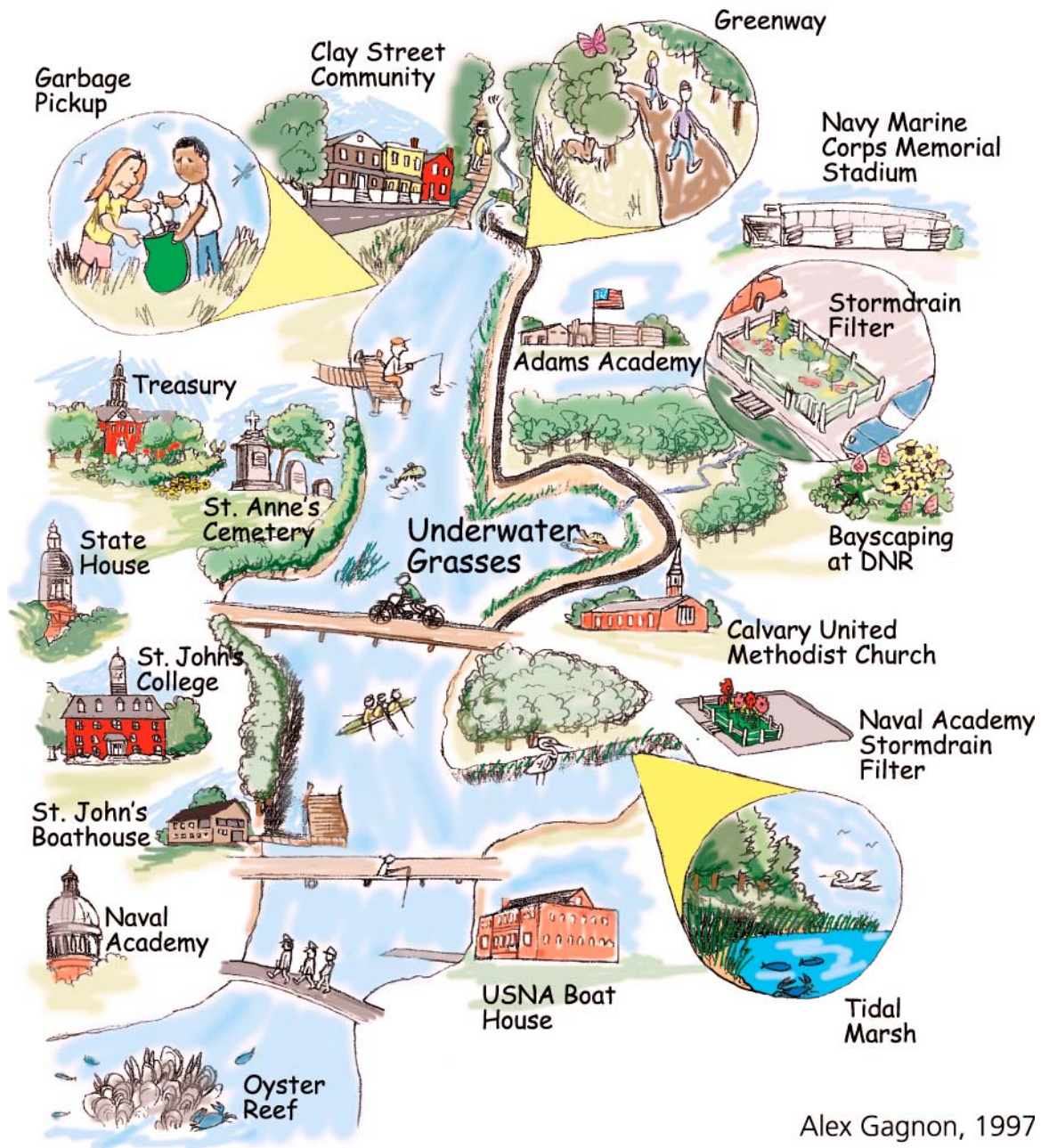


# 2007 COLLEGE CREEK WATERSHED ASSESSMENT

*Annapolis, MD*



Alex Gagnon, 1997

# **2007 COLLEGE CREEK WATERSHED ASSESSMENT**

## **ANNAPOLIS, MD**

**Conducted, assembled, and written by Friends of College Creek**

### **TABLE OF CONTENTS**

<b>Characterization of the College Creek Watershed, 2007</b>	<b>1</b>
<b>Overview of the College Creek Watershed Initiative, 2007</b>	<b>5</b>
<b>Water Quality in College Creek, 2003-2007</b>	<b>6</b>
<b>Submerged Aquatic Vegetation (SAV) in College Creek, 2007</b>	<b>10</b>
<b>Fishes and Other Macrofauna of College Creek: Impacts of Shoreline Restoration at St. John's College, 2007</b>	<b>11</b>
<b>Macroinvertebrates Sampling in College Creek and Spa Creek, 2007</b>	<b>13</b>
<b>Upland Stream Survey of College Creek, 2007</b>	<b>14</b>
<b>Upland Survey of the College Creek Watershed, 2007</b>	<b>15</b>
<b>Summary of the State of the College Creek Watershed Public Forum, November 3, 2007</b>	<b>19</b>
<b>Citizens' Comments—Concerns Identified by the Community at the State of the College Creek Watershed Public Forum, November 3, 2007</b>	<b>21</b>

