

Pathways to Water Quality Exhibit

Indiana State Fair Immersive Learning Project Spring 2015

Ball State University

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Table of Contents

Introduction	4
Map.....	5
Pathways to Water Quality Mascots	6
Entrance	7
Back Entrance.....	9
Rock Waterfall.....	10
“My Home, My Backyard”	11
Pervious Concrete	12
Rain barrel and Rain Garden Display	13
Drip Irrigation.....	13
Compost Bin.....	13
Garden and Raised Bed	14
Bioretention for Storm Sewers	16
Woodland.....	17
Farmland.....	18
Wetland.....	19
Bat Display	19
Indiana Soils	20
Septic Display	21
Water History Cabin	22
Water Well Pump	22
Pasture	23
Education Area	24
Monarch Butterflies	26
Expansion Ideas	27
Septic System Expansion	27
Agriculture/Farmland Expansion.....	27
Educational Expansion	27
Sign Material Estimates	28
Permanent Poster Housing (Wooden with Plexiglass)	28
Permanent Ploymetal Signs	28

Additional Suggestions for Overall Exhibit.....29

 Speaker Boxes--QR Codes29

 Key Boxes29

 Canopy Area29

 Algae Bloom Exhibit29

 Two Stage Ditch30

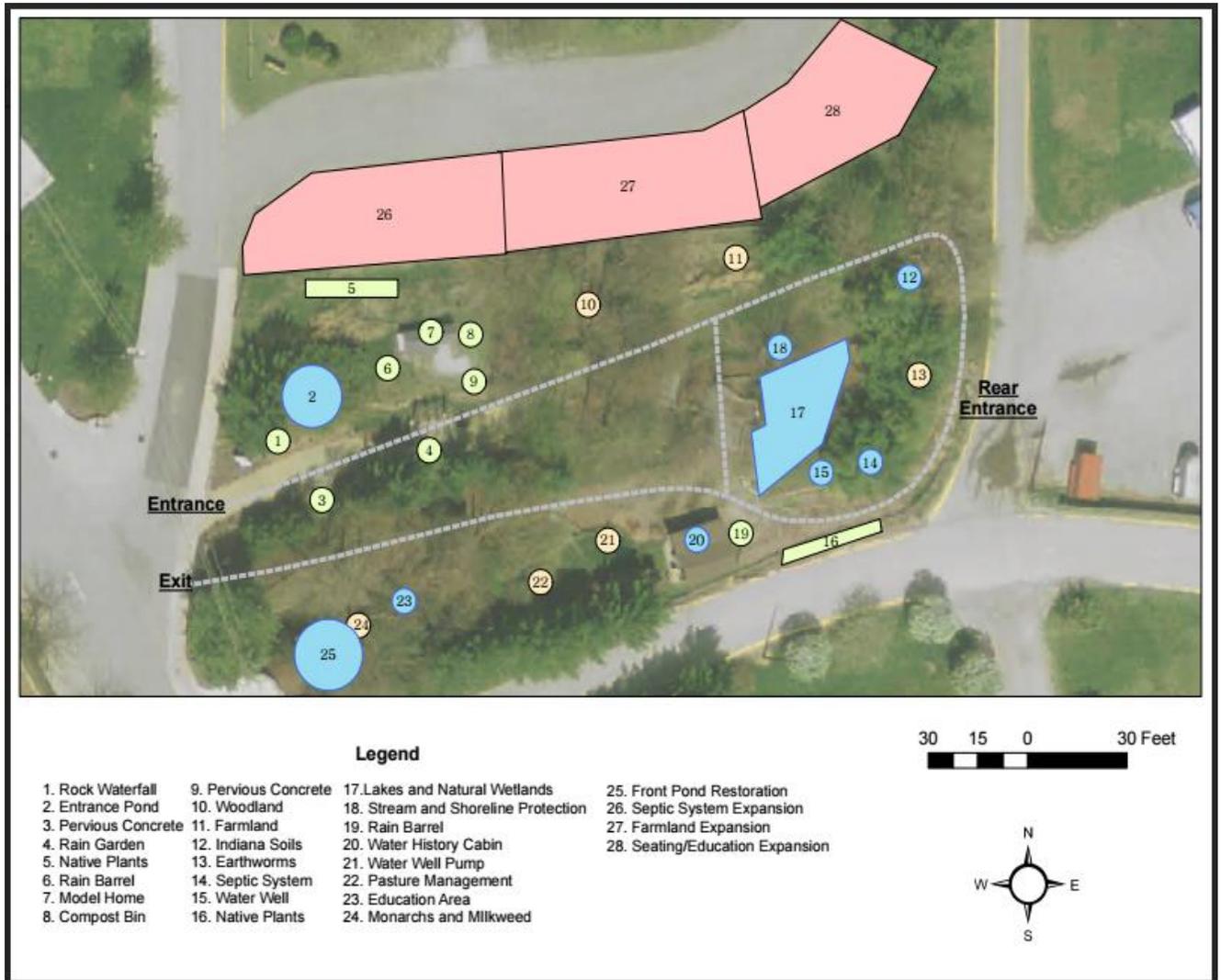
Appendix.....32

Introduction

Pathways to Water Quality was created by the Indiana Conservation Partnership in 1993. Over the past 20 years, it has grown to become a major highlight of the State Fairgrounds, especially during the summer fair season. With its emphasis on water and soil health, the educational exhibit allows visitors to learn more about the environment and how they can contribute to a healthier world. Throughout the 2015 spring semester at Ball State University, Dr. Ghezzi and Ball State University students from the NREM 299X class and Water Resources class collaborated with partners from the Pathways to Water Quality Exhibit. Together, the students, professors and committee partners brainstormed ideas that are able to be incorporated throughout the exhibit during and after the Indiana State Fair in the summer of 2015. The ideas are now presented to you within this document, and throughout the oral presentation.

Map

We created this numerical map using GIS and included the original exhibits along with the revisions we are suggesting. We are proposing a poster for the entrance that includes an image of this new map, and invites visitors to follow the Adventures of Walter and Sally. We also propose a sign in the back entrance, that way people can figure out where they are and follow throughout the exhibit.



Pathways to Water Quality Mascots

We are proposing mascots named Walter the Water Drop and Sally Soil. “Follow Walter the Water Drop and Sally Soil for a cool drink of water” could be advertised throughout the exhibit, especially at the front to catch kids’ attention and advertise free water. Walter the Water Drop and Sally Soil were specifically designed for children so they could follow the characters throughout the exhibit.

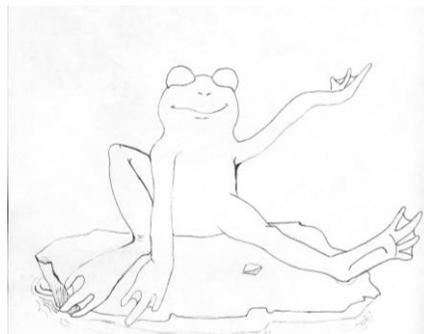
We designed a coloring book to follow Walter and Sally throughout the exhibit as well. Our coloring book would include trademark designs by Hayley Anderson, and a trademark storyline by Kasey Burchett (we sent the trademark forms to Gary Struben for you to trademark these under Pathways as well, we just ask that the girls be given credit in the printed documents for their role). The storyline would include cute and original facts that incorporate Walter and Sally throughout the exhibit, as well as original drawings of the two mascots. The coloring book would be a fun and easy way to get children involved. It would also allow them to bring something home at the end of the day.

