IOWA STATE UNIVERSITY

MUNICIPAL SEPARATE STORM SEWER SYSTEM

2016 ANNUAL REPORT

Permit Number 85-03-0-04

March 2016

Prepared by
Department of Environmental Health and Safety
and
Facilities Planning and Management
2408 Wanda Daley Drive
Ames, Iowa 50011-3602

IOWA STATE UNIVERSITY

Storm Water 2016 - Just the Facts

"Essentially, all life depends upon soil … There can be no life without soil and no soil without life; they have evolved together." – Charles E. Kellogg

KEEPING SOIL IN ITS PLACE

In 2016, EH&S completed 282 storm water inspections at 8 construction sites, preventing 23 tons or 166 wheelbarrow loads of soil from entering our waterways. Keeping soil on site

and out of our local creeks and streams improves water quality. Streams play a critical role in maintaining the quality and supply of our drinking water.

STUDENTS GETTING INVOLVED

Undergraduates in the Environmental Science program are gaining practical experience by collecting water quality data from **3** creeks flowing through the ISU campus. Students in 2016 completed **25** sampling events that are gauging the campus' impact on water quality.

STEWARDSHIP COSTS

Storm water management expenditures are funded on a per-project basis including project design, implementation, inspection, and maintenance.

A CLEAN SWEEP

In 2016, Iowa State University collected **371** tons of sweepings from our **50.5** miles of streets, and **177** acres of parking lots. **21.0** tons of sand was collected from **34** miles of sidewalks. The material is sifted and repurposed saving **$12,800** in landfill disposal fees.

INTRODUCTION

The *2016 Annual Storm Water Report* for Iowa State University (ISU) was prepared by Environmental Health and Safety (EH&S) in accordance with Part III of the facility's Municipal Separate Storm Water System (MS4) permit, number 85-03-0-04. This report summarizes storm water compliance activities within the boundaries of ISU and outlying farm properties, including Central Campus, North Campus, South Campus, Applied Science Complex, Arboretum, Southwest Athletic Complex, College of Veterinary Medicine, Dairy Teaching Farm, and the BioCentury Research Farm.

STATUS OF IMPLEMENTING THE COMPONENTS OF THE STORM WATER POLLUTION PREVENTION AND MANAGEMENT PROGRAM

ISU was issued a National Pollutant Discharge Elimination System (NPDES) permit on February 6, 2004. The permit was renewed in 2009 and in 2014. The current permit expires on January 31, 2019.

STATUS OF COMPLIANCE WITH ANY COMPLIANCE SCHEDULE ESTABLISHED BY THIS PERMIT OR BY ANY MODIFICATIONS TO THIS PERMIT

Active and Discontinued Sites

During the 2016 calendar year, 8 construction sites operated under NPDES General Permit No. 2 authorizations. The status of these permits is summarized in Table 1.

Table 1 – Status of Permits

Facility	Permit	Status
Marston Hall Renovations	IA-25789-25540	Discontinued 9/13/2016
Buchanan Hall 2	IA-27005-26737	Discontinued 11/23/2016
ATRB- Industrial Ed II Demolition	IA-28103-27854	Active
Bessey Hall Improvements and Addition	IA-28244-27992	Active
University Village Patios Projects	IA-26981-26719	Discontinued 10/5/2016
Recreation Field College Creek Pedestrian Crossing	IA-28640-28374	Discontinued 9/13/2016
Jack Trice Stadium Green Space	IA-28751-28483	Active
Spangler Geotechnical Lab Demolition	IA-30014-29746	Active

Four sites reached final stabilization, as defined in the permits, and Notices of Discontinuation were submitted to the Iowa Department of Natural Resources (IDNR). Four permitted sites were still active as of December 31, 2016 (See Attachments A and B).

Storm Water Web Page (https://www-ehs.sws.iastate.edu/environmental/stormwater)

The storm water web page consists of storm water facts and information, Storm Water Management Policy statements, storm water hotline telephone number, publications and forms, links to pre- and post-construction activities, and a storm water survey. In 2016, the storm water web page was viewed 538 times, a decrease of 6.4% from 2015.

Storm Water Hotline (515-294-7229)

The storm water hotline received eight calls related to storm water activities on campus. EH&S staff responded to each of the calls and a summary of each is below:

- One call (1-4-16) reported spilled heating oil from a fuel fill station at the ISU heating plant. The spill was actually overfill from the delivery transport filling the new tanks at the heating plant. The fuel truck operator was utilizing a poly garbage can to collect fuel at end of his deliveries to collect a small amount of heating oil from the fuel hose. EH&S emptied the container into a 55 gallon open top-drum. The labeled drum is in place for future deliveries as the new tanks fill. No environmental contamination was present at the site.
- One call (5/23/16) reported concrete cutting slurry going into the storm drain by Lagomarcino Hall. EH&S staff responded and found a construction crew installing new sidewalks along Osborn Drive was generating concrete slurry without protecting storm water intakes. EH&S worked with the contractor to prevent additional slurry from reaching the intake and to oversee the cleanup. EH&S followed up the contractor to ensure that a best management practice (bmp) would be used while finishing their project.
- One call (6-2-16) reported a large antifreeze spill flowing down the hill on Union Drive east of the memorial Union. ISU FP&M landscape crews were onsite immediately and responded with spill mitigation best management practices. The source of the antifreeze was a CyRide bus. Approximately 15 gallons of antifreeze was released to the street from a mechanical malfunction on the bus, flowing downhill to a storm intake. A rapid response deploying spill containment materials prevented product from reaching nearby College Creek. CyRide is a city entity and reported the spill to IDNR.
- One Call (6-9-16) reported an oil spill on University Boulevard. A witness report a John Deere tractor ruptured a hydraulic hose and spilled the oil onto the pavement. EH&S staff responded, applied oil dry material. ISU Police provided traffic control and FP&M supplied a street sweeper to pick up the oil dry from the pavement. A spill report was filed with IDNR. No waterways were affected.
- One Call (8-1-16) reported drilling mud flowing into a storm water intake on Lincoln Way. EH&S staff responded to find an out of state contractor horizontal boring for a City of Ames Project. EH&S delivered the contractor spill containment BMP's and provided regulatory guidance. The contractor flushed the storm sewer and vacuumed the drilling muds.