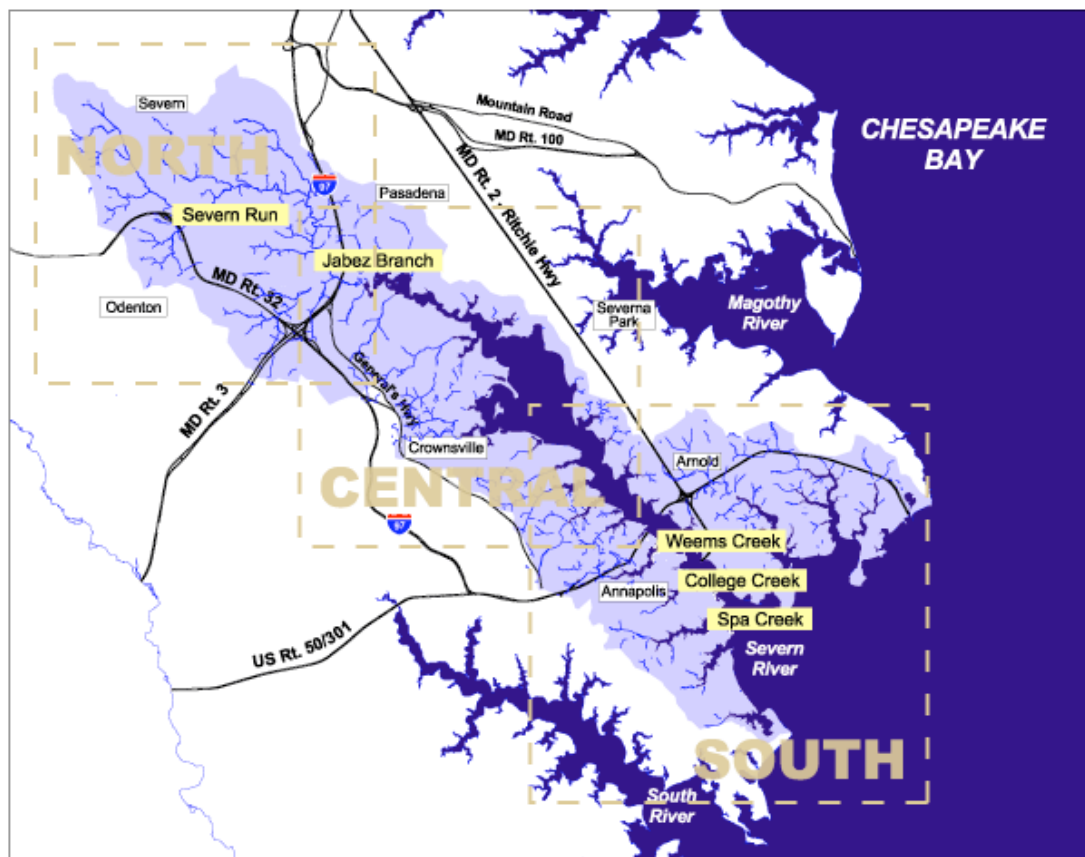
## CHARACTERIZATION OF THE COLLEGE CREEK WATERSHED, 2007

The College Creek watershed, located in the heart of Annapolis, Maryland covers 732 acres (1.14 square miles), and contains over 57 percent impervious surface.

The upland areas of the watershed include residences and institutions, while most of the lower watershed is owned by institutions. College Creek—which flows into the Severn River—is mostly surrounded by institutions, including: Adams Academy at Adams Park (alternative middle school) and home of the Chesapeake Ecology Center, Calvary United Methodist Church, the US Naval Academy, St. John's College, St. Anne's Cemetery, and other government buildings and lands. There are very few waterfront homes and boats, both of which can cause pollution; however, waterfront homeowners are generally the core of most watershed associations. The College Creek shoreline is mostly natural and forested above King George Street Bridge, and mostly altered below it in the areas owned by the US Naval Academy.

The watershed is becoming more densely urbanized, as the number of buildings, residents, and traffic increases. Polluted stormwater runoff is increasing as the amount of impervious surfaces increase, including rooftops, driveways, sidewalks, roads, and parking lots. However, although 57 percent of the College Creek watershed is covered with impervious surfaces, there are numerous opportunities for community engagement to restore and protect the watershed.

### SEVERN RIVER WATERSHED AREA MAP



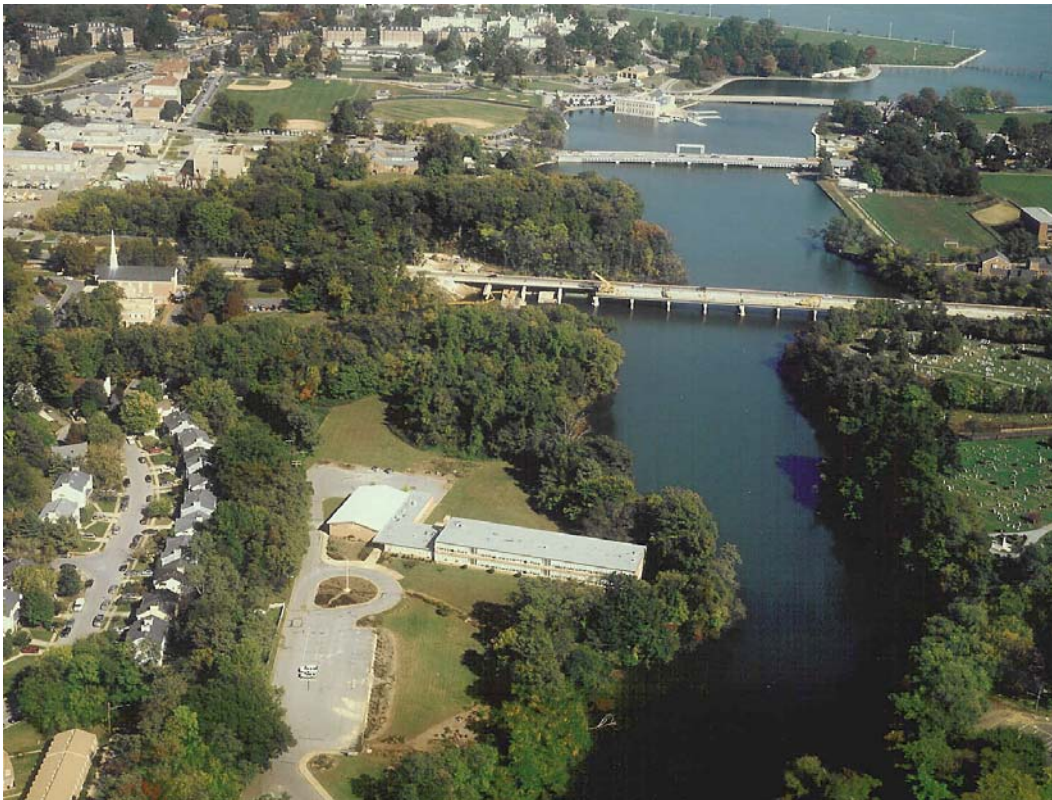
(Map provided by Anne Arundel County)





(Map provided by Anne Arundel County)

If you live, work, or play within the area of the solid orange line, you are in the College Creek watershed. All stormwater runoff within this area drains to College Creek.



(Photo by David Wallace)

Adams Academy at Adams Park Middle School, which is also the home of the Chesapeake Ecology Center, is located in the foreground at the tidal headwaters of College Creek. The US Naval Academy is located in the background at the mouth of College Creek.