Another mascot that was proposed was Finn the Frog. Finn’s backstory will be that he is a happy resident of the exhibit and that he lives in the model home where he enjoys working in his garden, collecting rain for his plants in rain barrels and using phosphorus-free fertilizer along with his homemade compost. His best friend will be “Marsha Monarch” who visits the milkweed plants once a year.

Finn will also appear on the signage in front of individual displays (waterfall, pervious concrete, etc) to provide simple information to children to pique their interest in science and water quality. An example of this includes, regarding the “pervious concrete” display, Finn saying: “And this is called “Pervious Concrete”. It lets Walter Water Drop through to the soil underneath so that he can make his way to the plants, trees and streams.”

Another mascot idea would be a waterdrop. The mascot should have a distinct and recognizable name and appearance. The design should be simple enough to carry over into a physical mascot suit, if that option is chosen. The mascot should also be approachable and understandable at a basic level. The quotes should include useful facts and maybe a few water-related jokes to keep peoples’ interests. Possible Names: Drippy, William Water, H₂O Harry.

The Adventures of Walter and Sally



Entrance

The biggest part of the entrance is attracting the attention of potential visitors. In order to do this, we are suggesting some changes or improvements.

First, moving the entrance sign forward so it is not overshadowed by trees would allow guests to see it more clearly. Adding more color, such as bright bushes and flowers, around the sign would also draw proper attention to it. Next, advertising for free water, especially during the fair season, would draw in visitors who may end up walking through the entire exhibit. Giving out small favors, such as free water bottles, would also boost attendance. Adding simple “entrance” and “exit” arrows would allow visitors to see more clearly that there is something to be seen in that area of the fairgrounds and plainly indicate which directions the crowd should move in. Additionally, the current sign could be repainted and outfitted with lights that will illuminate the exhibit and potentially attract more visitors. Another idea that was proposed was a green roof and maybe putting the entrance sign on top of the roof when it is implemented.

We would like to propose the distribution of brochures that would include the mascot, a bit of information about each exhibit, a bit of information on the history of the project, and updated map on the back. In order to increase foot traffic at the Pathway to Water Quality exhibit at the State Fairgrounds, improving tours of the facility are suggested. However these need to be scheduled within the pamphlets handed out at the entrance to the fairgrounds so that patrons are immediately aware of the exhibit and tours can plan their trip around it. A tour through the Pathway to Water Quality could be done in about 15 minutes, with 5 minutes for questions afterwards. Therefore, tours could be scheduled every half hour on the half hour (8:00, 8:30, 9:00, etc.). This would leave ten minutes for tour guides to rest and ready themselves for the next tour.

The selection of tour guides is very important. A promising option would be to have college students across Indiana intern as tour guides for the facility. If interns (or any other person) is operating a tour, they would need educated on the exhibit. The State Fair begins on August 7, 2015. Therefore, a weekend in late July or early August would be the prime time to have a day-long informational session to educate prospective tour guides on the exhibit, and prep them for any expected question a patron may have based on past experience of the operators of the facility.

Another (slightly less interactive) activity would be a walking tour of all of the environmentally conscious additions to the exhibit. This one may be tailored slightly more towards adults, but still lively enough to keep children entertained. The focus of this event would be not only to educate patrons on what pervious concrete and rain gardens are, but also the importance of them and how the average individual can implement these strategies in their own homes. This session could provide information to visitors on local business connections that could help them improve water quality in their own backyard

At the beginning of the exhibit will be a small gazebo to be used as a visitor’s information center. There will be a sign on the gazebo with an image of the mascot, and in bold

lettering it will read “Pathway to Water Quality”. One volunteer will man the gazebo and distribute brochures, talk about activities and provide information about the exhibit.

The brochure (Appendix 1) will contain more concise information and images that reflect the updated features of the exhibit. Information that will be on the brochure includes an updated map on the back pinpointing all the attractions. Additionally, the brochure will contain a smaller section on the history of the exhibit and the organizations that support the project. More space will be devoted to a description of how a couple of the major aspects, such as waterfall and monarchs, are involved.

Back Entrance

Going along with the focus on bringing people into the exhibit, adding an entrance sign to the back fence grants visitors access straight from the adjacent parking lot. The entrance sign here would be the same as the entrance sign we suggested for the front entrance. Including brochures here would be beneficial as well. This could also be a place children could pick up the Walter and Sally Coloring book. It would be great to include entrance arrows pointing in the correct direction and maybe a map diagram to inform visitors that they are in the back of the exhibit.

Rock Waterfall

This is a beautiful natural display that allows visitors to feel the serenity of the exhibit directly upon entering. One idea is to add a small amount of native fish to draw the eye more to this area, as it may be overlooked because of the natural shade that encloses it.

The average individual attending the Exhibit would simply associate '*aquatic life*' with fish and smaller, more visible, creatures. Given that the partners involved wish to update the signs already, we believe it would be best to explain how in addition to fish and crustaceans, oxygen is a crucial element involved with micro-bacterial digestion – the beginning of water treatment. We believe there would be no better way to begin a 'water quality' exhibit other than by expressing the importance of bacterial respiration in water treatment process. The idea of suspended solids, flocculation and sedimentation could lead into the importance of wetlands and slow, meandering rivers. Strait rivers hinder this sedimentation process and agitate the components of the water – increasing turbidity and reducing the quality of the water (appendix VII).

“My Home, My Backyard”

For the homestead area, or “My Home, My Backyard,” we kept the focus on how sustainable practices in this display could be transferred to visitors’ homes. We have created a sign with information on rain gardens, composts, rain barrels, raised gardens, and home cover crops which guests can use to incorporate better management practices into their own homes. We also propose creating covered boxes that can survive the winter months below this displays sign to hold pamphlets/brochures that show where to get more information on the ideas from the sign.

Permeable sidewalks are already installed and lead up to the small storage garage of the model home. The replacement/addition of a driveway with permeable concrete could help highlight the use of permeable concrete for areas other than the sidewalk. An option, instead of using concrete for the driveway, would be to use permeable paving. Examples of permeable paving materials include: dry-laid pavers, brick with sand to allow flexing, recycled stone/gravel, stone/flagstone, plastic materials with cells, or grass pavers. Many of these types of paving are newer technologies or using recycled materials. The cost of the paving will depend on the type of material chosen.

The model home is a good representation of what an average home looks like. The home could be added to and spruced up some with ideas that are renewable, recyclable and more efficient. First, the idea of adding a green or living roof to a portion or all of the model home roof. A green roof can save energy on heating and cooling. The roof stores a large amount of heat when it is wet and helps to reduce temperature fluctuations inside the home. When the roof is dry, it acts as an insulator to decrease the flow of heat through the roof. This could be a good display for those urban visitors. Typically, it is more warm in an urban setting versus a rural setting. The addition of a green roof to the visitors’ homes could help them save money on heating and cooling. A green roof can cost anywhere from \$10 per square foot all the way to \$25 per square foot. The annual maintainer cost ranges from 75 cents to \$1.50 per square foot. A small sign or pamphlet about the benefits of a green roof could be included at the exhibit so visitors understand what it is and how it can help. Additionally, to spruce up the home and promote recycling, the door could be recycled by repainting the door, adding new hardware, and adding additionally support if need be. Also, the house could be repainted a different color other than white so that it catches visitor’s attention.