- One call (8/24/16) reported soil washing down the sidewalk on the south side of the Landscape Architecture building. An FP&M Utilities project had disturbed a small-sloped portion of grass and the downpour of rain overwhelmed the waddles in use. EH&S advised FP&M that ISU's policy is to treat all sites as if they are permitted and to install additional down gradient waddles.
- One call (9-9-16) reported a cooking oil spill at UDCC. The BioBus club was attempting to transfer used cooking oil from a storage tank to a smaller container. In the process 20-30 gallons of used cooking oil spilled on an asphalt parking lot. EH&S responded and contained the oil with oil dry, preventing it from reaching a storm intake. EH&S notified IDNR and chose to decline assigning a spill report to the incident. EH&S provided the BioBus club with suggested alterations to their existing SOP for transferring oil.
- One call (9/13/16) reported that there was a contractor's semi-truck leaking fuel from a saddle tank at the Pearson Hall loading dock. EH&S responded and contained the diesel fuel with oil dry on the paved surface. The contractor shut off the fuel line to the saddle tank and left the scene to repair the tank. No fuel entered the MS4 system.

Inspection of the MS4 System

Courtesy of Michael M. Murray
FP&M Utilities Chief Mechanical Engineer

Facilities Planning and Management (FP&M) is required to inspect the entire MS4 system every five years. FP&M tracks areas inspected and records dates, inspection methods, observations, and corrective actions. There are approximately 2080 manhole structures (junctions and intakes) covered under the ISU permit. These structures are labelled on campus utility maps based on map grade and are given a sequential number. To date the exact location of 1,420 of these structures are confirmed on campus maps using a global positioning system surveying device. FP&M plans to continue to survey manholes to improve our inventory. To inspect each manhole once every 5 years requires an average of 400 inspections per year.

FP&M uses a facilities management program (FAMIS) to store all maintenance records. These records include the date, person making repairs or doing cleaning, manhole number, cost, and items/services purchased. The system works well to document repairs, but is not effective in documenting that inspections were completed. To document that 5 year inspections are completed on time, FP&M has implemented a separate data collection process. FP&M is systematically inspecting the system based on campus-map grid sheets. In 2016, 519 structures were inspected. The combination of systematic inspection and paper records meets our requirements. Other methods to collect and store this information electronically are being evaluated.

As part of maintenance, FP&M rehabilitated four crumbling brick manholes using a cement mortar lining process.

Storm Water Management Committee

In 2016, ISU's Storm Water Management Committee held three formal meetings (March 1st, July 12th, and November 1st). Further communications with team members occurred periodically, via e-mail and telephone, concerning storm water policies and project sites.

In addition, EH&S and FP&M staff meet biannually (March and September) to discuss storm water management on all ISU construction projects. EH&S invited Chuck Gipp, Director, Iowa Department of Natural Resources, to the September meeting as a special guest speaker. Director Gipp spoke to ISU staff members detailing the Department's water quality goals and programs. While on campus Director Gipp toured several storm water improvement projects, reviewed best management practices utilized on construction projects, and attended a water quality-sampling event on College Creek by Environmental Science students enrolled in the Science of the Environment and Sustainable Systems Learning Community (SESS LC).

Iowa State Students Help Eliminate Illicit Discharge on Campus

Courtesy of Hannah Carroll
PhD Candidate, Department of Ecology, Evolution and Organismal Biology

Iowa State University Environmental Science students are part of an ongoing effort to monitor surface water quality across campus. Each fall, Freshmen and incoming transfer students are trained and certified as IOWATER volunteers and begin collecting water quality data at six stream sites chosen to gauge ISU's impact on the three streams which flow through campus. Monitoring begins as early in the Fall semester as students can be trained and continues throughout the ice-free season. The experiential learning project teaches beginning students how to collect accurate scientific data, analyze and summarize their data, and produce professional scientific posters. Students are preparing to launch the fourth year of water quality monitoring the week after spring break. This project is intended to be a permanent part of the undergraduate Environmental Science program.

Second-year students can elect to take two additional courses which introduce them advanced topics in Environmental Science, and more advanced monitoring skills; these students are certified in benthic invertebrate collection and identification through the IOWATER program. Benthic invertebrates are organisms, such as aquatic insects, which live in the rocks and sediment at the bottom of streams; under dead leaves, fallen trees, and branches; or in plants at the edge of the stream. Students collect data once per season at each site, and their findings provide important information about stream health. Together, the datasets help to build a more complete picture of water quality across campus, and assist EH&S and the university in ensuring that ISU continues to be a responsible steward of its grounds.

Senior Josh Cinnamon (L) and Junior Travon Valverde (R) search for benthic invertebrates in College Creek. *Photo by Hannah Carroll.*

Peer mentorship is a critical part of the experiential learning project. Students who complete the first two semesters of introductory Environmental Science courses are eligible to apply for positions as paid Peer Mentors. Duties include assisting with in-class activities, planning recreational outings and gatherings for first-year students, and tutoring in a wide range of subjects. The most critical mission for Peer Mentors is leading groups of students during stream monitoring events. Peer Mentors have the opportunity to build important leadership skills, hone their teaching abilities, and further develop their burgeoning scientific abilities. They also provide an informal contact for younger students and offer advice on classes, career paths, and employment opportunities.

Students were eager to explain each step of their monitoring protocol to Director Gipp (far right) as he made his way downstream. *Photo by Todd Hartnell.*

Iowa Department of Natural Resources (IDNR) Director Chuck Gipp visited campus on September 22, 2016. Both introductory and advanced students had the rare opportunity to meet with Director Gipp to demonstrate their water quality monitoring skills and discuss environmental issues facing the state of Iowa.

Instructor Hannah Carroll (left) discusses the water quality monitoring project with Director Gipp (near right) while Peer Mentor Sam Freestone (far right) watches students collect data. ***Photo by Todd Hartnell.***

Director Gipp was joined by Miles Lackey, Chief of Staff to ISU President Steven Leath. Together, they spoke with groups of students collecting water quality data along College Creek. Director Gipp quizzed the students about their methods and the meaning of their results. Later, Gipp helped advanced students identify benthic invertebrates.

