

# STORMWATER

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## REDEFINED



BALL STATE  
UNIVERSITY.

## PROMOTING STORMWATER QUALITY AND AWARENESS IN THE CAMPUS COMMUNITY

This endeavor is the continuation of a class project students Megan Griffith and Nicole Holt participated in during fall semester ('07) with Dr. Jarka Popovicova. The class focused on water issues and a final class project intending to promote awareness about storm water issues. Due to the limited time available to work in the semester, stenciling storm drains in Yorktown was as far as the project extended. After the class ended, Megan and Nicole still wanted to raise awareness at Ball State University so an independent project was created to help the campus community become familiar with storm water issues directly related to campus.

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## ADDITIONAL INFORMATION

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### [Background On Project](#)

Semester participation in an Honors science class...

### [Water On Campus](#)

Here's a map showing the various locations of water...

### [Materials Not To Dump](#)

A list of substances that should not be dumped down storm drains...

### [Ways To Get Involved](#)

If you would like to get involved in numerous projects...

### [Links](#)

If you would like to learn more...

### [Additional Information](#)

Copies of stormwater posters, brochures, and more...

# MAIN INFORMATION

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## QUICK FACTS

A person needs 4 to 5 gallons of water per day to survive [1, 2]. The average American individual uses 100 to 176 gallons of water at home each day [3, 4]. The average African family uses about 5 gallons of water each day [4].

Less than 1% of the world's fresh water (about 0.007% of all water on earth) is readily accessible for direct human use [5].

Eighty-eight percent (88%) of all diseases are caused by unsafe drinking water, inadequate sanitation, and poor hygiene [6].

## WHY GROUNDWATER IS IMPORTANT

Groundwater is water that is found underground in the cracks and spaces in soil, sand and rock. It is stored in and moves slowly through layers of soil, sand and rocks called aquifers. These materials are permeable because they have large connected spaces that allow water to flow through [7]. Wells, a drinking source for many, tap into these aquifers, so the water quality and quantity is important for survival.

Groundwater supplies are recharged by rainfall, melting snow, soil moisture, permafrost, and surface water (lakes, rivers, etc.) naturally. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. In other areas groundwater is polluted by human activities. In areas where material above the aquifer is permeable, pollutants can readily sink into groundwater supplies. Movement of water and dispersion within the aquifer spreads the pollutant over a wider area, which can then intersect with groundwater wells or find its way back to surface water, making the water supplies unsafe. Groundwater can be polluted by landfills, septic tanks, leaky underground gas tanks, hazardous waste sites, the widespread use of road salts, and from overuse of fertilizers and pesticides [7, 8].

It is necessary for all of us to learn to protect our groundwater because of its importance as a source of water for drinking and irrigation. Groundwater is used for drinking water by more than 50 percent of the people in the United States, including almost everyone who lives in rural areas. The largest use for groundwater is to irrigate crops, a major food source for Americans and economic profit in the world market [7].

Groundwater is available in limited quantities. Since groundwater is an important resource for so many people, it is important to protect it. Conserving the quantity of groundwater is easy. By simply reducing the amount of water that we use, our water supply will last longer [7, 8].

## HOW YOU ARE CONNECTED: UPPER WHITE RIVER WATERSHED



The Upper White River Watershed is mainly used for:  
Cropland 80.0%, Forestry 20.0%, and Urban 25.0%.