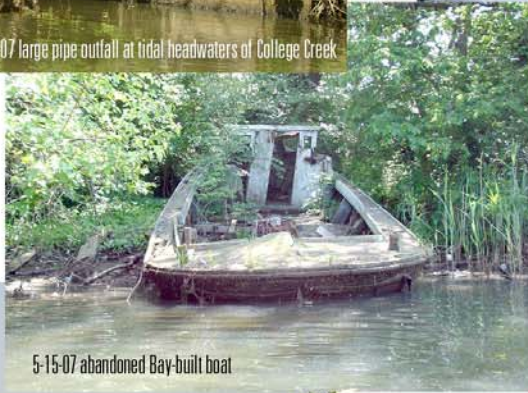




5-15-07 large pipe outfall at tidal headwaters of College Creek



11-30-07 shoreline is mostly natural and forested above King George Street Bridge



5-15-07 abandoned Bay-built boat

8-4-07 Navy-Marine Corps Memorial Stadium



5-15-07 shoreline is mostly altered below King George Street Bridge along Naval Academy grounds



9-30-07 Maryland Department of Natural Resources; parade after game at Navy Stadium



9-30-07 Maryland State House sign



11-30-07 Rowe Blvd. Bridge, Bloomsbury Square, State Capitol building in background



9-30-07 Maryland State Capitol building



9-28-07 St. Anne's Church, downtown Annapolis



9-30-07 US Naval Academy grounds



9-28-07 historic photo on building in downtown Annapolis >





9-28-07 West Street, downtown Annapolis



< 9-28-07 Loews Hotel, West Street, downtown Annapolis



^ 9-28-07 Residential area of downtown Annapolis



9-24-07 Park Place under construction



9-24-07 Clay Street Community



9-24-07 Brown-Leanos Memorial (pocket) Park at Westgate Circle



9-24-07 Stanton Center in Clay Street Community



9-24-07 St. Anne's Cedar Bluff Cemetery



9-28-07 Westgate Circle, Westin Hotel on left



9-22-07 Homewood-Germantown neighborhood



9-22-07 Homewood-Germantown neighborhood



^ 9-24-07 Glenwood Senior Housing

## OVERVIEW OF THE COLLEGE CREEK WATERSHED INITIATIVE, 2007

Friends of College Creek (FOCC)—an informal coalition of watershed stakeholders—has been active on and off since the mid-1990s. The coalition has been re-energized and is sponsored by the Lower Western Shore Tributary Team, to continue work to protect and restore the College Creek watershed.

The FOCC Watershed Initiative is a collaborative effort involving several major watershed stakeholders, including the Lower Western Shore Tributary Team, Chesapeake Ecology Center (CEC), Adams Academy at Adams Park, Maryland Department of Natural Resources, US Naval Academy, Navy-Marine Corps Memorial Stadium, Calvary United Methodist Church, St. John's College, and Germantown-Homewood Civic Association. The City of Annapolis, Anne Arundel County, and others have also made significant contributions.

Throughout 2007, Friends of College Creek met to make plans to conduct a new assessment of the environmental health, or lack thereof, of the watershed. Extensive data was obtained from various sources, including Water Quality Monitoring, Fish Survey, Impervious Cover and other overall watershed characteristics. From the spring of 2007 through the fall of 2007, several surveys were conducted, including SAV Surveys, Macroinvertebrate Survey, Upland Stream Survey, and Upland Photo Surveys.

The "2007 College Creek Watershed Assessment" builds on the "1997 College Creek Watershed Survey," both of which were conducted by Friends of College Creek. With the availability of new technologies since 1997, several new parameters were added to the 2007 data assembled and surveys conducted. To the extent practical, the 2007 Watershed Assessment results were compared to the results of the 1997 Watershed Survey. Notably, since 1997, the watershed has seen the construction of several large development projects, including: the District Court Building; Rowe Bridge reconstruction; several buildings including Park Place condominiums and the Westin Hotel on an 11-acre site; and the Severn Bank building.

**Some major changes over the ten-year span are: increased impervious surface from 47 to 57 percent, along with concomitant runoff; increased invasive plant species; and a decrease in the number of individual dump sites (but not necessarily a decrease in the amount of trash in the remaining areas where trash collects and/or dumping occurs).**

On November 3, 2007, the results of the more than year-long effort were highlighted at the well-attended "State of the College Creek Watershed Public Forum," held at Adams Academy at Adams Park/Chesapeake Ecology Center.

### **Additional parameters yet to be determined are:**

- Sediment quality
- Bacteria (enterococci)
- Stormwater outfalls, including locations and areas drained (the City of Annapolis may have this information)

### **Surveys to be continued in 2008 and beyond include:**

- Ongoing tidal water quality monitoring (the State Highway Administration-funded monitoring project ended fall 2007. FOCC volunteers will continue to monitor water quality; and the US Naval Academy will conduct monitoring near the mouth of creek.
- Ongoing SAV monitoring (2 visits/year, spring and summer)
- Ongoing fish monitoring to assess living shoreline impacts (1 or 2 visits/year)

### **Examples of planned and ongoing watershed restoration projects for 2008 include:**

- Soften the College Creek shoreline to the greatest extent possible
- US Naval Academy is considering a living shoreline project
- Stormwater mitigation projects
- Ongoing invasive species removal and reforestation at Adams Academy/CEC
- Invasive species removal and reforestation initiatives throughout the watershed
- Trash clean-up initiatives

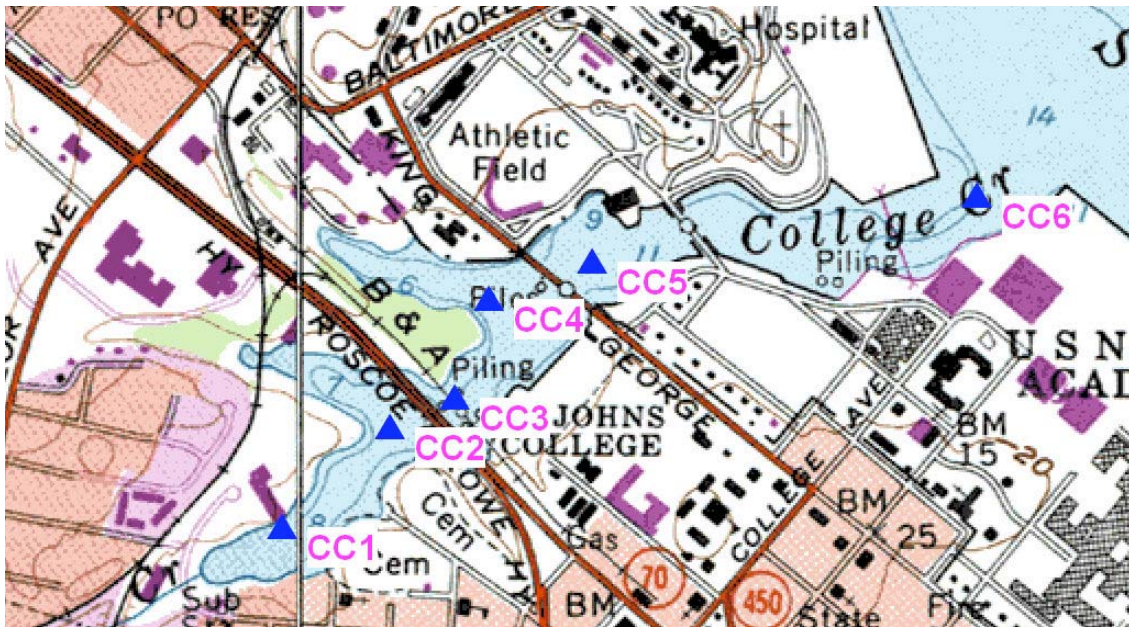


## WATER QUALITY IN COLLEGE CREEK, 2003-2007

Compiled by Dr. Peter Bergstrom, NOAA Chesapeake Bay Office, 12/4/07

### Methods

A State Highway Administration contractor, ESA, sampled water quality once a month from 2003-2007 at 5 sites (CC1-CC5) to assess possible Rowe Boulevard bridge construction impacts. The bridge was under construction from 2004-2006. Nutrients and total suspended solids were only sampled at the sites just above and below the bridge (CC2 & CC3), due to their increased costs. USNA staff and students sampled at one pier near the mouth of the creek (CC6) starting in 2007, but they did not measure Secchi depth. All samples were from the surface layer except dissolved oxygen was sampled just above the bottom.