Following the demonstrations, Director Gipp addressed the class and fielded questions. He thanked them for their work, and advised students to get as wide a range of experiences as possible by accepting opportunities and being open to developing new, seemingly incongruous skillsets. This, he said, would make them more competitive for jobs and open up entirely new and unexpected career paths.

Director Gipp also responded to students' questions about the pressing water quality problems in Iowa. He said that ongoing cooperation between stakeholders, rather than searching for someone to blame for poor water quality, offers the best hope for a positive outcome. His focus, he told them, is on moving forward.

Experiences like meeting with Director Gipp and Miles Lackey help to enrich students' education, and show them that their work is meaningful. In turn, they impressed upon Director Gipp the importance of the IDNR-run IOWATER program to themselves and to the ISU campus. The students came away with a renewed sense of excitement about their chosen field of study.

Environmental Science Students Monitor Campus Impact on Water Quality

Undergraduate students in the Environmental Science program at ISU monitor water quality at six stream sites on and near campus. The data they generate help EH&S ensure that ISU continues to meet its mandate to have zero net impact on water quality. In addition, the monitoring project gives EnSci students hands-on experience in scientific data collection, handling, and analysis in their first year of college; a rarity among rigorous science majors. Data from the project are also contributed to the IOWATER database and are freely available to the public.

Each fall, incoming freshmen and first-year transfer students in the Environmental Science program are trained and certified as IOWATER volunteers. They then collect weekly data at six sites chosen to capture the most information about water quality on the three streams that flow through campus. Over the summer, students who have completed the first two semesters of monitoring can earn course credit for continuing data collection, which helps to ensure the most complete water quality record possible. The monitoring year begins in spring as soon as weather conditions permit, and runs through mid to late November. Students are preparing to launch the fourth year of monitoring early in March 2017.

As of this report, EnSci students had completed 133 monitoring events across their six sites in just 3 monitoring years (Table 1), more than doubling the amount of data available for water quality across campus (Figure 1). Data generated by EnSci students are combined with any data collected before the EnSci project began in Spring 2014, and used to better understand the ISU campus' impact on water quality.

Table 1: Environmental Science students have completed 133 monitoring events. Other IOWATER volunteers have contributed 94 observations. There are a total of 227 observations across the six sites. Site 985134, Squaw Creek in Stuart Smith Park, was created by the EnSci program in 2014 and is the downstream site for all of campus.

Site ID	Site name	Date first monitored	EnSci observations	Other observations	Total observations
985036	Clear Creek at Hyland Avenue	13-Oct-2001	24	10	34
985072	College Creek at ISU Arboretum	12-Nov-2004	22	18	40
985095	College Creek near Ash Avenue	12-May-2007	32	7	39
985015	College Creek near Elwood Drive	04-Nov-2000	18	46	64
985088	Squaw Creek at Stange & 13th	07-Oct-2006	17	13	30
985134	Squaw Creek in Stuart Smith Park	28-Jul-2014	20	0	20
		Total	133	94	227

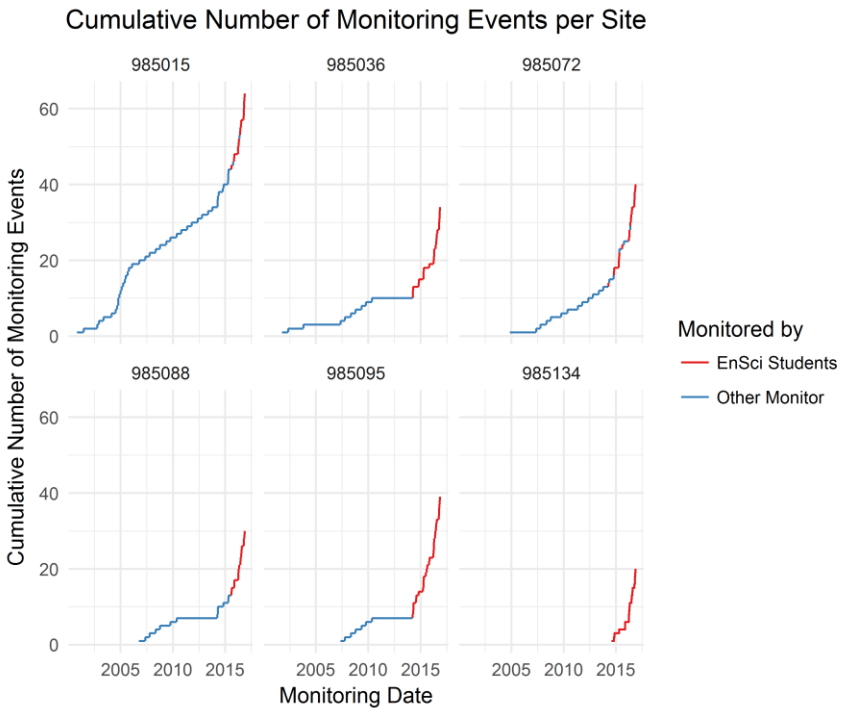


Figure 1: Cumulative number of monitoring events by site. EnSci students have more than doubled the amount of data available for campus streams.

Key water quality parameters

Students collect a wide range of water quality data. The parameters which are most crucial to stream health are reported (Table 2). Nitrate (Figure 2) and phosphate (Figure 3) are key drivers of eutrophication in freshwater systems, and are therefore especially important to consider. Chloride is a useful conservative tracer of anthropogenic inputs (Figure 4). It is typically derived from road or sidewalk salt applications. Chloride itself is harmless to aquatic life, though the sodium that accompanies it can be stressful at high concentrations. It is not biologically active, and so changes in amount upstream to downstream are more easily quantified. Dissolved oxygen is crucial for aquatic life (*Figure 5*). Fish and invertebrates must have adequate dissolved oxygen to survive, and low levels can cause stress and even death. Aquatic plants require dissolved oxygen at night for respiration. Low levels of dissolved oxygen can be an indicator of eutrophication when accompanied by other markers of high nutrient loads. Transparency is a measure of particulate matter in the water column. This matter may be organic (algae, etc.) or inorganic (soils). Low transparency can be an indicator of high sediment loading to streams caused by erosion of streambanks or uplands, or from material washing in from parking lots or construction sites. High loads of particulate matter can suffocate fish and invertebrates, bury fish nests, and shade the leaves of aquatic plants.