Another idea would to implement the movement of the model home on the permeable concrete path, so people could walk through the home as they travel through the exhibit. If the model home was reconstructed and moved on the path it would be more interactive, and people could see inside the home as well. Also, another idea would to add an urban themed water management component. Someone would design a blue street, a model urban home, and also an urban plaza that all include sustainable practices.

The drainage ditch in front of the home seemed somewhat disconnected from the rest of the exhibit even though it could have been connected with everything else. One possibility is to design a pipe with running water and a set of faucets on the sides, so water flows out the far end of the pipe freely, probably onto permeated concrete or the river. When one of the faucets is

opened, the water flow through the main pipe is reduced, with all open the water flowing out the end of the pipe should be little more than a trickle. This would show that leaving water sources in a building on would reduce the amount of water in the natural system around it.

The biggest three water uses in the U.S. come from the home. This could be shown in the home by having a faucet near each of the three uses: a toilet, a washing machine, and a shower head. The faucet should be attached to a clear set of tubes and valves at each station, and turning the faucet's handle will activate the specific item and water will flow through it. This should diminish the water flowing through the house. If all three are turned on and left on, then the water should stop flowing through the house altogether.

Pervious Concrete

This exhibit is easily one of the most visited and most important displays. A good idea is to improve the sprinkler head that is currently there, and moving the sign closer to the actual display would give guests easier access to the knowledge that this area provides.

To draw attention to the permeable concrete, the current signage could be removed and a sign could be placed into the concrete. The sign would draw the attention of the visitors to the exhibit. The current sign content could be condensed and simplified. The text could be cut from the current permeable pavement and would need to be about six inches deep. The text should be centered in the middle of the path and take up most of the area dedicated to the permeable exhibit. The total area of the text should be approximately 7x10 feet. A circular saw could be rented and used to accomplish this task. Once the text is cut, the letters could be filled with dirt and then moss on top to highlight the text. The moss would come near the top of the concrete, then the text would be covered with plexiglass so that there is a flush fit. The plexiglass will keep the moss from being stepped on directly and getting destroyed.

Adding footprint designs on the pervious concrete could help lead visitors through the exhibit. Each footprint could have a fun water fact included so it is fun and educational at the same time (Appendix XV). The footprints could also act as a self-guided path through the exhibit, where the footprints stop at each exhibit and give a brief explanation of the scene. The footprints need to be kid-friendly to help keep the kids engaged. Since the concrete is not found throughout the whole exhibit, the footprints can be laminated and staked into the ground in the back half of the exhibit where there is no concrete. Some examples of fun facts to include are: water covers around 70% of the Earth's surface, water is made up of two elements, hydrogen and oxygen, the longest river in the USA is the Missouri River at around 2,340 miles in length.

Another idea for the pervious concrete is to replace the fountain showerhead with a different feature. A water feature such as a lily pad could be more attractive to the children. Also, the splash area could be expanded to include more water features which could accommodate more children. If lily pads cannot be included, another idea is to add a rainfall type shower head which could more closely mimic the natural flow of rainfall from the sky. If neither the lily pad or showerhead idea work, then a modified or new flowerpot fountain could be another option. The flowerpot could be funded by sponsors and their names could be included on the side of the pot.

Lastly, an idea to improve the display would be to showcase how water runs off of the concrete. A cross section could be cut out of the concrete at the end, then covered with Plexiglass. Visitors would be able to see the way water puddles and runs off a regular concrete surface versus being absorbed in pervious concrete. The cross section would also better display the layers necessary to pave a surface with pervious concrete.

Rain barrel and Rain Garden Display

Signage has been created to highlight what a rain barrel as well as to explain the concept of a rain garden. It would be great to include a brochure on how to create a rain barrel and a rain garden in association with the QR Scan Codes that will be on the permanent signage.

Drip Irrigation

Drip irrigation is a great way to water plants or crops and conserve water. Not only does drip irrigation conserve water, but it is better for the plants because it waters in the exact place you need it to. This keeps the soil in between the plants dry, which reduces wasted water and weeds. It also is better for the soil because if water exceeds the soil's percolation rate, the water will run off the surface and take vital nutrients and topsoil with it. We are proposing to add drip irrigation by using the already existing rain barrel by the Model House. The rain barrel is currently located on the left side of the house, if moved to the right side of the house we could demonstrate drip irrigation using the raised bed garden.

This plan is very cost effective since the only supplies needed are an irrigation kit and crops to plant in the bed. There are many different types of irrigation kits. These kits come with soaker hoses, emitters and plugs. There is a "Raised Bed Garden Drip Irrigation Kit" at Home Depot for only \$30. The kit comes with 62 pieces and has everything needed for an installation. There are other types of drip irrigation kits but this is the cheapest and best method available. The cost of crops also depends on the type wanted. We propose that this garden be made into an herb and fruit garden that are common garden plants that households may have. Some of these plants could be basil, mint, parsley, rosemary, sage, strawberries, and tomatoes. These costs will vary when the season arrives. Since the raised bed is relatively small the amount for plants should be around 30 or 40 dollars. Below is an idea of what the sign could say (See Appendix VIII).

Compost Bin

A compost bin exhibit could be added by installing multiple different systems. The different systems could show visitors that there is more than one way to compost and that there could be one that will fit their lifestyle. According to BenefitsofRecycling.com, there are three main types of compost systems that are used, aerobic, anaerobic, and vermicomposting. A compost system would be relatively cheap to create because of the simplicity of the system. The cost of all three will depend on the material needed. The aerobic and vermicomposting systems will cost the least because of the low cost of supplies needed. The three systems could be placed to the left side of the Model House to utilize space and show a side by side comparison of how the systems differ.

Aerobic composting requires air and is high maintenance because the contents need to be turned to keep the air in the system. Anaerobic composting does not require air and is low maintenance because you do not need to turn the contents to let the air in, and vermicomposting is the most beneficial for composting food waste and requires medium maintenance since the worms need to be fed and the conditions need to be monitored.

Garden and Raised Bed

To enhance to garden exhibit, a vertical garden could be added. The garden could be placed on the open space by the house and serve as a backdrop for the composting system. This type of garden would show visitors the opportunities that come with having a vertical garden on site. The vertical garden is ideal for those in an urban setting because it highlights the reduced amount of space needed to be able to have a garden. Depending on the exact living wall, the price for the system can range from \$30 to \$300, but living walls can produce a mass amount of food and other plants compared to a conventional system.

Since there is a large amount of yard around the model home available, there is the opportunity for several raised beds to be added. These additional beds could be made of building materials that are commonly thrown away. Items like: cinder blocks, stone, steel panels, and wood are typically just thrown away during construction and remodeling projects. These additional beds could highlight how to use the materials instead of throwing them away. Ideas can be found at <http://www.fix.com/blog/gardening-with-raised-beds/> to help show simple specific detailing for each material used and the proper way to install a raised planting bed.

Another idea would to add a curb appeal to the raised garden. The curb appeal improvements can be used from previous supplies that are being recycled so in the end it would inexpensive. Rocks or stones left over or donated can be used as a nice border for the rain garden. The neatness of the border will add to the curb appeal and visitors would be more drawn to it. There are ideas of a possible different designs to use for the rain garden (Appendix IX and X). This is farther away from the traditional rectangular design that is in place already. The other picture is an example of how the rain garden would look with a rock border. Lastly, refreshing the mulch in the rain garden for the spring and summer would be beneficial and pleasing to look at.