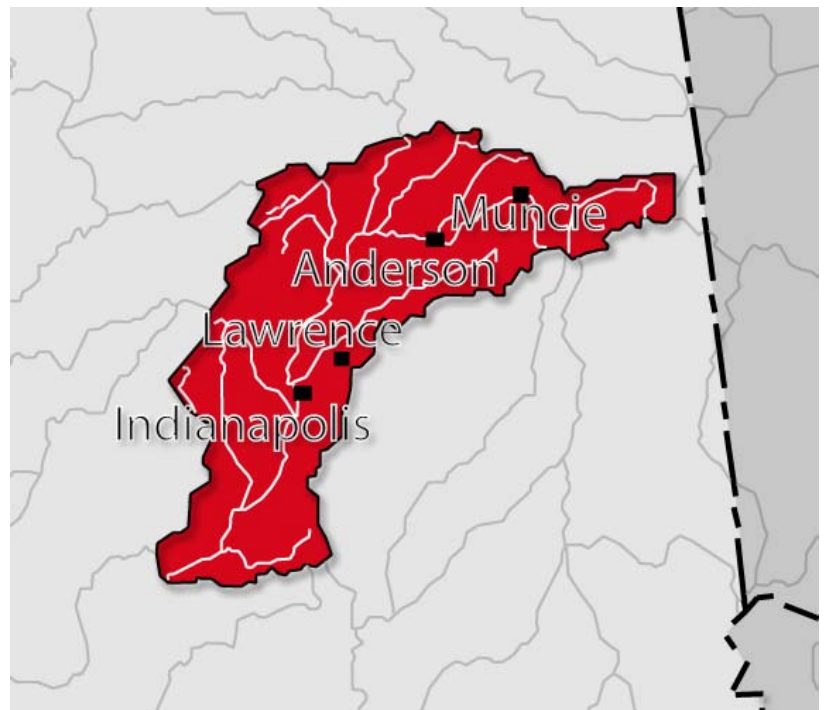
Specifically, its water is used for: Flood Retention, Irrigation, Recreation, Wetlands, and Wildlife Habitat.

The watershed's main stressors and pollutants include: Bacteria, Exotic Species, Flooding, Heavy Metal(s), Instream Flows, Land Use/Development, Nitrogen, Noxious Weeds, Odor, Open Spaces, Pathogens, Pesticide(s), Phosphorus, Sediment, Temperature, Toxic Substance(s), Turbidity, and Wildlife Habitat.

Reasons for these pollutants include: Buried Tanks, Cropland, Dams, Septic Tank/System, and Streambanks [9].

## PRAIRIE CREEK RESERVOIR

The Army Corp of Engineers constructed the Prairie Creek Reservoir in 1960 in order to provide a water source for Muncie and the surrounding area. Current uses of the reservoir include drinking water source, community assets, wildlife preserve, playground, campground, hiking and biking trails and recreation (horseback riding, ATV trails, boating, fishing, swimming). Some concerns about Prairie Creek's water quality are that many pollutants get dumped into the water, destroying its quality for aquatic life. Another problem is uncontrolled runoff from nearby farms also contributing to the pollution problems. Some other activities that contribute to the reservoir's overall pollution include the large amount of boating and ATV traffic, which cause soil erosion as well as leak toxins into the water while riding through. While it is not



apparent Prairie Creek Reservoir is heavily polluted, on the southwest side where the flow of the river is slower, one can start to see the effects of all this pollution in the water. Some contributing concerns include drainage and updating sewage systems. Some of the future plans for York Prairie Creek include enhancing the wetlands by Perry Elementary School by replacing the current unproductive vegetation with species that will help filter polluted water before it makes it to the reservoir. Other plans include installing grass waterways in place of the current washed-out ditches, and adding further buffer zones between agricultural areas and waterways in order to improve the filtration of pollutants. If future generations want to enjoy the reservoir as it is enjoyed now, some of these issues need to be addressed in order to preserve its water quality.

## CAMPUS WATER

Look for these medallions on Ball State-owned storm drains during campus tours or walking to class. They warn of the immediate consequence of pollution, littering, and irresponsible environmental behavior -it affects our local water supply (the White River) and thereby our health.