Table 2: Water quality parameters included in this report are chosen to provide crucial data about stream health.

Parameter	**Importance**	**Typical source**
Nitrate	Excess nitrate can lead to algal blooms	Lawn fertilizer
Phosphate	Excess phosphate can lead to algal blooms	Lawn fertilizer, manure
Chloride	Conservative tracer	Sidewalk salt, road salt
Dissolved oxygen	Low oxygen levels can harm aquatic life	Rotting organic matter in streams
Transparency	Excess particulate matter can bury fish nests, suffocate aquatic animals, and reduce photosynthesis	Sediment erosion from stream banks, lawns, or construction sites

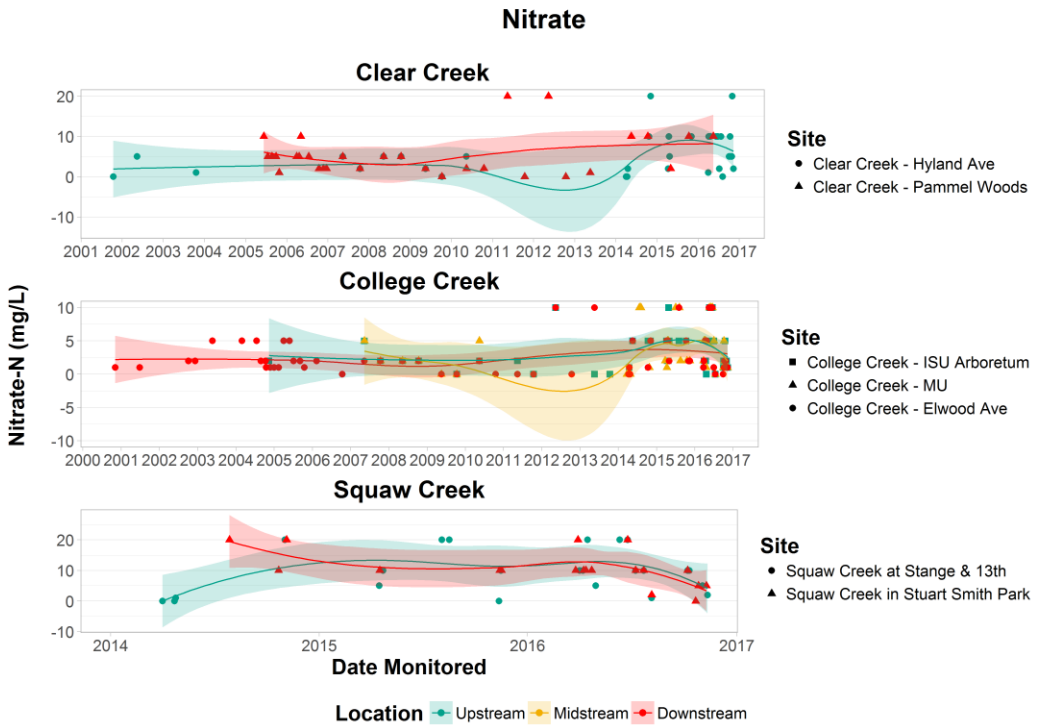


Figure 2: Nitrate results across all seven stream sites included in the analysis of campus water quality. Smooths use Loess regression.

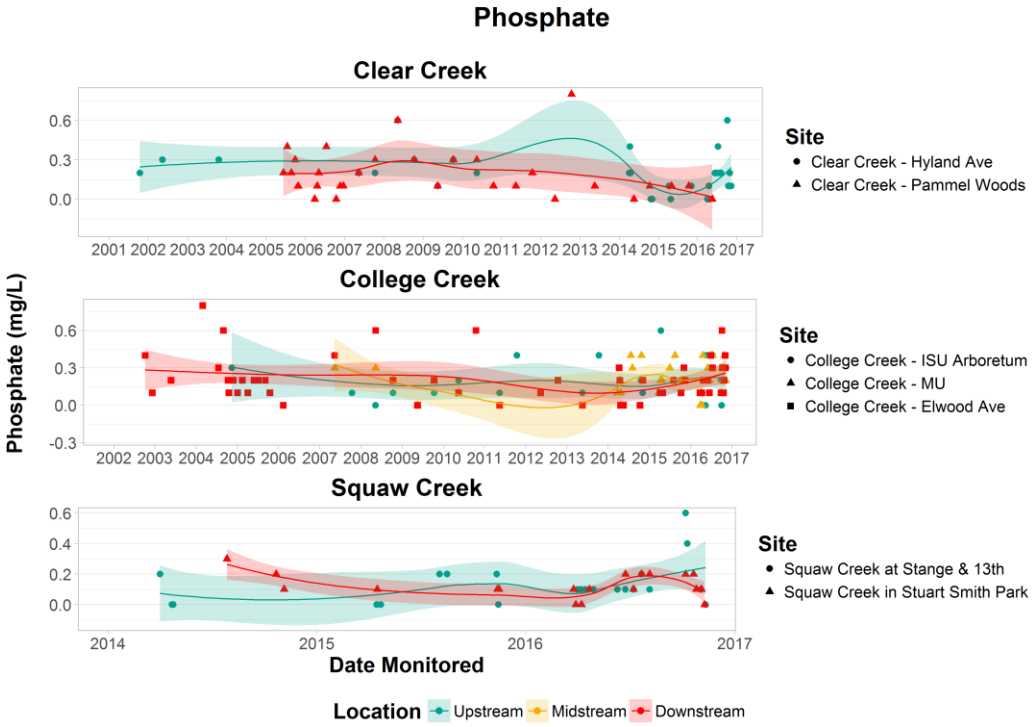


Figure 3: Phosphate results across all seven stream sites included in the analysis of campus water quality. Smooths use Loess regression.