Improvements would need to increase the attention towards the rain gardens as well as curb appeal. It is important that people be able to relate and understand how realistic rain gardens can be implemented in neighborhoods and personal yards. The plants that are implemented in each rain garden should be native to Indiana and people should be able to identify them easily.

The last idea for the rain garden would to build an interactive display that demonstrates the permeability of different substrates. We would fill four small, hollow metal barrels (Appendix XIII) with different substrates: gravel, grass, asphalt, and small shrubs (with gravel, dirt, and mulch) to simulate a rain garden. There would be a station with small cups and a water source to let children/visitors pour water over each barrel. Another, but more costly, option would to construct a system that uses gravity and allows water to trickle over each barrel and continue on through the watershed, similar to (Appendix XII).

Bioretention for Storm Sewers

A bioretention for storm sewers would be a very interesting and potentially something more urban areas may consider implementing. A simple two stage retention area that leads to the storm sewers on the roads is what we are suggesting. The first part would consist of the layout of the area that the runoff would be diverted into. It is likely during heavy rains that much of the surface contaminations would immediately back up pipes and allow harmful substance to enter our waterway. This retention area would be able to absorb the diverted water and allow the trees, shrubs, or any other ideal type of vegetation to aid in cleansing the water. The debris left on the surface would be easily accessible to handle and dispose of. A good amount of trash and litter that lies in the road would be collected here and could be tossed away or recycled. The project would consist of a concrete container filled with soil with pre-existing plants or new plants. This area could be located in front of or near the homestead exhibit.

For the exhibit, a smaller “green street” could be created and get people aware that there is another alternative drainage system. Create a small addition alongside the curb at the very front of the exit or anywhere that pre-existing flora resides. By using the pre existing vegetation the cost to produce a curbside bioretention exhibit will also be reduced. Now the costs would consist of the materials needed to create the filter system that the precipitation will be guided and collected. Sand, peat, leaf compost, underdrain gravel, geotextile fabric (if required), impermeable liner (if required), underdrain piping, concrete (precast), and non-steel rebar are the materials needed for construction. Casting of the concrete will take some time as well as possibly using a small backhoe for digging out the area, and will also probably be the most expensive thing required. However, the scale can be brought down and a backhoe can be eliminated reducing the cost of the project. The people that work at the exhibit would only have to clean of debris 2-3 times a month with very little effort made due to it being collected within the concrete bioretention area. The brochure that has been made (Appendix III) is intended to be relative information that people will find interesting as well as inspiring visitors to assist in creating more “green streets” in their own urban community.

Woodland

We would like to incorporate a sign saying “Follow the Path Less Traveled” to encourage visitors to go off the beaten path and explore Indiana's natural woodland. Along with this sign encourages visitors, adding arrows where the path branches would also draw more attention to it. The sign and arrows would be simple and wooden to match the woodland atmosphere. Once visitors enter the woodland area, having small identifiers on each tree will help them to recognize the native Indiana plants. This allows them to educate themselves by simply looking at each plaque. There was little signage and nothing that we could find to link it to water. Therefore, we propose illustrative diagrams to show how trees and woodlands interact and affect water. We also believe a small structure or focal point could be implemented on the east corner of the area. This would act as an area for visitors to gain interactive knowledge about the importance of trees and woodlands and water quality.

Adding artificial wildlife figures to the trees, woods, and ditch areas will provide a more natural look to the woodland area. Figures such as Indiana native birds should be added to the trees, possibly squirrels, deer, and groundhogs could be added to the wooded areas, and the ditch areas could have mink or foxes placed to add an aesthetic, natural look to this Watershed area. Native habitats play a huge role in every ecosystem, and by adding these artificial animals; a more realistic look will be achieved. A Male Whitetail Deer figurine would cost \$89.99, male and female mallards would cost \$49.99 and an Adult Red Fox costs \$239.00. All estimates were taken from cabelas.com and skymalls.com. In (Appendix XII) there are handwritten notes strategically placed for a natural setting of the particular wildlife. The deer is located in the wooded area, the mallards are in the largest pond, and the fox is located along the ditch with tree and grass cover. Due to such a confined space, it would be unnatural for more wildlife to occupy this area. The placement of each species is done so based upon natural behavior.

Farmland

The agriculture area has a few small changes that we are proposing. The new sign in this area focuses on the importance of agriculture and gardening. Sustainable farming practices, like cover crops and no till are explained in simple language so that even visitors from urban areas could understand. Another subject is soil erosion and how it can be slowed by farmers using best management practices. The last section on this sign describes why home gardens are beneficial and why someone should take the time to set one up. The agriculture section in the exhibit is perfect for giving the visitors a small preview of where their food comes from and how they are able to grow their own food in their own backyards.

Wetland

This is already such a great natural display that we have no major changes to suggest for the actual wetland. However, we do have a few ideas on drawing visitors past the wetland area, and to the soil display. In order to accomplish this, we propose more wooden arrows, like those in the woodland along the path so that guests realize it extends towards the back. Also, we would add a Walter and Sally popup on the existing sign. There are three suggested posters for the wetland that give a synopsis of what a wetland is as well as the importance/benefits of wetland conservation. Further, a mascot called Finn the Frog could be developed to draw in children to the concepts demonstrated here.

Bat Display

The bat display, if created, would go in the wetland area right before the tree line. Bat houses must be at least 15 feet high in order for the bats to remain safe while inside the shelter. While bats are warm blooded creatures, their bat house must be exposed to sun throughout the day so that they can stay warm. The sign for this area is simple, grey and black (to go along with bats being nocturnal), and could be located next to the wetland sign. First, the sign explains why bats are necessary and beneficial to the environment. Next the sign explains that bats eat insects and help protect crops from the insects which help farmers so they don't have to use as much pesticides. Lastly, the sign states how bats are endangered and how they become more susceptible to diseases when disturbed during hibernation.

Indiana Soils

We did not make any revisions to this sign except to add Walter the Water Drop to the area as a separate mini pop-up sign. The pop-up sign would be located right next to the soil profiles that are in the exhibit. The Indiana Soils area is already in a popular area because of the refuge from the sun that it allows visitors. With this knowledge, we propose adding another bench to provide more seating for the guests.

This area has a lot of good intent, however the manner in which information is displayed is somewhat confusing. We believe this area could greatly benefit from better signage. The current signs are very text heavy and hard to interpret for all ages. Upgrades to this information could be visual, allowing every age range to understand the content easily and quickly. Visual aids could be diagrams displaying soil profiles from different locations around the state. They would also demonstrate the relationship between soil and water quality. Our main goals are to create signs with soil profiles, and to update the current soil profiles. This could include better labeling of each layer and the importance of each layer. It is vital that these signs be simple enough for children to understand. Another great idea is signage covering how soil and water interact as well as the water cycle. We also came out with the idea of creating stations with “flip signs” of different soil and water qualities.

Septic Display

We incorporated signs so visitors can have a better understanding of their home septic systems and designed the signs to be colorful, and eye-catching. The signs incorporated the importance of soil quality in septic systems and the water table in septic systems. The signs also include information on city water versus well water and the taste differences between hard and soft water.

Water History Cabin

The Water History Cabin is great the way it is, however we have a few suggestions to improve the exhibit.