## WHAT YOU CAN DO TO PROTECT OUR WATER

1. Dispose of chemicals properly; check your community for locations and methods.
2. Take used motor oil to a recycling center.
3. Limit the amount of fertilizer used on plants and lawns.
4. Take short (five minute) showers.
5. Shut water off while brushing teeth.
6. Run full loads of dishes and laundry.
7. Check for leaky faucets, toilets, pipes and septic systems and have them fixed.
8. Water plants only when necessary.
9. Keep a pitcher of drinking water in the refrigerator to keep from running the tap.
10. Get involved in water education.
11. Pick up litter in your neighborhood.
12. Purchase 'green' household cleaning alternatives instead of harmful products [7].

### Sources:

- [1] "Humanitarian Charter and Minimum Standards in Disaster Response." The Sphere Project. 2006. The Sphere Project. January 20, 2008. <<http://www.sphereproject.org/>>.
- [2] Roberts, Les. "Diminishing Standards: How much water do people need?" International Committee of the Red Cross. 1998. International Committee of the Red Cross. January 20, 2008. <<http://www.icrc.org/Web/eng/siteeng0.nsf/htmlall/57JPL6>>.
- [3] "Water Facts: Facts about water, drinking water, and water-related disease." 2008. Water Partners International. January 20, 2008. <<http://www.water.org/waterpartners.aspx?pgID=916>>
- [4] Information Pending
- [5] "Health in Water Resources Development." World Health Organization Fact Sheet. 2006. World Health Organization. January 20, 2008. <[http://www.who.int/docstore/water\\_sanitation\\_health/vector/water\\_resources.htm](http://www.who.int/docstore/water_sanitation_health/vector/water_resources.htm)>.



- [6] Oliver, Rachel. "All About: Water and Health." Eco Solutions. December 18, 2007. Cable News Network. January 20, 2008. <<http://edition.cnn.com/2007/WORLD/asiapcf/12/17/eco.about.water/>>.
- [7] The Groundwater Foundation. <<http://www.groundwater.org/>>.
- [8] U.S. Geological Survey Groundwater Fact Sheet <<http://pubs.usgs.gov/fs/2007/3003/>>.
- [9] "Know Your Watershed". National Watershed Network. 10 July 2000. Conservation Technology Information Center. March 5, 2008. <<http://www2.ctic.purdue.edu/kyw/nwn/nwn.html>>.

## BACKGROUND ON PROJECT

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### PHASE ONE

The purpose of our Honors 297 course, taught by Professor Popovicova, was to become familiar with current local, national and international water resource issues as the class explored water quantity as well as water quality topics. Our class' active learning was based on research, discussions, presentations, field trips and activities, with a final group project aimed at promoting storm water awareness.

### GOALS

Our group's project goal was to create awareness and further educate students and faculty of Ball State University about the harmful materials and chemicals entering storm drains through their own waste and sanitation habits.

Our original idea was to design a professional logo, slogan and eye-catching phrases to be painted around drains located on campus. This phase was supposed to focus on stenciling curb-side drains, but we hoped to expand the project to the many different types of drains throughout campus and work with the Muncie Delaware Stormwater Management to paint throughout Muncie and Yorktown as well.



Examples of storm drains down McKinley at Ball State University

## SLOGAN IDEAS

The slogan we decided on was: **Your Waste. Your Water. Your Health.** We felt it would reach a larger audience with its general, non-specific message. It connects each person's waste habits with the effect on his/her health. This message is simple, but powerful in its implications and could be used both on campus and in the surrounding community since it has no direct connection with Ball State

## PUBLICITY

In order to inform the Ball State community about our class project, we contacted the Daily News and Ball Bearings online to cover our project and run it in their features sections. The idea was to get our project published at the same time we paint the drains in order to supplement our project by drawing attention to the problems associated with storm drains on campus while explaining the project at the same time.

## CLASS PROJECT CONCLUSIONS

In order to get permission to stencil storm drains on campus, we took our proposal to President Jo Ann Gora. We presented our side, mentioning that through Indiana Rule 13 (327 IAC 15-13) and as an MS4, storm drain marking is a requirement of the university. We explained how we thought that our project would be the most cost-effective option for marking and would draw the most attention, locally and nationally. The media coverage and PR campaign of students marking their own university drains could even be more effective than the marking itself.