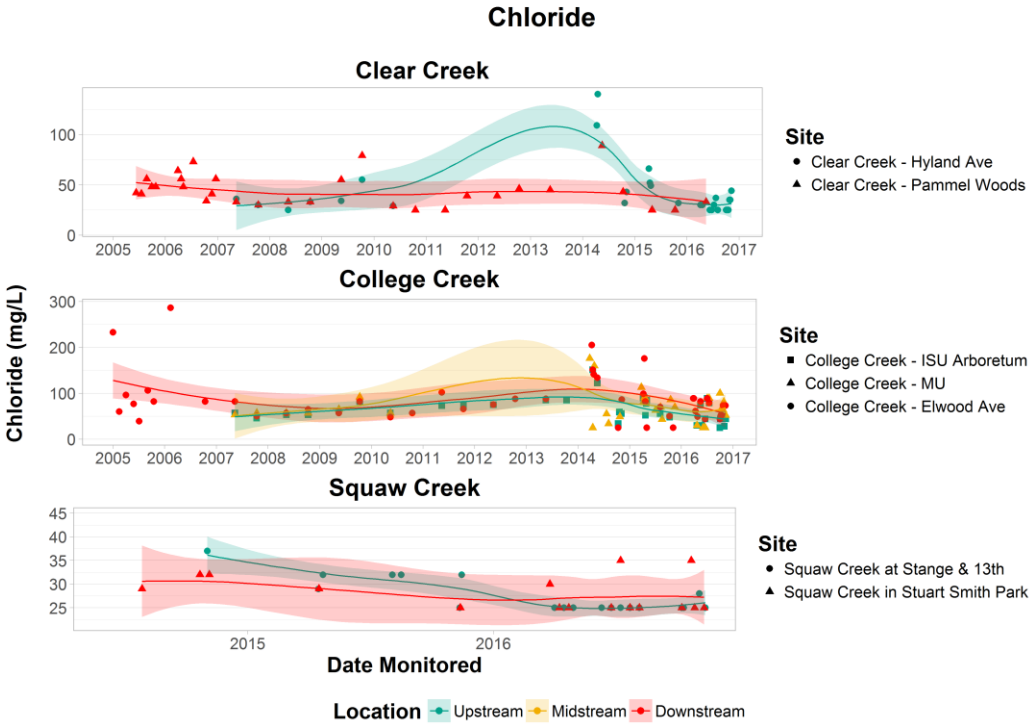


Figure 4: Chloride results across all seven stream sites included in the analysis of campus water quality. Smooths use Loess regression.

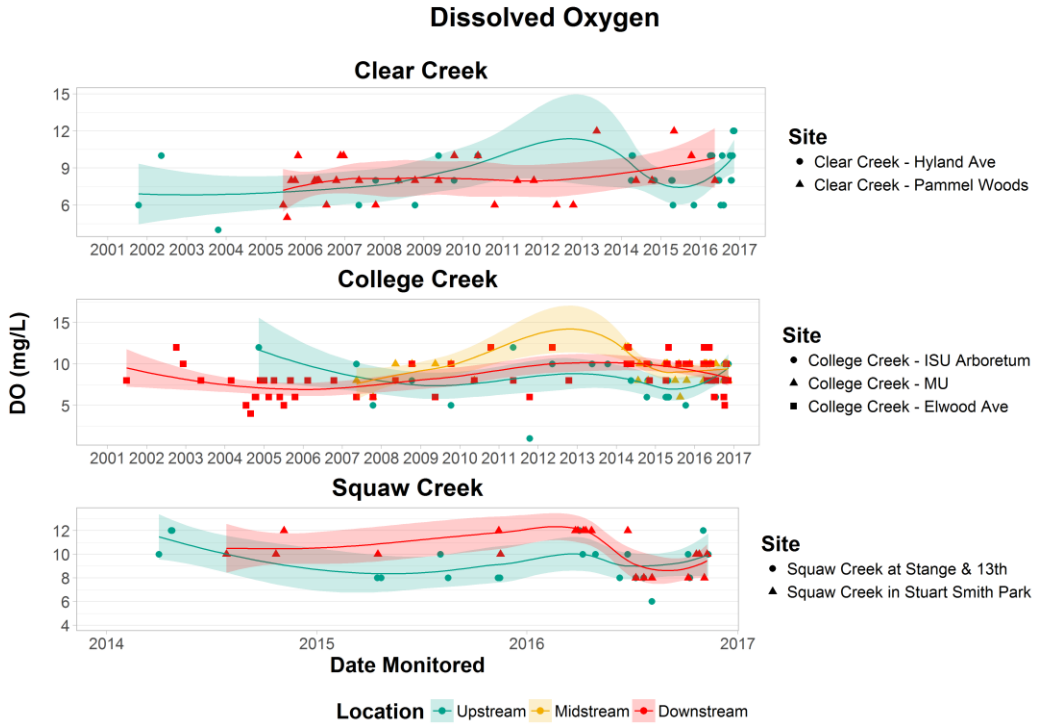


Figure 5: Dissolved oxygen results across all seven stream sites included in the analysis of campus water quality. Smooths use Loess regression.