We realize in this day and age technology is big with grabbing the younger generations attention. Therefore we plan to use updated voice boxes that can capture the attention of these children while also teaching them some facts about water usage. Right outside the house there will be a washing board set up that allows the kids to physically wash clothes on a washing board like the pioneers would have in the past. The washing board below to the left is what we would plan to use because it is the easiest and safest. The device to the right would be the possible design we would use as a voice box within the pioneer house to teach the children. Here is a design of a speaker box that could be implemented. <http://www.oldandinteresting.com/washboards-history.aspx>

There will also be facts about the water use of pioneers such as “The average amount of water used to do laundry by pioneers is 5 gallons, while today’s standard washing machines use 27 gallons for a single load.” Next to the voice box there would be a picture that shows the amount of water we use for different things in our daily lives such as shown below. This is just a self explanatory graph that is color coded and kid friendly. “When the pioneers did their laundry it could be a 3 or 4 day long process, while today a full load of clothes takes roughly 55 minutes.” <http://laundry.about.com/od/laundrybasics/a/Laundry-In-The-1800s-Laundry-History.htm>

<http://sustainability.about.com/od/Sustainability/a/How-We-Use-Water.htm>

Another idea is to have a volunteer dress in pioneer-garb and act and show how things were done during that time period. Because volunteers can be scarce at times, this would be a good idea to have during the fair season when there are more visitors and workers. The volunteer could memorize lines that would help them interact with guests and show how pioneers lived. This includes how the washboard works, how much water pioneers used, state facts about how they conserved water because it was less available, and offering drinks from the water well would encourage visitors to learn more about how things were done in the old times.

Water Well Pump

We propose to add another sign for free water that will really encourage visitors to approach the exhibit. Also, we propose adding a simple sign that explains the difference between city water and well water so people can see the differences after they drink from the water well.

Pasture

This sign details how animals can help with soil health and defines not only what pastures are, but what they should look like. The sign should be located before the education exhibit, on the fence in front of the pasture area. We noticed that most days the pasture had stuffed animals instead of real animals. We would like to propose the addition of real animals in a petting zoo format. Bringing in real animals for the petting zoo will draw in people because children like petting zoos and while they are there the parents can learn about water resources, possibly getting people informed and involved in the issue. We could possibly do this by contacting local farms to borrow their animals. Live animals will allow the kids to interact more and allow them to see how animals can act in a pasture setting. If animals that are easy to feed were incorporated, food could be purchased for 25 or 50 cents to help cover the cost of the animals.

Education Area

We really love the covered bridge and how it encourages visitors to walk back to the education area. We have made no changes to the layout of this area. However, there are a few interactive and educational ideas that could be put into place. First, a take home tree program could be installed that would allow kids to take a baby tree home and plant it in their yards. They would receive a red pine seedling tree in a small paper pixie cup. To go with this activity and to make it relevant, an educational program talking about the benefits of the trees could be installed. We would like to propose some activities for the education area that will allow children to participate and visually see the concepts that are discussed in the exhibit. We suggest implementing a station in the education area of the exhibit. The new station would be an activity for the kids to enjoy. They would get to plant their very own tree in a cup and be able to take it home. We think this would draw kids into the exhibit. If they see other kids walking around the fair with a free tree they planted, they will want to know where it came from and to learn more about it. We would have educational signs showing the importance on why trees need water and what they do for our environment and air. This activity could be held every half hour during the peak of the fair season and would last for approximately 20 minutes. To avoid kids from taking the trees and leaving them around the fair, the parents would have to sign their kids up for the activity. We would have a sign-up sheet with the hours of operation at the welcome shelter in front of the exhibit.

Another idea for the educational area are runoff soda bottles shown in (Appendix XIV). these runoff bottles will show children and adults how water runoff soils since it's a very hard concept to wrap your head around, you can make the bottles small or large, depending if you want people to take them home!

Also for this area, another education program that involved trees is learning about storm water runoff. Storm water runoff is rainfall that flows over the ground surface. It is created when rain falls on roads, driveways, parking lots, rooftops and other paved surfaces that do not allow water to soak into the ground. Storm water runoff is the number one cause of stream impairment in urban areas. Storm water runoff also picks up and carries with it many different pollutants that are found on paved surfaces such as sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides and metals. Trees and forests improve stream quality and watershed health primarily by decreasing the amount of stormwater runoff and pollutants that reaches our local waters. Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil. This helps to replenish our groundwater supply and maintain stream flow during dry periods. The presence of trees also helps to slow down and temporarily store runoff, which further promotes infiltration, and decreases flooding and erosion downstream. A small educational sign has been created that can stand in the education area to make it easier for visitors to learn about stormwater runoff (See Appendix V). <http://www.forestsforwatersheds.org/reduce-stormwater/>

To get children to retain important information about water management and soil conservation through age appropriate fun, repetitive games.

1. **Soil Filters** – this game gives kids information about how soil naturally filters water, and shows them how soil filters many chemicals out of water just like it did the grape Kool-aid. These same techniques are used to purify waste water that comes from houses, cities, industry, and large animal feeding operations.

<http://www.doctordirt.org/teachingresources/soilfilter>

2. **Quick Sand** - If you add just the right amount of water to cornflour it becomes very thick when you stir it quickly. This happens because the cornflour grains are mixed up and can't slide over each other due to the lack of water between them. Stirring slowly allows more water between the cornflour grains, letting them slide over each other much easier. Poking it quickly has the same effect, making the substance very hard. If you poke it slowly it doesn't mix up the mixture in the same way, leaving it runny. It works in much the same way as real quick sand.

<http://www.sciencekids.co.nz/experiments/quicksand.html>

3. **Perkin' Through the Pores** - Students will be able to determine the water holding and draining capacities of different soils and will investigate how organic matter increases the amount of water soil will hold.

<http://www.soils4teachers.org/files/s4t/lessons/perkin-through.pdf>

Monarch Butterflies

We designed the Monarch Butterfly sign to be simple as possible and let the natural beauty of the flowers and pond speak for themselves. One of the ideas we proposed is that the sign could be attached to the fence post in front of the pond to allow visitors to read about the importance of monarch butterflies while potentially viewing them firsthand.

Another idea to provide the Pathways exhibit with a monarch butterfly element would be to plant milkweed around the wooden-canopied structure in the middle of the pathway. Milkweed plants could be planted around the base of the structure. The structure could then become the monarch butterfly exhibit and information center. Posters and informational panels could be added in the structure to help visitors understand the importance of milkweed and monarch butterflies. Here, Marky the monarch butterfly character could come to life and tell visitors about the butterflies.

Expansion Ideas

We proposed three ideas that could possibly be implemented for the expansion area in the exhibit.

Septic System Expansion

One idea for the expansion area is to provide more information on septic systems. We propose a more interactive display on septic tanks and their importance. Also, a real life demonstration of septic systems and how they work. Title it, "Follow the Flush".

Agriculture/Farmland Expansion

Another idea for the expansion area is to expand the agriculture area down the hill, but also keep the original agriculture/farmland area. Crops that need less sun can be located on top of the hill and crops that need more sunlight can be extended in the expansion area. In the expansion, there could also be a little area where it talks about farmers in Indiana and how important they are. Due to the location it is a difficult task showing the broad agricultural practices in a small confined area. Due to the lack of sun in the area because of the maturing trees, agricultural crops will not grow to their full potential. It may be better to grow some example crops off-site and bring them in during the fair. Also, if the area available to the north for possible expansion is acquired, it could become a better location for full-sun agricultural vegetation.

Educational Expansion

The last idea for the expansion area is to make a second educational area that would be more interactive with things that you can do with your hands. This educational expansion can be set up for long periods of time and can be self-run.