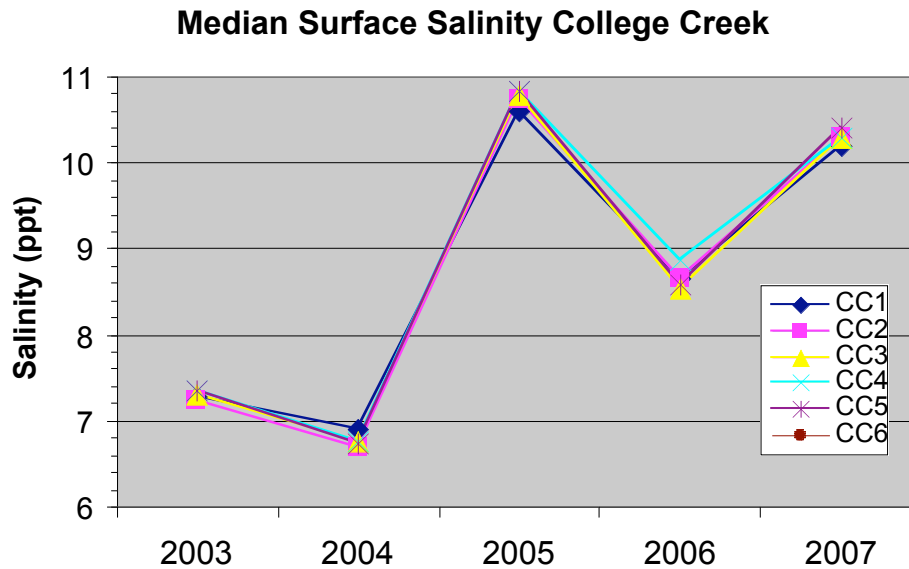
I calculated medians by site and year over the appropriate months to characterize the average conditions (the months used were those used in Chesapeake Bay Program analyses for tidal waters). 2007 medians used data through August only for SHA data (later data were collected but not yet available). For salinity, total nitrogen, total suspended solids, and Secchi depth the time period was April-October (the SAV growing season), and for bottom dissolved oxygen (DO) it was June-September (the period when most low DO occurs). I graphed the medians by site and year with years on the x-axis (to show any changes over time) and sites as different lines.



## Results

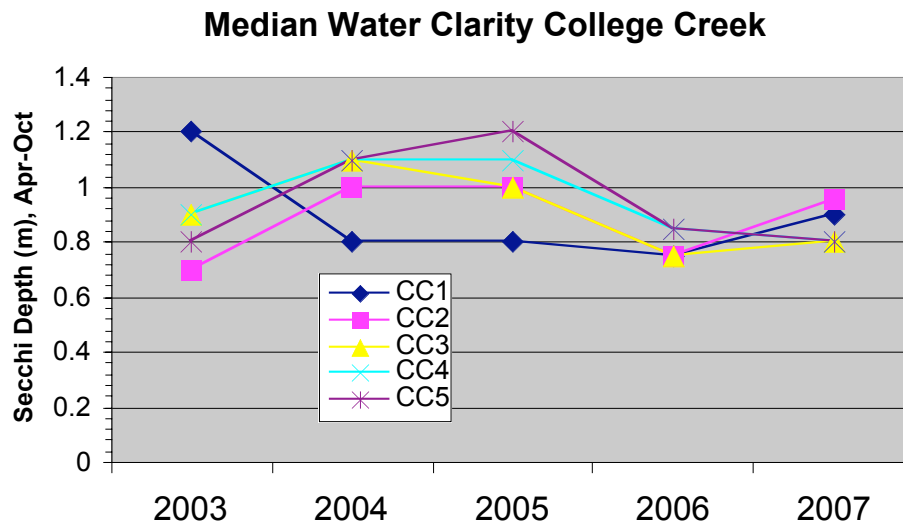
Salinity (Fig. 1) clearly responded inversely to rainfall. It was lowest in 2003-2004 (wet years), highest in 2005 & 2007 (dry years), and intermediate in 2006. Note that the scale goes from 6-11 ppt to show the very slight differences among sites more clearly.

**Figure 1. Salinity medians in College Creek by site and year, April-October each year.**

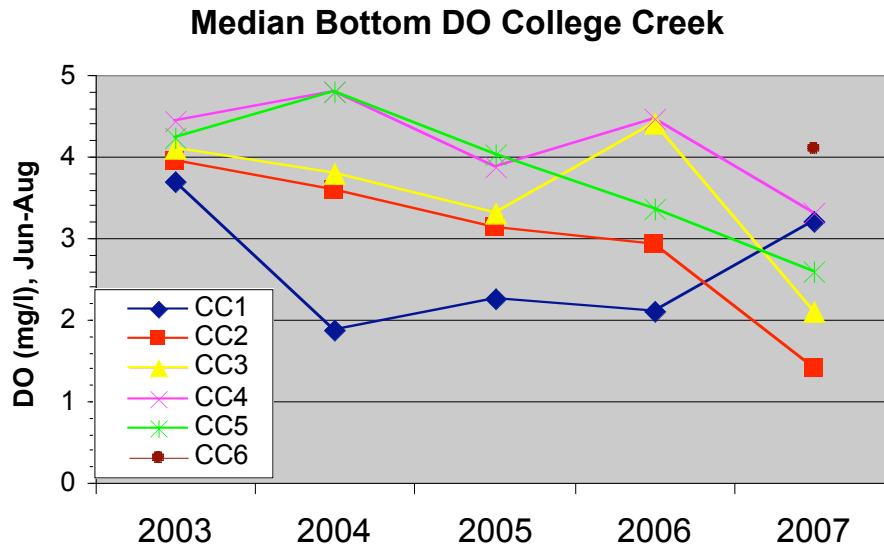


For the next two parameters, there were larger differences among sites than seen for salinity. Medians of water clarity (Fig. 2) and bottom Dissolved Oxygen (DO, Fig. 3) were often worst at CC1 and best at CC5 (or CC6 for bottom DO in 2007). For both parameters, more is better. Some clarity medians were high enough to allow SAV growth (1 m or more).