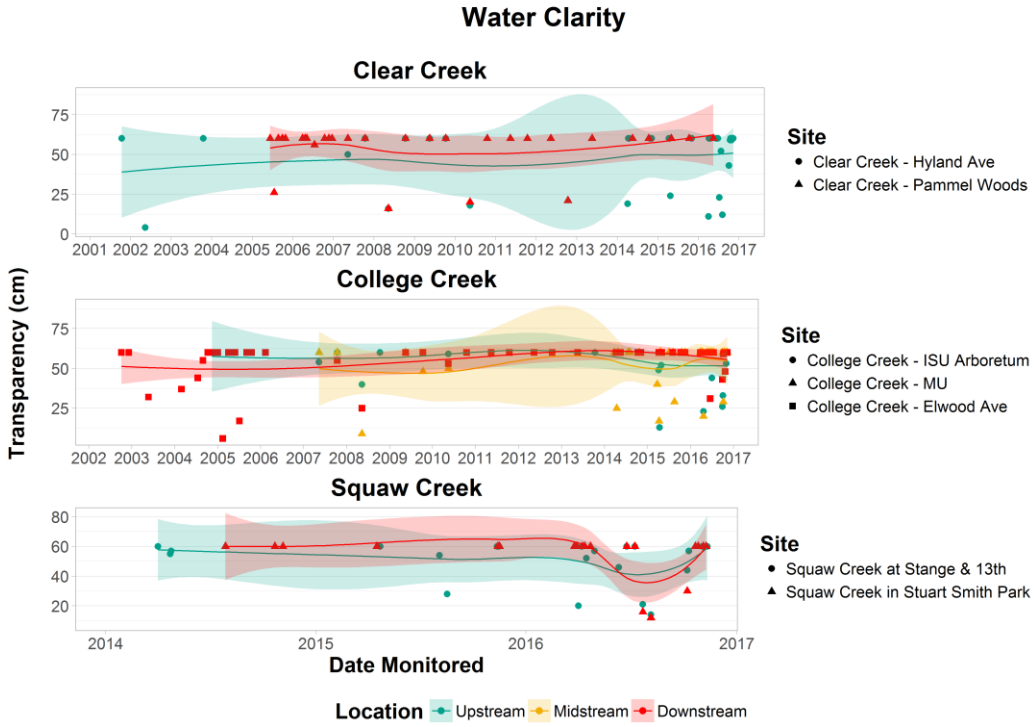


Figure 6: Water clarity results across all seven stream sites included in the analysis of campus water quality. Smooths use Loess regression.

Water quality parameters at stream-downstream pairs of sites (and midstream in the case of College Creek) were evaluated using a two-way factorial design with Site*Time interactions included in the model. These tests ask whether there is a difference in the parameter of interest over time, and whether there is a difference in the parameter between sites. Significance was assessed at the p = 0.05 level, with post-hoc adjustments using Tukey's HSD for multiple comparisons.

Results

College Creek

College Creek is perhaps the most recognizable to students, as it passes close to the Memorial Union before windings its way toward Brookside Park. College Creek at Elwood has the largest amount of available data of any of the sites, with 64 monitoring events since 2000. This long data record provides an excellent opportunity for thorough analysis.

Only two parameters indicated potential differences between sites; dissolved oxygen (p = 0.02277), and chloride (p = 0.05725) (Table 3). Post-hoc adjustments for multiple comparisons are shown only for these parameters (Table 4).

*Table 3: ANOVA results for selected parameters. Significance is assessed at the α = 0.05 level. P values which indicate significance are indicated by an *.*

Parameter	Model component	ANOVA results				
		Df	**Sum Sq**	**Mean Sq**	**F value**	**Pr(>F)**
Nitrate	Site	2	3.6	1.79	0.187	0.8299
	DateMonitored:Site	2	5.1	2.56	0.266	0.7665
	Residuals	135	1295	9.59		
Dissolved oxygen	Site	2	28.7	14.35	3.892	0.02277*
	DateMonitored:Site	2	8.7	4.35	1.179	0.31068
	Residuals	133	490.4	3.69		
Phosphate	Site	2	0.0129	0.006435	0.274	0.761
	DateMonitored:Site	2	0.0367	0.018364	0.782	0.46
	Residuals	127	2.9844	0.023499		
Chloride	Site	2	12011	6006	2.931	0.05725*
	DateMonitored:Site	2	8396	4198	2.049	0.13347
	Residuals	118	241800	2049		
Clarity	Site	2	347	173.6	1.141	0.323
	DateMonitored:Site	2	555	277.7	1.825	0.165
	Residuals	129	19623	152.1		

*Table 4: Results of Tukey's HSD for those parameters which indicated significant differences. Those whose p-values retain significance following multiple-comparison adjustments are indicated by an *.*

Tukey multiple comparisons of means
95% family-wise confidence level

Dissolved oxygen				
	diff	**lwr**	**upr**	**p adj**
cc.ash-cc.arboretum	1.219763	0.18236	2.257166	0.01669*
cc.elwood-cc.arboretum	0.64742	-0.29023	1.585066	0.233939
cc.elwood-cc.ash	-0.57234	-1.50251	0.35782	0.314283

Chloride				
	diff	**lwr**	**upr**	**p adj**
cc.ash-cc.arboretum	8.147449	-17.7478	34.04273	0.736136
cc.elwood-cc.arboretum	22.06377	-0.97145	45.09899	0.063533
cc.elwood-cc.ash	13.91632	-9.74328	37.57591	0.346188

After adjustment for multiple comparisons, the site pair Clear Creek at ISU Arboretum (upstream) and Clear Creek at Ash Ave (midstream) retain an indication of significant difference (p = 0.01669) in dissolved oxygen levels. On average, dissolved oxygen is 1.2 mg/L lower at the Ash Ave site versus the Arboretum

site. This is likely because Clear Creek runs underground beginning at the intersection Lincoln Way and Welch Ave, and only coming back above ground a few meters upstream of the site. Oxygen levels drop slightly in that time, but not enough to be a cause for alarm. Dissolved oxygen levels fully recover by the time the stream reaches the Elwood Ave monitoring location.

Differences in chloride are no longer significant at the $\alpha = 0.05$ level after adjustment for multiple comparison, meaning that inputs of road and sidewalk salt do not appear to be having a major impact on College Creek at this time.

Clear Creek

Clear Creek at Hyland Avenue is paired with a monitoring location not accessible to EnSci students. Twice-yearly data are collected by non-EnSci volunteers at Clear Creek in Pammel Woods, which is upstream of any major campus inputs. Clear Creek is the smallest of the three streams, and the most consistently shaded. Its length is entirely within ISU campus.

No parameters exhibited differences between sites which were significant at the $\alpha = 0.05$ level (Table5).

Table 5: ANOVA results for selected parameters. Significance is assessed at the $\alpha = 0.05$ level. No tests were determined to be statistically significant.

Parameter	**Model component**	**ANOVA Results**				
		Df	**Sum Sq**	**Mean Sq**	**F value**	**Pr(>F)**
Nitrate	Site	1	16	16.01	0.644	0.4253
	DateMonitored:Site	1	1.5	1.51	0.061	0.8059
	Residuals	60	1490.6	24.84		
Dissolved oxygen	Site	1	1.24	1.243	0.404	0.527
	DateMonitored:Site	1	0.02	0.02	0.007	0.936
	Residuals	60	184.36	3.073		
Phosphate	Site	1	0.0126	0.01263	0.47	0.4954
	DateMonitored:Site	1	0.0007	0.00066	0.024	0.8762
	Residuals	60	1.6106	0.02684		
Chloride	Site	1	1	1	0.002	0.964
	DateMonitored:Site	1	121	120.6	0.255	0.615
	Residuals	54	25506	472.3		
Clarity	Site	1	765	765.4	2.701	0.106
	DateMonitored:Site	1	55	54.5	0.192	0.663
	Residuals	60	17005	283.4		

Squaw Creek

Squaw Creek is the largest of the three streams which run through campus, and receives water from both Clear Creek and College Creek. Squaw Creek at Stange & 13th is upstream of main campus, while Squaw

Creek in Stuart Smith Park is downstream of campus. This stream therefore receives the bulk of inputs from campus. The monitoring location in Stuart Smith Park was established by the EnSci program in 2014; data are therefore only available for this site since that time. Squaw Creek at Stange & 13th has been monitored sporadically since late 2006.