Sign Material Estimates

Permanent Poster Housing (Wooden with Plexiglass)

This estimate is for building a wooden box with plexiglass similar to that in the current soil exhibit. This estimate does not include labor for construction, it only includes the cost of materials.

Pressure treated (2x6x8) x 4= \$23.08

Pressure treated (4x4x8) x 2= \$15.54

Pressure treated plywood(1/2"x4'x8')= \$29.97

36" x 48" plexiglass= \$37

Exterior stain = \$8

Wood screws= \$10

Trim (3/4" x 3/4" x 8') x 2= \$29.22

Estimate Total = \$152.81

Permanent Ploymetal Signs

This estimate is for printing permanent signs in 16x24" dimensions on 3mm Ploymetal through T-Max Signs in Muncie, Indiana.

One, 24x16" di-bond ACM White 3mm Euro ACP LITE (di-bond) \$38 each

Printing estimate: three day time-frame.

for 15 signs = \$570.00

Estimated Total = \$570.00

Additional Suggestions for Overall Exhibit

Speaker Boxes--QR Codes

Children press a button and can hear a short blurb about an exhibit. Where children go, parents will follow and big red buttons are a great way to get children interested in today's technology driven culture. Having Walter and Sally on each sign near the speaker box with a QR Code that can be scanned to take them to fact sheets and the Walter and Sally Coloring book would really help as well!

Key Boxes

The Water Resources Class also suggested a Key box, similar to those used at some zoos. Where you give out keys as souvenirs and let children or adults keep them so they can re-use the keys every time they come back to the exhibit! The keys would be used to turn on boxes throughout the exhibit and follow a talking storybook (Appendix XI).

Kids would obtain a small key at the beginning of the exhibit that fits into boxes spread throughout the exhibit that would verbally provide fun water information. Not only would this attract and educate children, but it would also serve to educate adults with additional water conservation ideas that might otherwise not be considered simply through signage. Construction of the boxes would be fairly simple, however cost per box has not yet been determined.

Canopy Area

One particular area that could be used to relay more information is the wooden-canopied structure in the middle of the pathway. By utilizing this area as a spot where visitors will sit and rest as an information/education area, visitors can relax and read. Instead of long and strenuous information that some people may not take the time to read, we would like to implement a list of simple facts for each area so people receive the information the Pathway to Water is trying to inform.(Appendix IV) We would also like to enlarge the font size of the signs on the pathway, finding it was hard for us to read if we were not close enough along with implementing a color scheme to make the signs and information seem more attractive to draw people in information of the pathway and its components in a comfortable, shady setting.

Algae Bloom Exhibit

For a simple algae bloom exhibit, two cylindrical water storage devices (fish tanks or bowls) are needed. One of these containers will hold pure water from the stream that flows through the exhibit. The other will have the same water, but it will have fertilizer mixed in with it. Shortly after doing this, an algae bloom should develop within the container. Signs should be included

explaining that one contains regular water and the other has water that's been contaminated with man-made fertilizers. This new exhibit would be a better way of explaining to visitors why eutrophication should be avoided. This exhibit would be a new exhibit, but be fairly easy to set up. Two fish tanks would be needed, some high nitrogen content fertilizer, water from the stream, and signage to tell visitors what is occurring.

Since the exhibit will be new we will need completely new signs for the exhibit. The information could probably be covered in two to three signs, one of which can be found in (Appendix VI), one for each tank/bowl. The sign posted by the fresh river water could read as follows:

“This bowl is filled with freshwater taken from our nearby river. As you can see, it appears clear and unpolluted. This is what we ideally want rivers to look like since this water is safe for aquatic plants and animals, good for recreation, and easier to clean for drinking water. Aquatic ecosystems are fragile and prone to change however. What would happen if one pollutant is added to this system?”

The sign paired with the fertilizer polluted water could probably look something like this: “As you can see, this water is much less clean than the water in the other tank. This water has been polluted by fertilizers. Most fertilizers are high in nitrogen content. Nitrogen is considered to be a limiting nutrient in most systems. This means that nitrogen is one nutrient that all plants need, but there's only a certain amount available which limits the ability of plants to grow. When you introduce more nitrogen into the system it allows for far more plant mass. Because this system has been polluted with fertilizer the water has been saturated with large algae growths. Perhaps counterintuitively, this excess green life is actually bad for ecosystems.”

A second sign under the fertilizer polluted water could give information about why this phenomenon is bad. This sign could read as follows:

“When a body of water has lots of algae the system actually produces less energy than it could if there was less plant mass. When the algae begins to die off, it requires lots of bacteria to decompose it. While these bacteria break the algae down they use all the oxygen in the water. This makes the water uninhabitable for most all animal life. This algae also prevents sunlight from reaching plants under the water's surface which kills those plants off. When this phenomenon, called eutrophication, reaches its completion, there will be little to know life in the water aside from the algae itself.”

Two Stage Ditch

Most two-stage ditch projects cost around \$10 per linear foot, because of land and monetary constraints, constructing a standard-sized fully-functioning two-stage ditch will not be feasible. However, the recommended guidelines for sizing and construction can still be utilized to create a scaled-down model ditch (possibly half the average size) that still gives visitors a good visual idea of how these ditches function in real life settings. The improved ditch, along with the recommended signage (Appendix II) will help educate visitors on how ditches play an important role in affecting the water quality in larger systems. Additional signage could also be created to

display the vegetation chosen for the benches or further explain the specific nutrients (nitrogen and phosphorus) that come from agricultural runoff.

The ditch in the exhibit needs to be expanded and reconstructed so it is a more obvious example of a two-stage ditch. The reconstructed ditch will be a small-scale version of how the system is typically built. Once the ditch is reconstructed, the benches will need to be replanted with specific vegetation and labeled to show which plants can be used successfully in a two-stage ditch. Examples of plants being utilized elsewhere include: a mix of: tall fescue, orchardgrass, perennial ryegrass, and Virginia wildrye or a mix of: Frank's sedge, fox sedge, riverbank wild rye, Virginia wildrye, switchgrass, and prairie cordgrass. Reconstructing the ditch will more adequately illustrate how the system works and its purpose. It will help visitors understand how certain plants can act as filters to mitigate water pollution. Lastly, it will help give guests a better understanding of the vital role that vegetation plays in water quality.

Appendix

Appendix 1- Entrance Brochure



**Come Walk
the Path**
At Pathway to Water Quality
located at the
Indiana State Fair Grounds

Stations of the pathway...

The path is illuminated by streams of blue light for visitors to follow, guiding them through the different information stations regarding watershed:

1. Visitor Gazebo
2. Rock Waterfall
3. Native Plants
4. Pervious Concrete
5. Model Home
6. Rain Barrels
7. Compost Bin
8. Rain Gardens

Water Quality

9. Stream and Shoreline Protection
10. Front Pond Restoration
11. Lakes and Natural Wetlands
12. Indiana Soils
13. Water Well
14. WaterHistory Cabin

15. Well Water Pump
16. Education Area

Farm and Woodlands

17. Monarch Station
18. Two-stage Ditch
19. Woodlands
20. Farmlands
21. Pasture Management



Brochure Revised By:

Katie Harper, Sanson Pittman, Taylor Gabrysiak



History of PWQ

Pathway to Water Quality was established at the Indiana State Fairgrounds in 1993. It is sponsored by eight state organizations and agencies who comprise the Indiana Conservation Partnership (icwpind.org).