**Figure 2. Secchi depth (water clarity) medians in College Creek by site and year, April-October each year.**



**Figure 3. Bottom dissolved oxygen (DO) medians in College Creek by site and year, June-September each year.**



Comparing these medians to data from a nearby tidal river for the same years (Table 1), all College Creek medians were within the range of the other medians, except:

- College Creek had the highest salinity (as expected since it is near the mouth of the Severn, which is closer to the mouth of the Bay than the Magothy), and
- College Creek had lower Total Suspended Solids (TSS) than the two groups of Magothy creeks, and slightly lower TSS than the Severn DNR site.

**Table 1. Overall median, and ranges of medians by creek or river and year in College Creek, compared to overall medians and ranges at nearby tidal monitoring sites.**

Parameter	College Creek 03-07 (5 sites, except 2 for TN & TSS)	Severn 06 (16 sites, none in College Creek)	Magothy 06 (4 or 6 sites, Mill & Dividing)	Magothy 03-06 (3 other sites)
Salinity	8.7 ppt* (6.7-10.8 ppt)	8.4 ppt (6.6-9.2 ppt)	7.5 ppt (2.1-8.1 ppt)	5.8 ppt (3.1-9.1 ppt)
Water clarity (Secchi depth)	0.9 m (0.7-1.2 m)	0.85 m (0.5-1.1 m)	0.6 m (0.4-0.7 m)	0.9 m (0.6-1.2 m)
Bottom DO	3.6 mg/l (1.4-4.8 mg/l)	2.4 mg/l (0.2-4.1 mg/l)	3.8 mg/l (2.5-4.8 mg/l)	3.1 mg/l (0.06-7.1 mg/l)
Total Nitrogen (TN)	0.8 mg/l (0.5-1.4 mg/l)	0.9 mg/l+ (0.8-1.2 mg/l)	0.5 mg/l (0.25-1.0 mg/l)	1.0 mg/l+ (0.9-1.2 mg/l)
Total Suspended Solids (TSS)	6.5 mg/l* (5.0-9.0 mg/l)	6.7 mg/l+ (4.7-8.3 mg/l)	16.5 mg/l (15.0-20.5 mg/l)	8.2 mg/l (4.6-11.0 mg/l)

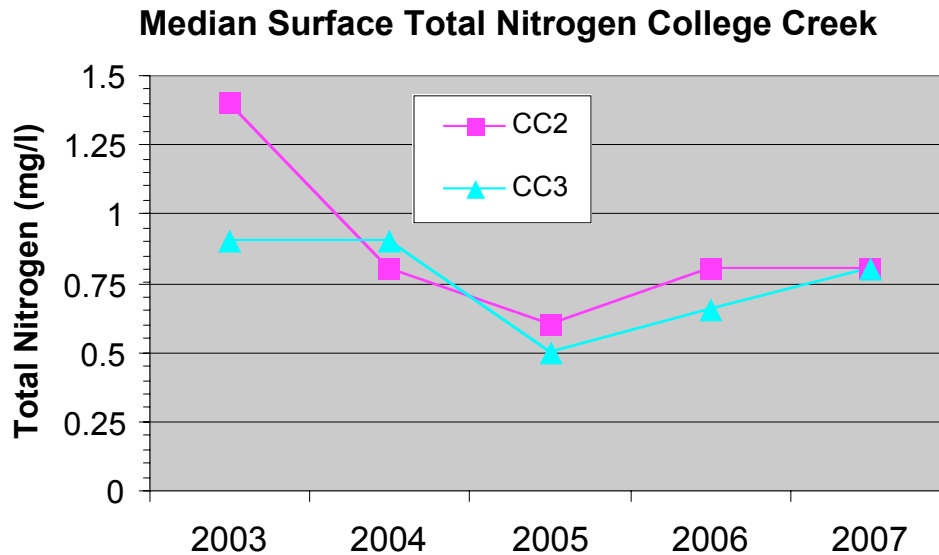
\*Outside range of other medians (see text)

+2003-2006 data from DNR site (WT6.1 Magothy, WT7.1 Severn)

Two other parameters were sampled at the two stations closest to the Rowe bridge only (TN and TSS). Total nitrogen (Fig. 4) was higher at CC2 in 2003, with little change since then. TN medians were similar to those found at two groups of Magothy sites (Table 1).

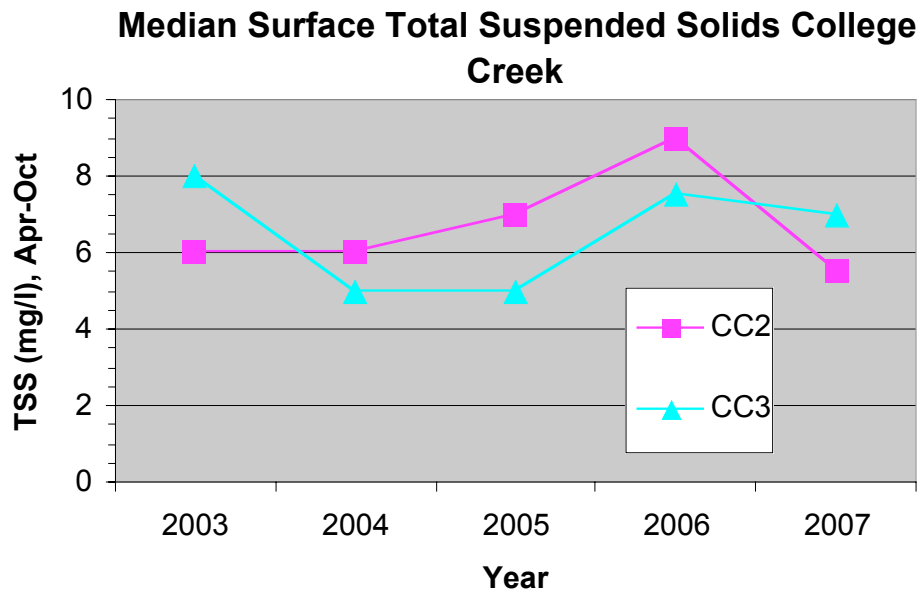


Figure 4. Total Nitrogen (TN) medians in College Creek by site and year, April-October each year.



Total suspended solids (Fig. 5) varied little among sites or years. Medians were about half of those found in 2006 in Mill & Dividing creeks on Magothy, but were similar to 2003-2006 medians in 3 other Magothy creeks (Cattail, Old Man, and Forked), and slightly less than TSS medians at the DNR site, WT7.1 (Table 1). Thus, the TSS levels in College Creek did not appear to be raised by the bridge and building construction during the sampling period. However, elevated TSS levels might occur mainly after heavy rain, and might be missed by monthly sampling.