Two parameters were determined to have statistically significant differences; the interaction between monitoring date and site for nitrate ($p = 0.0153$), and dissolved oxygen between sites ($p = 0.0558$) (Table 6). However, after adjusting p-values for multiple comparisons using Tukey's HSD, these effects are no longer significant at the $\alpha = 0.05$ level.

*Table 6: ANOVA results for selected parameters. Significance is assessed at the $\alpha = 0.05$ level. P values which indicate significance are indicated by an *.*

Parameter	**Model component**	**ANOVA Results**				
		Df	**Sum Sq**	**Mean Sq**	**F value**	**Pr(>F)**
Nitrate	Site	1	16.4	16.4	0.428	0.5161
	DateMonitored:Site	1	243.4	243.36	6.358	0.0153*
	Residuals	45	1722.5	38.28		
Dissolved oxygen	Site	1	11.99	11.986	3.859	0.0558*
	DateMonitored:Site	1	4.25	4.255	1.37	0.2481
	Residuals	44	136.66	3.106		
Phosphate	Site	1	0.0006	0.00055	0.037	0.8482
	DateMonitored:Site	1	0.0023	0.0023	0.155	0.6957
	Residuals	44	0.6539	0.01486		
Chloride	Site	1	0.7	0.679	0.03	0.863
	DateMonitored:Site	1	30.1	30.087	1.336	0.255
	Residuals	40	900.8	22.519		
Clarity	Site	1	262	262.2	0.99	0.3251
	DateMonitored:Site	1	555	555.1	2.097	0.1547
	Residuals	44	11646	264.7		

Campus Summary

Monitoring efforts thus far indicate that, at present, campus does not appear have a measurable impact on stream water quality. Nutrient loads in streams are typically high, as with most Iowa streams, and this can create serious water quality problems. However, contributions from campus are not detectable using IOWATER methods. Restrained use of fertilizers and road salt, strict implementation of BMPs at construction sites, and regular maintenance of storm drains and roads are all crucial in helping Iowa State University to achieve its goal of net zero impact on stream water quality.

Campus Volunteer Activities

Courtesy Merry Rankin
Director of Sustainability

In addition to water monitoring, significant volunteer assistance was offered from the ISU and Ames community in ensuring water quality through trash pick-up. Most notably, through Iowa State University's Keep Iowa State Beautiful Program and Adopt Campus opportunity 108 student organization volunteers provided 187.5 hours of trash pick-up throughout campus, including direct waterways and areas adjacent. The annual College Creek Cleanup event, held each summer semester, added another 125 hours of trash pick-up from 50 campus and community volunteers specifically dedicated to the College Creek watershed throughout the Iowa State campus and arboretum areas, as well as Campustown.

Iowa State University Concrete Slurry BMP Solution

Courtesy Storm Water Management Team

Iowa State projects involving concrete cutting incorporated the practice of utilizing a super absorbent preventing concrete slurry from reaching storm drain intakes.

Training and Development

Members of the Storm Water Committee, Environmental Health and Safety, and Facilities Planning and Management's Design and Operations group participated in programs to improve storm water management knowledge. Professional development included:

- EH&S staff discussed with FP&M Project Managers and Construction Managers pending changes to General Permit No. 2 (GP2).
- EH&S staff and FP&M staff attended three meetings with Iowa DNR in 2016:
    - One meeting included discussions with Region 5 staff on improving post construction metrics and preventing concrete cutting slurry from reaching storm intakes.
    - EH&S and FP&M staff participated in a meeting with MS4 cities and Region 5 staff to discuss Iowa DNR expectations for MS4 stakeholders.
    - EH&S met with the IDNR MS4 permit writer to discuss future changes to rules in GP2.

AN ESTIMATE OF THE PREVIOUS FISCAL YEAR EXPENDITURES FOR IMPLEMENTATION OF THE MANAGEMENT PROGRAM AND THE BUDGET FOR THE CURRENT FISCAL YEAR

The storm water management budget for calendar year 2015 was funded "as needed" by several campus entities:

- EH&S dedicated ½ fulltime equivalent (FTE) staff time to storm water activities, that included regular inspections of all permitted construction sites. EH&S conducted 282 weekly site inspections in 2016 at a total expenditure of $26,790.
- EH&S staff maintained the storm water website, managed quarterly storm water hotline advertisements in the student newspaper, attended storm water training, and developed ISU staff training programs, at an estimated expenditure of $28,210 in salary and benefits.
- Construction of new storm water management projects and design fees associated with capital site, parking and building projects is estimated at $1,000,000.
- FP&M expenditures associated with storm water project design/BMPs, project support, implementation, maintenance, MS4 televising and cleaning, and seeding/sodding were approximately $856,000.
- FP&M maintains 50.5 miles of paved institutional roads, 177 acres of parking lots, and 45 miles of sidewalks and bike paths. To ensure safe passage of all vehicles, sweeping of pedestrian and cyclist roadways, parking lots, and bike paths resulted in an expenditure of $250,000. The 371 tons of sweepings included 350 tons from streets and 21 tons from sidewalks.

Total estimated storm water management expenditures were $2,156,785. No annual amounts are appropriated by ISU, as storm water expenses are funded on a per-project basis.