While President Jo Ann Gora supported our project, we were not able to get permission from campus facilities with the argument that it would be too much upkeep to reapply the stencil design everytime it started looking worn down. So we did not end up stenciling on campus, however we did get permission to stencil in some of the residential neighborhoods of Yorktown, a town just outside of Muncie. We ended up stenciling in Yorktown on three different Saturdays during the semester, marking storm drains in many different neighborhoods.

We discovered that the university had already purchased metal medallion markers to install on all unmarked campus drains. However, our group agreed that these markers blend in easily to the metal drain and are not completely legible for drivers or passersby. Stenciling commands more attention, especially from college students on campus. We realized that the stencil application will not last as long, but we believed that its effect would be greater than other storm drain markers and draw more awareness to this problem.



Our group lunch meeting with President Jo Ann Gora.



Our group stenciling in Yorktown and an example of the final stencil design painted onto the pavement. Members included Dean Kessler, Payton Corn, Allison Scribailo, Megan Griffith, Katie Marinaro, Kenny Brown, Nicole Holt, Sarah Potts and Brian Daugherty.

## PHASE TWO

### WHY IS STORM WATER IMPORTANT?

There are several reasons why storm water is an important issue for the Ball State University campus. The most important aspect to be aware of is that stormwater does not get filtered or treated before it is released into the White River and its tributaries. As rainwater travels to the storm drains, any debris or chemicals it picks up goes straight to the river. Ball State's campus has a great number of impervious, paved surfaces. These areas accumulate oil, grease, cigarette butts, and various other pollutants. Once precipitation starts to fall, these contaminants have nowhere to go except to the storm drains.

### STORM WATER ISSUES FOR AN ENVIRONMENTALLY FRIENDLY CAMPUS

The effect these chemicals have on the environment should be taken into account to create a sustainable campus, a goal of Ball State University. Most notably, these contaminants greatly affect and impair the quality of the water. The whole chemical makeup of Muncie's river system is changed, and the balance that nature provides, is thrown off. Some effects include an increase in harmful algae growth and a decrease in the number and variety of aquatic life. It is crucial to realize that the contaminated river is not only an environment that many animals and organisms depend on. It is also a source of water for the community. Muncie and communities downstream use the White River as a source for drinking water. These contaminants also have an impact on a larger scale. Not only is the White River affected, but other waterways downstream. The White River combines with the Wabash River, the Ohio River, the Mississippi River, and then enters the Gulf of Mexico. The effects of stormwater pollution on Ball State's campus are magnified as it combines with other chemicals and contaminants along this journey to the ocean.

In summary, there are four things to consider when thinking about stormwater pollution on the campus of Ball State University: the water is not treated, the water picks up an accumulation of pollutants, the water quality affects both nature and humans, and this combines with other pollution down stream and ultimately empties into the Gulf of Mexico.



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Even the smallest (and unconscious) of actions can have large consequences when entire communities are involved. Awareness and small changes in your habits can help. To expedite this improvement on Ball State's campus, the following plan has been established and pursued.

## 1 WEBSITE

- Largest audience-awareness method will cover: White River Watershed with a campus focus and the systems affects on the larger Delaware County community
- Pictures at/of important points on campus, locate walkways, water flow path, streets, ditches, York Prairie Creek and the Duck Pond
- Make map with supplemental info for each page
- Post on COTE/CERES website with links from BSU home page where it will be advertised

## 2 BROCHURES

- Covers the White River Watershed, groundwater/impervious surfaces around campus/city, notable water facts, issues facing local community, and how students/faculty can conserve and protect this precious resource
- White River site, project website address, and other links to referenced sites for those interested to have more of an active role on campus
- Distributed to the Housing and Residence halls for their information tables, by handouts at orientation for freshmen, on information tables in administration buildings, at local businesses and apartment leasing offices, in public libraries and banks