Figure 5. Total Suspended Solids (TSS) medians in College Creek by site and year, April-October each year.



### Conclusions

In general, water quality in College Creek was similar to what was measured in nearby sites on the Severn and Magothy. There was no apparent effect of bridge construction. Sampling some of the parameters reported here (all but TN and TSS) at the same 6 sites in 2008, twice a month if possible, would be useful to see if water quality changes in the future.

## SUBMERGED AQUATIC VEGETATION (SAV) IN COLLEGE CREEK, 2007

Compiled by Dr. Peter Bergstrom, NOAA Chesapeake Bay Office, 11/3/07

**Methods:** I led a group of FOCC members in kayaks and canoes in May and July at low tide; we looked for SAV with small rakes and recorded its locations with GPS.

**KEY:** Zp = horned pondweed, Ms = milfoil, Rm = widgeon grass, Ppf = redhead grass. Larger letters = dense.



### Results

May 15, 2007 (yellow labels): Dense Zp in Peters Cove and upper creek; sparse Zp in a few other places; one piece of Ms. Zp is the most common SAV in the spring.

July 11, 2007 (blue labels): Sparse Zp in Peters Cove and upper creek; sparse Rm in 2 places; sparse and dense Ppf in 3 places; sparse Ms in 2 places (but none in lower creek).

Both dates: No SAV was found in the lower creek (red oval). Although water quality was better here, there is almost no suitable habitat for SAV (all the shoreline has bulkhead or riprap); no SAV beds have ever been mapped here in the aerial survey.

### Conclusions

Restoring natural shorelines in lower College Creek should help SAV to expand into areas with better water quality. SAV surveys should be continued twice a year.



5-15-07 beginning of first SAV Survey along Calvary Church grounds



7-11-07 second SAV Survey, Peter Bergstrom holding branch covered with dark false mussels



7-11-07 second SAV Survey, Nicholas Maistrellis holding horned pondweed



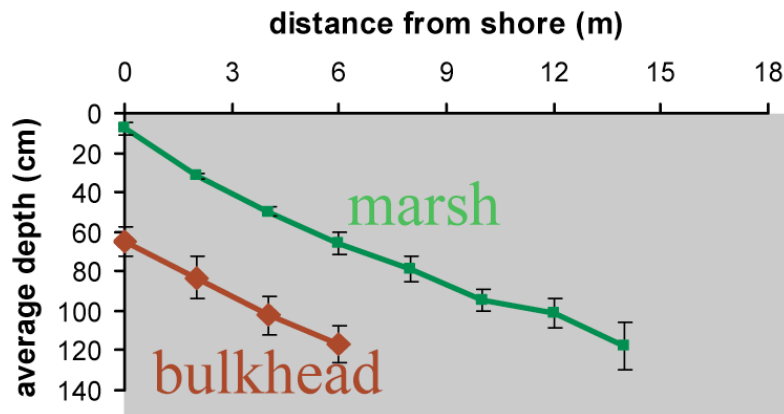
## FISHES AND OTHER MACROFAUNA OF COLLEGE CREEK: IMPACTS OF SHORELINE RESTORATION AT St. JOHN'S COLLEGE, 2007

Compiled by Dr. Jana Davis, Chesapeake Bay Trust

In 2006, St. John's College replaced approximately 800 feet of wooden bulkhead with a "living shoreline." The living shoreline or marsh protects against erosion with natural habitat elements. In some cases, such as the living shorelines at St. John's College, natural habitat can be combined with hard elements such as rock. This "hybrid" technique maximizes protection while also providing better habitat for wildlife and water quality benefits.

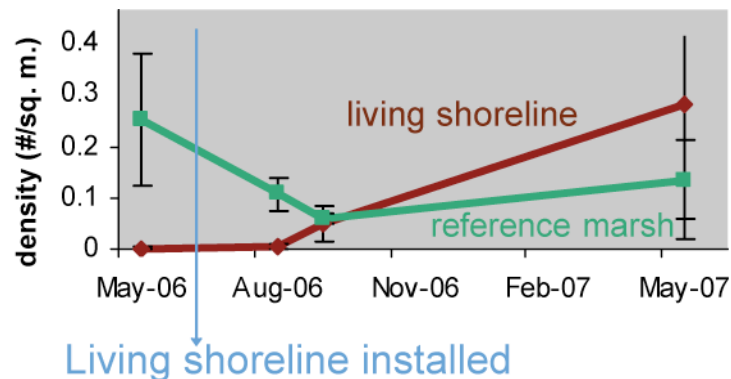


**Bulkheads do not provide the same habitat as marshes do.** For example, important shallow refuge habitat (<60 cm deep) was not present at the St. John's bulkhead prior to living shoreline installation in June 2006.



As a result, 5 species were significantly less abundant at the bulkhead than at a reference fringe marsh (mummichog, grass shrimp, spot, chain pickerel, stickleback).

**Transforming a bulkhead to a living shoreline led to increases in 4 marsh-oriented species (relative to a reference fringe marsh):**



### Conclusions

- College Creek hosts at least 20 species of fishes and 3 macroinvertebrates.
- Removal of the bulkhead at St. John's College had almost immediate (within 2 months) impact on the assemblage.
- Some species are more abundant now at the living shoreline than they were at the bulkhead (pumpkinseed, mummichog, grass shrimp, spot).
- No species significantly declined after installation of the living shoreline.
- Fishes and macroinvertebrates now have shallow habitat where the bulkhead used to be.
- Additional shoreline restoration projects in College Creek may similarly benefit these species.

### College Creek Macrofaunal Species List, beach seine data collection

#### July 2006

Bulkhead	Mean density (#/m <sup>2</sup> ) (not corrected for gear efficiency)
<i>Brevoortia tyrannus</i> , Atlantic menhaden	1.50
<i>Lepomis gibbosus</i> , pumpkinseed	0.14
<i>Menidia menidia</i> , Atlantic silverside	0.055
<i>Fundulus heteroclitus</i> , mummichog	0.014
<i>Morone americana</i> , white perch	0.0059
<i>Fundulus majalis</i> , striped killifish	0.0041
<i>Esox niger</i> , chain pickerel	0.0040
<i>Fundulus diaphanous</i> , rainwater killifish	0.0021
<i>Pomatomus saltatrix</i> , bluefish	0.0021
<i>Strongylura marina</i> , Atlantic needlefish	0.0019
<i>Leiostomus xanthurus</i> , spot	0
<i>Apeltes quadracus</i> , stickleback	0
<i>Syngnathus fuscus</i> , pipefish	0
<i>Anchoa mitchilli</i> , bay anchovy	0
Natural Marsh	Mean density
<i>Lepomis gibbosus</i> , pumpkinseed	0.27
<i>Fundulus heteroclitus</i> , mummichog	0.119
<i>Apeltes quadracus</i> , stickleback	0.059
<i>Esox niger</i> , chain pickerel	0.025
<i>Menidia menidia</i> , Atlantic silverside	0.017
<i>Leiostomus xanthurus</i> , spot	0.0083
<i>Fundulus diaphanous</i> , rainwater killifish	0.0083
<i>Fundulus majalis</i> , striped killifish	0.0041
<i>Syngnathus fuscus</i> , pipefish	0.0021
<i>Morone americana</i> , white perch	0.0021
<i>Brevoortia tyrannus</i> , Atlantic menhaden	0.0021
<i>Anchoa mitchilli</i> , bay anchovy	0.0021
<i>Strongylura marina</i> , Atlantic needlefish	0.0019
<i>Pomatomus saltatrix</i> , bluefish	0