SUMMARY DESCRIBING THE NUMBER AND NATURE OF INSPECTIONS, ENFORCEMENT ACTIONS AND PUBLIC EDUCATION PROGRAMS CONDUCTED DURING THE REPORTING PERIOD

Permitted Site Inspections by ISU Staff

283 inspections were conducted by Environmental Health and Safety on all Iowa State University construction sites requiring a National Pollutant Discharge Elimination System Permit General Permit Number 2. The inspections determined if contractors were following BMPs as described on the site-specific Storm Water Pollution Prevention Plan (SWPPP). EH&S and FP&M staff coordinated mitigation efforts with site contractors when deficiencies were noted. Using the Revised Universal Soil-Loss Equation shows a soil-loss savings of 23 tons of soil on ISU permitted construction sites.

Outfall Inspections by ISU Staff

MS4 Permit Section F.4 Inspection and Maintenance Program requires inspection of the entire storm water system every five years. FP&M tracks inspection dates, methods, observations, and corrective actions. ISU has approximately 2,000 service structures consisting of junctions and intakes. Structures are identified on campus utility maps with updated locations of 1,340 structures utilizing global positioning survey (GPS). During 2016, FP&M inspected 519 MS4 structures. ISU continues to inspect and GPS structures at an average rate of 400 per year.

EH&S conducted annual dry flow inspections of MS4 campus storm water outfalls during November and December 2016. EH&S staff visually inspected storm water outfalls to public waterways and dry land with no illicit discharges detected. A review of the annual outfall inspection process was conducted; no changes were administered to the inspection program.

Notices of Discontinuation

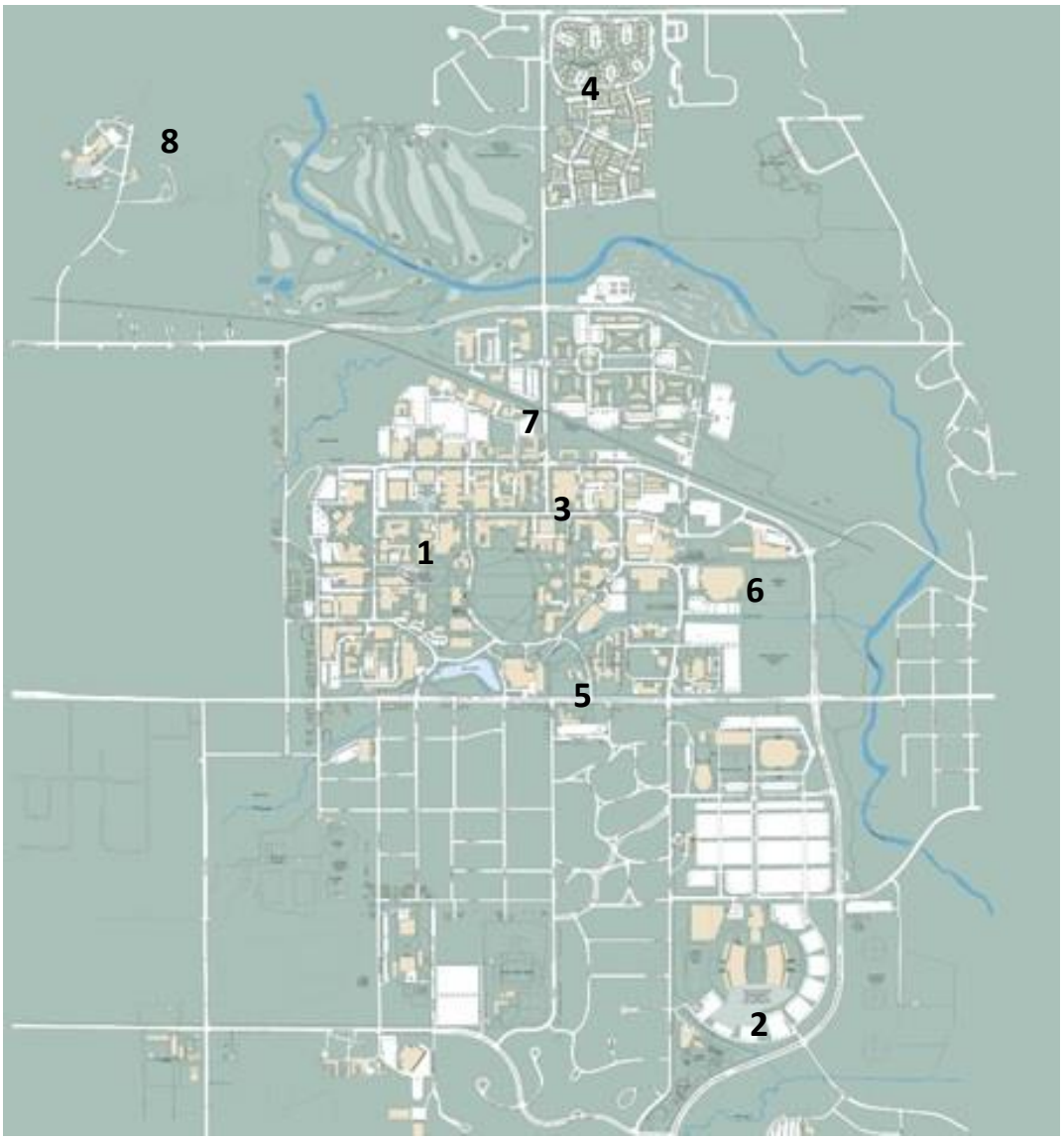
Four construction projects reached final stabilization as defined in General Permit. (Refer to Active and Discontinued Sites section on page 2).

IDNR Inspections

ISU received no Notice of Violations (NOV's) associated with NPDES General Permit No. 2 construction activities for 2016.

Storm Water Education Program

EH&S staff trained 345 employees during calendar year 2016. Training topics included storm water regulatory compliance, construction site BMPs, storm water hotline, NPDES General Permit No 2, and SWPPP compliance and review.



Key:

1)	Marston Hall Renovations	IA-25789-25540
2)	Jack Trice Stadium Green Space	IA-28751-28483
3)	Bessey Hall Improvements and Addition	IA-28244-27992
4)	University Village Patios	IA-26981-26719
5)	Buchanan Residence Bldg. 2	IA-27005-26737
6)	Recreation Field College Creek Pedestrian Crossing	IA-28640-28374
7)	Advanced Teaching Research Bldg.	IA-28103-27854
8)	Spangler Geotechnical Laboratory Bldg. Demolition	IA-30014-29746

Attachment B
Campus Storm Water Management Projects