## 3 CAMPUS BUILDING POSTERS

- More visual information and less text, will reference brochure locations and project website, informational links, notable water facts, and some information from brochures
- Distributed to Residence Halls, Bracken Library, CERES department, Student Center, Honors College, NREM building, and Atrium
- Folders with brochures inside nearby to the posters for those interested to know more

## 4 MEDALLION INSTALLATION

- Two to three hours one day in Spring 2008 to be coordinated with Facilities and Maintenance department to install medallions
- To be installed around campus on drains that are not pre-stamped



# PHASE THREE

## FUTURE PLANS

One thing we learned while doing this project is that it takes much longer than expected to get things approved and ultimately carried out. The following are a few ideas we would have liked to implement, but just didn't have enough time in the course of one semester.

### 5 SHUTTLE BUS STOP SIGNS

- Visual metal signs suitable for high/quick traffic areas will direct students to other sources of information and spark awareness and curiosity to find out more about the issue
- Similar to posters, sponsor and BSU info is visually displayed on them
- Attached to light posts and trashcans at shuttle stops and inside bus shelters at each structure
- Since this step requires approval processes from the Grounds department, implementation will occur after this semester



### 6 TRI-FOLDS

- Water facts, catchy sayings (from previous semester spraypainting project), references to website, and notice to storm drain markers and bus stop signs will attract the eye of faculty and staff at dining halls
- Due to previously reserved time, these will appear at campus dining hall tables after this semester

### 7 PERMANENT KIOSK MAPS

- Part of each campus kiosk will be reserved to display more permanent information and maps, including a notice for Ball State University's efforts in sustainability (including stormwater management practices) once the new designs are constructed next year
- Each sign would highlight storm water, green buildings, and BSU initiatives to become more sustainable and environmentally responsible on campus

# WATER ON CAMPUS



1 **Cardinal Creek** runs north/south between Studebaker and Noyer residence halls. It flows beneath the Neely Avenue. It floods and is boggy during high rainy season; dry and empty other times. Its source is a natural spring north of Park Hall. After running north from Neely Avenue, the creek runs below grade at Irving Gymnasium and Worthern Arena, resurfacing to the west at the Duck Pond.

2 The **Duck Pond** gathers all excess water runoff from campus. The litter and sediment from most of the campus' parking lots (marked in yellow) flow into the pond. Here, they settle to the bottom, reducing the quality of aquadic life and building up harmful deposits (such as lead) that can filter further downstream.

3 **York Prairie Creek** runs off campus to the northwest from the Duck Pond. This creek meets with the White River, then the Wabash River, the Ohio River, then the Mississippi River and eventually out to Gulf of Mexico. Therefore, even the smallest of careless actions can have larger consequences in communities downstream.

The range of area we affect is large. Our behaviors and precautions determine quality of water for those living downstream from Anderson, Indiana to New Orleans, Louisiana.

## Good Daily Practices

- throw trash in trashcans and recycling bins on campus
- dispose of cigarettes properly in designated smoking areas
- fix all oil, gas, and coolant leaks in your car to prevent these chemicals from entering water system when snowmelt and heavy rains cause runoff

# MATERIALS NOT TO DUMP IN STORM DRAINS

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- Acids
- Aerosol Sprays
- Ammunition or explosives
- Antifreeze
- Asbestos products
- Batteries
- Car Washing: Like fertilizers, many car detergents contain phosphate
- Cleaning products: ammonia based products, drain cleaners
- Cleaning products: polishes, rust removers, floor care products
- Coal Tar Products: Driveway foundation and roof sealers
- Creosote products: wood treatment and wood sealer products
- Fertilizers: contain nitrates and phosphates that, in abundance, cause blooms of algae that can lead to fish kills
- Fireworks and flares
- Gasoline
- Glue
- Gas propane tanks
- Household Hazardous Products: Many common household products (paint thinners, moth balls, drain and oven cleaners, to name a few) contain toxic ingredients. Do not discard with the regular household trash
- Inks and dyes
- Litter: cigarette butts and fast food containers
- Medicines
- Mercury Products
- Moth Balls
- Motor oil
- Nail polish/remover
- Paint latex
- Paint, oil-based and paint thinner
- Pesticides
- Pet Waste
- Photographic mixes: diluted developers, fixers
- Poisons
- Pool chemicals
- Radioactive materials
- Road salt
- Shoe polish
- Syringes and needles
- Vanish and stains
- Windshield Wiper Fluid
- Yard care products: pesticides, herbicides, fungicides, weed killers