# MACROINVERTEBRATES SAMPLING IN COLLEGE CREEK & SPA CREEK, 2007

Compiled by Karl Hellmann, Maryland Department of Natural Resources

In May of 2007, two stream sites were sampled for macroinvertebrates in the College Creek watershed, and one site was sampled in the Spa Creek watershed. The macroinvertebrate data were used to calculate an Index of Biological Integrity (IBI) score. Biologists use these IBI scores to rate the health of streams. All three sites have very poor IBI scores based on the samples. Watersheds that contain higher amounts of impervious surface, such as College Creek, normally produce lower scores. IBI scores from MBSS sites that were sampled from previous years in the Severn River watershed have ranged from 1.57 to 4.71.

## May 2007

College Creek – Site 1	Abundance
Asellidae, sow bugs	32
Chironomidae, midge flies	13
Crangonyctidae, scuds	27
Dytiscidae, predacious diving beetles	2
Physidae, pond snails	2
Sphaeriidae, fingernail clams	3
Tipulidae, crane flies	2

IBI Score: 1.29

---

College Creek – Site 2	Abundance
Asellidae, sow bugs	3
Chironomidae, midge flies	62
Crangonyctidae, scuds	6
Dytiscidae, predacious diving beetles	14
Lumbriculidae, oligochaete worms	3
Physidae, pond snails	20
Sciomyzidae, marsh flies	1
Sphaeriidae, fingernail clams	5
Tipulidae, crane flies	1
Tubificidae, oligochaete worms	3

IBI Score: 1.57

---

Spa Creek – Site 1	Abundance
Asellidae, sow bugs	2
Chironomidae, midge flies	14
Dytiscidae, predacious diving beetles	12
Hydrophilidae, water scavenger beetles	1
Libelluliidae, percher/skimmer dragon flies	1
Lumbriculidae, oligochaete worms	7
Lymnaeidae, pond snails	2
Physidae, pond snails	35
Sciomyzidae, marsh flies	1
Sphaeriidae, fingernail clams	23
Tipulidae, crane flies	1
Tubificidae, oligochaete worms	4

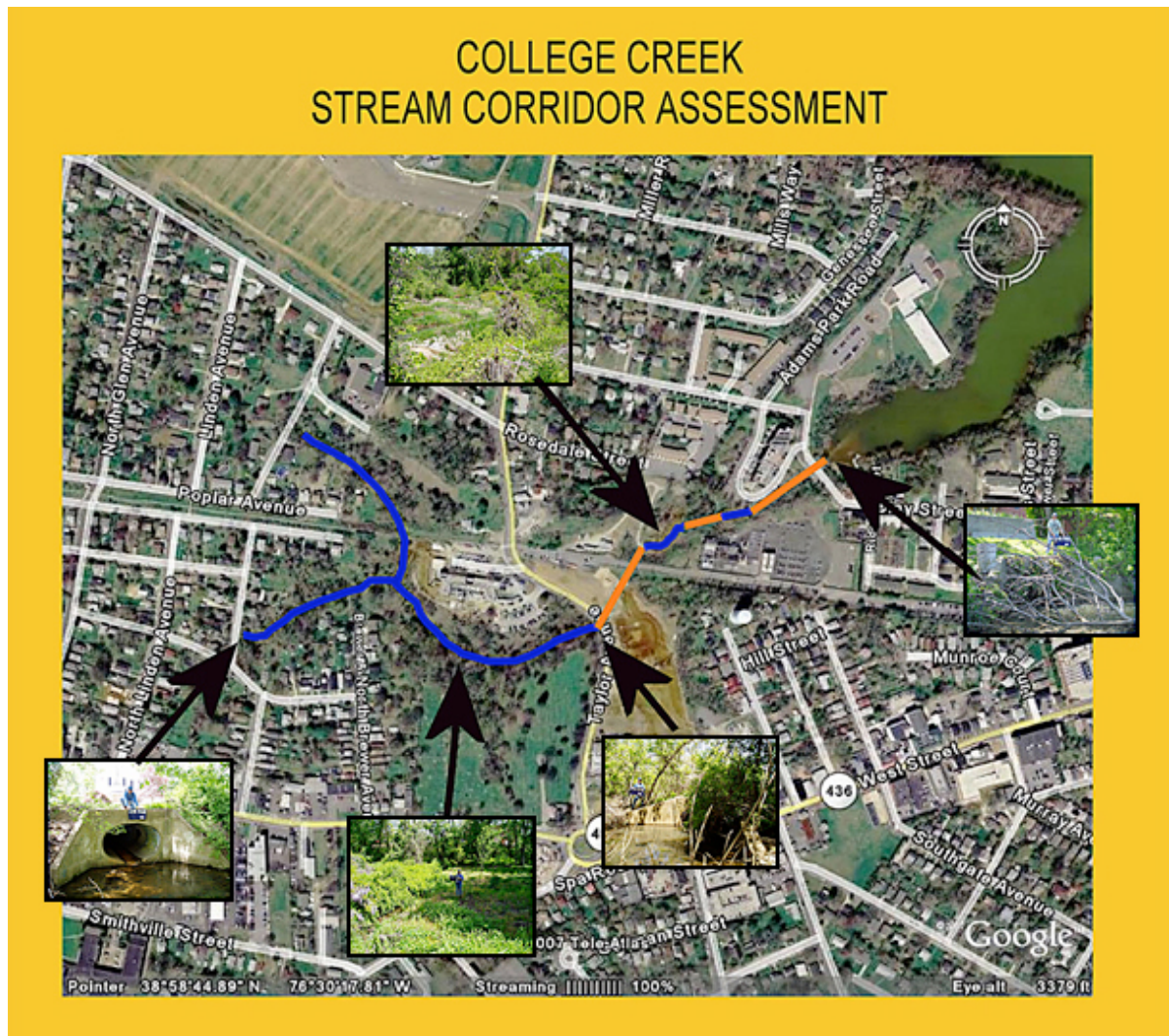
IBI Score: 1.57

---

## UPLAND STREAM SURVEY OF COLLEGE CREEK, 2007

Compiled by Ken Yetman, Maryland Department of Natural Resources

On May 7, 2007, I led an Upland Stream Survey. Claudia Donegan steered the group in the right direction, and Elizabeth Ley and Zora Lathan assisted in conducting the survey. The Upland Stream Survey took most of the day, and took place through some rather dense, overgrown terrain. We found trash dumping that needs to be addressed. We also saw an area where reforestation could possibly take place. Much of the area we walked through was rather dense with invasive species. Notably, it would require substantial resources to remove invasive species and reforest with native species.