Volunteers from these groups work with the Pathway to Water Quality's host, the Indiana State Fair grounds, to maintain the exhibit and educate the public about conservation practices.

The exhibit is open during the 13 days of the Indiana State Fair and for educational tours. Follow the path through this outdoor exhibit and discover how you can become a better caretaker of our natural resources!



INDIANA ASSOCIATION OF
soil and water conservation
DISTRICTS



"It is an excellent watershed demonstration site, allowing how proper management practices at home, on the farm and in business can protect our soil and water resources."

- Pathway to Water Quality

Pathway to Water Quality (PWQ) is a model watershed showing how land "sheds" water, or drains to a common place such as a river, lake, or stream. A watershed is the area of land that catches rain and snow and drains into a stream, river, lake, marsh or groundwater. Because we all live in a watershed, it is important that we are all aware of where exactly our water comes from, and how our lifestyles impact the quality of our water that we use on a daily basis!

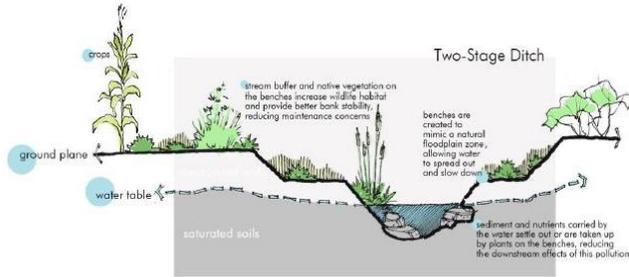
One of the primary goals of PWQ is to educate the public on the importance of water conservation, and also relaying to the public just how much both soil and water quality affect us in our everyday lives.

Guided tours are offered, and free to the public and allow visitors to travel the same path that water does through a small-scale simulation of a watershed. We also offer fun and interactive participate in, to engage in games and dialogue about the importance of maintaining a healthy ecosystem.

Come follow Finn the Frog, our Pathway Mascot, as he leads the way of the water's journey from each station to the next, explaining the concepts of watershed and conservation practices that both you and your family can practice at home!

Appendix II- Two-Stage Ditch

Two-Stage Ditch System



Urban and agricultural runoff contains sediment and certain nutrients that negatively affect water quality. Traditional ditches often flow too quickly and have little surrounding vegetation, which can aid in transporting this pollution into larger streams, rivers, and eventually into the ocean. This can cause water quality issues like eutrophication, or excessive algae growth, among others.



Traditional agricultural ditch

Benefits of the Two-Stage Ditch System:

- Improves nutrient & sediment removal
- Increases capacity of the ditch system & improves floodwater retention
- Mitigates downstream flooding
- Improves ditch bank stability & decreases bank erosion

The White River Alliance (Diagram)

- <http://the-white-river-alliance.org/wp-content/uploads/images/two%20stage%20ditch%20enlargement.jpg>

The Nature Conservancy

- <http://www.epa.gov/region5/agriculture/pdfs/nutrient2012/nc-nutrient-20121031.pdf>
- <http://www.nature.org/burinititiles/regional/northamerica/unitedstates/indiana/bioscience/two-stage-ditches.pdf>
- http://www.nature.org/ci/groups/vebcontent/@web/@indiana/documents/document/ind_034167.pdf

Purdue University Dept. of Agricultural & Biological Engineering

- <https://engineering.purdue.edu/watersheds/whitarsa/2StageDitch%20Bench%20vegetation%20for%20a%20two-stage%20ditch%20.pdf>

- <http://cdm.phys.org/newman/gfvs/news/tires/tiredrainage.jpg> (Photo)

Appendix III- Bioretention Brochure



“Green Street”

Ideal locations:

For a place of instalment an ideal location would be where most run off water ends up. Roads that have steeper pitches could have small scale designs where roads meet. Preexisting trees or vegetation that can be used will help lower costs of construction as well as material costs. Roads that are near water sources would also be an ideal location.

Glossary

Storm water- is water that originates during precipitation events, for example rainfall or snow melts. Storm water can soak into the soil, be held on the surface and evaporate, or runoff and end up in nearby streams, rivers, or other water bodies.

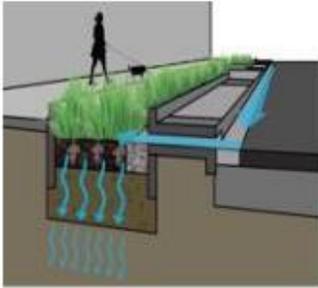
Rain Garden- A rain garden is a planted depression or a hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to be absorbed.

Bio retention- Bio retention is the process in which contaminants and sedimentation are removed from storm water runoff.

Water table- underground surface water that is beneath the earth materials, as soil or rock, or are saturated with water underground.



**BIO
RETENTION
“GREEN
STREET”**



How it works/Benefits

Bio retention, rain gardens, green streets, as well as many other types of environmental friendly methods consists of a grass buffer strip, sand bed, ponding area, organic layer, mulch layer, and planting soil that work together by filtering polluted runoff before it is put back into our water table. These will increase ground water recharge, reduction of thermal pollution, as well as reduction of all run off pollutants.

Expected to have a lifespan of up to 15 years and can filter thousands of gallons that would have just went straight into the storm sewers. Reducing backups on heavy precipitation events.

Impact statement- With implementation of the "green street", urban areas will then be turned into green cities. This is the future of road designs nationwide that can prove extremely beneficial to our environment and will also benefit the people who walk amongst the cities staring at metal and concrete every day. Let us change the cities one road at a time and incorporate some aesthetic value in people's lives while they are on their way to work, or just on stroll through the neighborhood.

Upkeep- The city would be able to create jobs or at least be able to add to the workload. The retention areas will collect debris that can be easily removed.



Small scale idea

Materials needed- sand, peat, leaf compost, underdrain gravel, geotextile fabric (if required), impermeable liner (if required), underdrain piping, concrete (pre casted), and non-steel rebar are the materials required for construction.

Pricing- it may vary from site to site as specifications can be small scale designs with one tree in a 5X6 area (\$1000-\$5000), to a whole road that may be 8X100 with no preexisting vegetation(\$10,000- \$25,000). Material prices may vary from state to state.

Appendix IV



Using Trees to Reduce Storm Water Runoff



The Problem

Storm water runoff is rainfall that flows over the ground surface. It is created when rain falls on roads, driveways, parking lots, rooftops and other paved surfaces that do not allow water to soak into the ground. Storm water runoff is the number one cause of stream impairment in urban areas. Storm water runoff also picks up and carries with it many different pollutants that are found on paved surfaces such as sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides and metals.



The Solution

Trees and forests improve stream quality and watershed health primarily by decreasing the amount of storm water runoff and pollutants that reaches our local waters. Trees and forests reduce storm water runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. In addition, tree roots and leaf litter create soil conditions that promote the infiltration of rainwater into the soil. This helps to replenish our groundwater supply and maintain stream flow during dry periods. The presence of trees also helps to slow down and temporarily store runoff, which further promotes infiltration, and decreases flooding and erosion downstream.

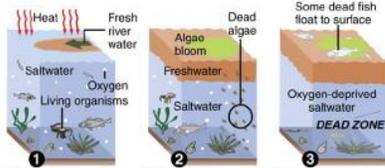


Appendix VI

When a body of water has lots of algae the system actually produces less energy than it could if there was less plant mass. When the algae begins to die off, it requires lots of bacteria to decompose it. While these bacteria break the algae down they consume all the oxygen in the water. This makes the water uninhabitable for almost all animal life.

