens section of the Cincinnati Zoo & Botanical Garden web site at www.cincinnatizoo.org. Click on Plants & Gardens.

American Horticultural Society at www.ahs.org

American Solar Energy Society at www.ases.org

The Daily Green at www.thedailygreen.com


Geothermal Education Office (Geothermal Resource Council) at www.geothermal.marin.org

The Green Home Guide (U.S. Green Building Council) at www.greenhomeguide.org

Green Roofs for Healthy Cities at www.greenroofs.org

Hamilton County Department of Environmental Services at www.hcdoes.org (links to Hamilton County Solid Waste Management District)

Hamilton County Soil & Water Conservation District (Rain Gardens manual) at www.hcswcd.org

Metropolitan Sewer District of Greater Cincinnati at http://msdgc.org

National Tree Benefit Calculator at www.treebenefits.com/calculator

National Wildlife Federation's Certified Wildlife Habitat™ program at www.nwf.org

U.S. Composting Council at www.compostingcouncil.org

U.S. Department of Energy at www.energy.gov

U.S. Green Building Council (manages the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ certification) at www.usgbc.org

Water – Use It Wisely at www.wateruseitwisely.com
Appendix G: Living Building Challenge Brochure

Pages: 189-191
In keeping with our designation as the “greenest Zoo in America,” the Cincinnati Zoo is pursing its most ambitious challenge in sustainable construction yet: the Living Building Challenge for the African painted dog exhibit in Africa.

The Living Building Challenge is a non-profit, international building certification program that promotes the most advanced measurement of sustainability for building and construction projects.

The Cincinnati Zoo has made the commitment to maintain the highest standard of sustainability for all new building projects, which started with the construction of the Harold C. Schott Education Center. In 2006, the Education Center was awarded the Leadership in Energy and Environmental Design (LEED) Silver certification, one of the first LEED certified buildings in Cincinnati. Since then, the Zoo has achieved LEED certification for each new construction project, including LEED Platinum for Historic Vine Street Village in 2009, LEED Gold for the Pavilion in 2009, LEED Gold for the Zoo Gift Shop in 2010, LEED Gold for Cat Canyon in 2012, and LEED Silver for the Shipping/Receiving building in 2012.

As rigorous and thorough as LEED certification is, the Living Building Challenge attains an even greater measure of a building’s sustainability by measuring actual, rather than modeled, performance.

The Challenge asks the question, “What if every single act of design and construction made the world a better place?” As the exhibit was designed and built in the most sustainable way possible, there were seven specific key performance areas, called Petals, to be addressed.

The Petals are: Site, Water, Energy, Health, Materials, Equity, and Beauty.

To earn “Living” status, the building project is evaluated after at least 12 consecutive months of operation, and must have met the imperatives of each of each Petal.
WATER

Imperatives include: Net Zero Water, and Ecological Water Flow

All rain water on the site is collected and stored for reuse in a 400,000 gallon underground reservoir. The water is used for irrigation, filling the water moats and to hose down back-of-house animal areas. Grey and Black water will be treated on site and reused within the exhibit.

SITE

Imperatives include: Limits to Growth, Urban Agriculture, Habitat Exchange, and Car-Free Living

The African painted dog exhibit was once a large asphalt parking lot. A variety of trees, shrubs, perennials and grasses were planted to convert most of the site into green space. Over time, it will grow into a thriving ecosystem that attracts native pollinators and birds. The “right-sized” animal holding building is also topped with a green roof.

ENERGY

Imperative includes: Net Zero Energy

The high performance African painted dog holding building achieves net-zero energy by requiring very little energy and by sourcing what energy it does need from solar arrays. Exhibit features such as the waterfalls are “turned off” during closed times to conserve energy usage.
HEALTH & HAPPINESS
*Imperatives include: Civilized Environment, Healthy Air, Biophilia.*
The African painted dog exhibit provides a robust healthy space, which appeals to our sense of interconnectedness with nature. Fresh air, a lushly planted landscape and accessible walking paths contribute to human health and happiness.

EQUITY
*Imperatives include: Human Scale + Humane Places, Democracy + Social Justice, Rights to Nature.*
The African painted dog exhibit was designed to foster a sense of community. Equally accessible to people of all abilities, the naturalistic exhibit creates an intimate setting for developing relationships between people and nature.

MATERIALS
*Imperatives include: Red List, Embodied Carbon Footprint, Responsible Industry, Appropriate Sourcing, Conservation + Reuse.*
The African painted dog exhibit was built with efficient, long-lasting materials and methods that minimized waste during construction as well as into the future. Tilt-up concrete panels containing insulation and stainless steel resulted in a low maintenance and durable structure that is 85-90% recyclable. All waste is collected in provided receptacles, then disposed of properly at local recycling centers or compost facilities.

BEAUTY
*Imperatives include: Beauty + Spirit, Inspiration + Education.*
The African painted dog exhibit immerses you in the natural beauty of the African savannah from colorful foliage to richly textured rocks to a babbling brook. We want you to feel as if you and the animals share the same space, fostering a close connection that inspires you to care for and conserve one of Africa’s most threatened species.