## Sources:

"Help Keep Pollution Out of Storm Drains." On-Going Programs: Storm Drain Labeling. April 12, 2008. South Jersey Land and Water Trust. June 1, 2008. <http://www.sjlandwater.org/ongoing/drainlabeling.htm>

"Household Hazardous Waste." May 7, 2008. Fairfax County, Virginia. June 1, 2008. <http://www.fairfaxcounty.gov/dpwes/trash/disphhw.htm>

"Storm Drain Stenciling: A Manual for Communities." 1996. Texas Natural Resource Conservation Commission. June 1, 2008. <http://www.dep.state.pa.us/dep/deputate/watermgt/wc/npdms4/ms4cd/Involvement/Storm%20Drain%20Stenciling%20Manual.pdf>

## WAYS TO GET INVOLVED ON CAMPUS

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### Center for Energy Research/Education/Service (CERES)

The Center for Energy Research/Education/Service (CERES) at Ball State University, Muncie, Indiana is an interdisciplinary academic support unit focused on issues related to energy and resource use, alternatives and conservation. The Center's mission is to serve the campus, local, state and regional communities. Visit their website:

<http://www.bsu.edu/ceres/>



### Council On The Environment (COTE)

The Council on the Environment provides leadership for initiatives at Ball State University and in the surrounding community that promote the sustainable use of natural resources and the protection of ecological systems that sustain life. Visit their website:

<http://www.bsu.edu/cote/>



### Students for a Sustainable Campus (SSC)

SSC coordinates student efforts for sustainability facing the BSU community; the organization looks to reduce campus' environmental impact through assessment and action. SSC aims to meet the needs of the present community without compromising the ability of future students to meet their needs. Contact through e-mail at [sustainable@bsu.edu](mailto:sustainable@bsu.edu) or visit their website:

<http://sustainable.iweb.bsu.edu>.



### Emerging Green Builders (EGB)

This organization's mission is to integrate students and professionals into the green building movement, to create a network of emerging green building leaders, and to develop opportunity involvement through the U.S. Green Building Council to further generate momentum for the green building industry. Visit:

<http://cms.bsu.edu/CampusLife/StudentOrganizations/DepartmentandProfessionalOrganizations/EmergingGreenBuilders.aspx>

or contact [Bob Koester](#) for more contact information.



## ADDITIONAL LINKS

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Friends of the White River

<http://www.friendsofwhiteriver.org/index.html>

White River Watershed Project

<http://www.whiteriverwatershedproject.org/index.html>

U.S Green Building Council

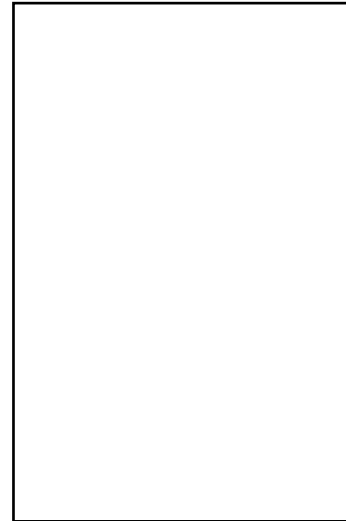
<http://www.usgbc.org/>

## ADDITIONAL INFORMATION

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[Click for Brochure](#)

[Click for  
24" x 36"  
Poster](#)



[Click for  
48" x 36"  
Student Symposium Board](#)