Mascot Here
Maybe?

How Dead Zones Form



1 During spring, sun-heated freshwater runoff from the Mississippi River creates a barrier layer in the Gulf and cuts off the saltier water below from contact with oxygen.

2 Nitrogen and phosphorus from fertilizer and sewage in the freshwater layer ignite algae blooms; when algae dies, they sink into saltier water and decompose, depleting oxygen in deep water.

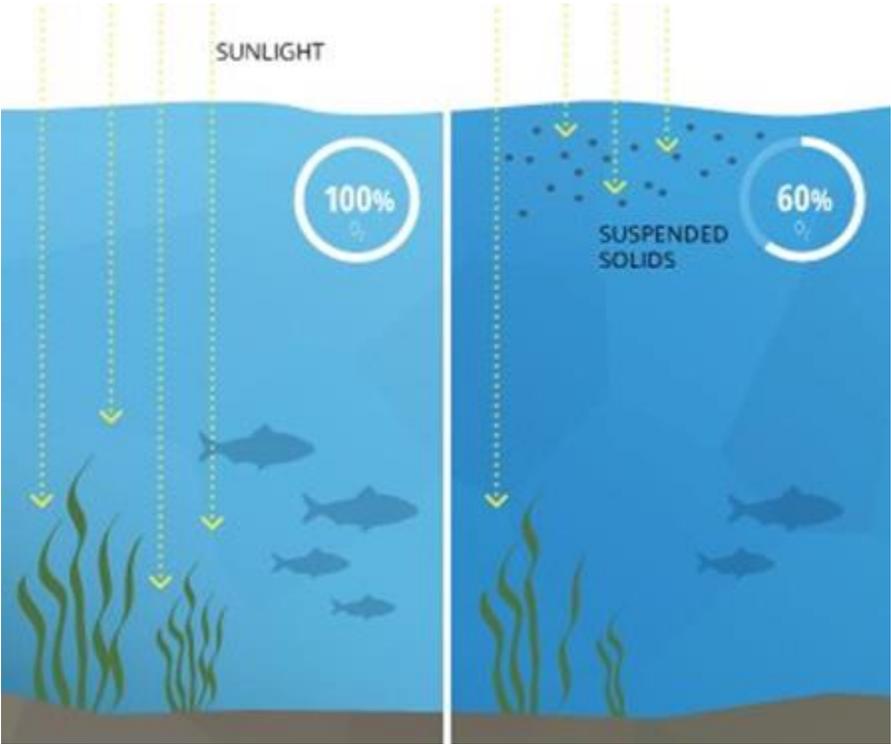
3 Starved of oxygen, deeper water becomes a dead zone; fish avoid area or die in massive numbers and organisms that form base of food chains also die; winter brings respite, but spring runoffs start cycle again.

Source: Louisiana Universities Marine Consortium, NOAA, Times Picayune Graphic, St. Louis Post-Dispatch © 2009 MCT

This algae also prevents sunlight from reaching plants under the water's surface which kills those plants off. When this phenomenon, called eutrophication, reaches its completion, there will be little to know life in the water aside from the algae itself.



Appendix VII

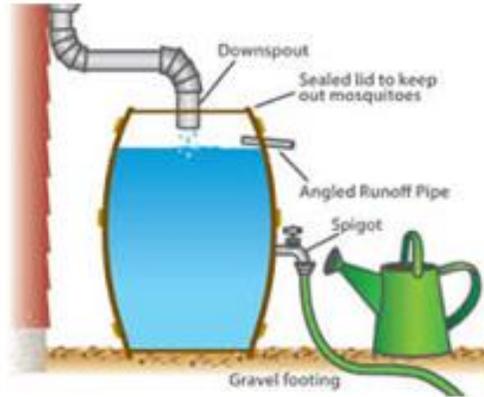


Appendix VIII



Drip Irrigation

Drip Irrigation is a method used to water plants in an environmentally friendly way. A hose is placed along your plants and a hole is made where plants are located. This hole will leak out water slowly to that certain area so that water isn't wasted. Drip irrigation also helps the number of weeds that are in gardens since only the plants are being watered.

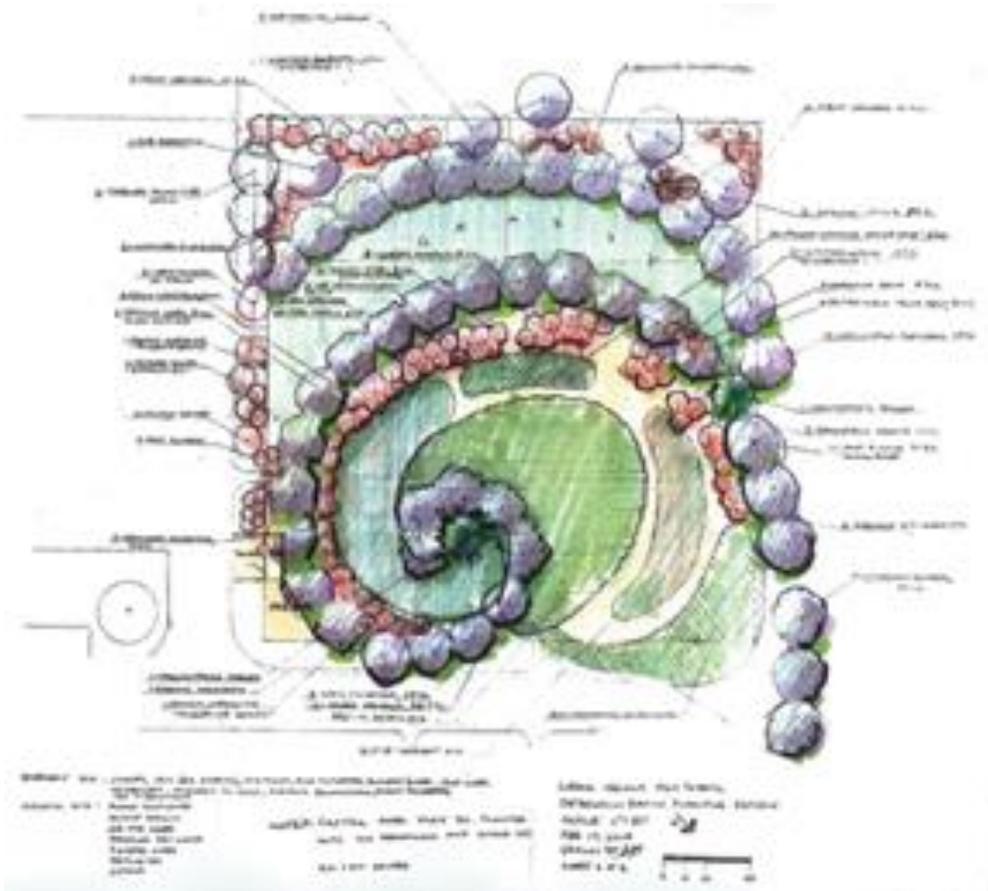


DRIP IRRIGATION
From Rain water

DID YOU KNOW?

Did you know you can save money and help the environment by collecting rain water in a rain barrel? You can use the water you collected in your barrel to water your plants, which lowers your water bill. If you have a spigot on your rain barrel you can attach a hose to it and either water your plants using the hose or you can water your plants by using a method called drip irrigation.

Appendix IX



Appendix X



Appendix XI



Appendix XII



Appendix XIII



Appendix XIV



Appendix XV