5-7-07 Ken Yetman at start of Upland Stream Survey



5-7-07 Upland Stream near Police Station



5-7-07 Upland Stream Survey, Elizabeth Ley and Ken Yetman



## UPLAND SURVEY OF THE COLLEGE CREEK WATERSHED, 2007

Compiled by Zora Lathan, Chesapeake Ecology Center

Several surveys were conducted from the spring of 2007 through the fall of 2007, covering the upland portion of the College Creek watershed, including the Homewood-Germantown neighborhood, the Navy-Marine Corps Memorial Stadium, the area between the stadium and College Creek, areas west of the stadium including portions of West Annapolis, the Clay Street/downtown area, and St. John's College and Naval Academy grounds. Participants included: Zora Lathan, Team Leader; Tim Lincoln; Cheryl Lincoln; Rebecca Hickman; Cindy Wallace; and William Sanders.

Upland and tidal areas were surveyed in 2007. Pipe outfalls appear to be the same as in 1997. There is evidence of trash dumping at the tidal headwaters of College Creek. St. Anne's Cemetery, along College Creek, is having problems with shoreline erosion. Brewer Cemetery, along the upland stream portion of College Creek, is also experiencing erosion problems. For three years, the sinkholes in front of the Glenwood Apartments, located off Clay Street, have been expanding.

Three obvious dump sites were identified in 2007: along the tidal headwaters of College Creek; along the upland stream section of the creek; and at Adams Academy at Adams Park Middle School—which was cleaned up in the summer and fall of 2007. Apparently, some of the dump sites identified in 1997 have been cleaned up, however, there may be dump sites which are not obvious, e.g., the extent of the dumping at Adams Academy wasn't apparent until invasive species were removed.

Land use and impervious surfaces increased between 1997 and 2007 from 47 percent to 57 percent (see the details below on land cover distribution from Anne Arundel County). As identified in 1997, the same overall conditions and needed restoration exist in 2007, only the problems are exacerbated. There is an increased need to mitigate ever-increasing amounts of polluted runoff, and remove invasive species. Along the shores of College Creek, many existing native species are being overgrown with invasive vines such as English Ivy, Japanese Honeysuckle, and Asiatic Bittersweet. There are numerous invasive shrubs such as Multiflora Rose and Privets, and invasive trees such as Tree of Heaven and Mulberry. Large stands of Bamboo were observed in the Homewood-Germantown area.

**IN SUMMARY, primary impacts identified in 2007 include: lack of stormwater runoff quality and volume controls; shoreline erosion at St. Anne's Cemetery and Brewer Cemetery; parking lot cave-in at Glenwood Apartments; invasive species throughout the watershed; and trash dump sites.**

## EXCERPTS FROM 1997 WATERSHED SURVEY RESULTS

### EXECUTIVE SUMMARY

*.... The survey volunteers identified several environmental problems including:*

- *A high percentage of impervious surface areas for which there is no stormwater management.*
- *Numerous trash dump sites and pipe outfalls into College Creek.*
- *Failing shore erosion control structures.*

***Survey volunteers also identified sites for restoring the water quality and wildlife habitat within the College Creek watershed. These sites provide opportunities for:***

- *Improving the quality of upland runoff discharging into College Creek.*
- *Reforestation.*
- *Improving environmental stewardship.*
- *Reducing shore erosion and improving wildlife habitat.*

### UPLAND AND TIDAL AREAS

- ***Upland Areas:*** *Participants who surveyed the upland portion of the watershed identified local land use conditions including construction sites, fuel storage areas, dump sites, vacant lots, open space, storm drains, vacant homes, and reforestation sites. The upland portion of the College Creek watershed includes the Homewood, Germantown, Navy Stadium, DNR, Clay St./Downtown, and Naval Academy sub-watersheds.*
- ***Tidal Areas:*** *Participants who surveyed the tidal College Creek sub-watershed identified exposed sections of sewer lines, pipe outfalls, unusual stream conditions, shore erosion problems, unshaded stream sections, and trash dump areas.*

### **UPLAND SUB-WATERSHEDS**

- **Land Use:** Watershed survey volunteers estimated that the land use within the College Creek watershed was 44% residential, 31% commercial/industrial and 25% open space. Furthermore, they estimated that 47% of the watershed has impervious surfaces including roads, roof tops, sidewalks, and parking lots. The commercial/industrial areas include federal, state, and local government facilities, a shopping center, and the Navy/Marine Corps Memorial Stadium. The 25% open space within the watershed was identified on forty-three sites and the land use at these sites was primarily manicured lawn.
- **Dump Sites:** 20 dump sites were found throughout the Watershed and only a limited amount of new construction is currently ongoing within the watershed (specifically a new District Court building).
- **Parking Lots:** The Watershed has almost 75 parking lots that contain thousands of parking spaces. Most of these parking lots were constructed before the enactment of stormwater management laws and regulations. Many outfalls from these parking facilities reflect the damaging effects of untreated stormwater.
- **Storm Drains:** Most of the storm drains within the Watershed are not stenciled with "Don't Dump - Chesapeake Bay Drainage."

### **TIDAL COLLEGE CREEK**

- **Shoreline Characteristics:** The tidal portion of College Creek is characterized by a primarily forested shoreline, as well as, many bulkheads, emergent tidal wetlands, eroding banks, and abandoned boats. Several tidal emergent marshes along College Creek are dominated by the nuisance plant species *Phragmites*.
- **Outfall Pipes:** Almost 50 separate outfall pipes were identified as potential discharge points into College Creek. Several of these outfall pipes were discharging fluids that were discolored and carried the strong smell of chorine.
- **Shore Erosion Control Structures:** Many shore erosion control structures along the creek are failing and there is a significant amount of sediment being deposited at the head of the creek.

### **OPPORTUNITIES FOR RESTORING COLLEGE CREEK UPLAND SUB-WATERSHEDS**

#### **Opportunities to Improve the Quality of Upland Runoff**

- Determine those areas within the Watershed where stormwater is not currently being treated before it enters the Creek. Target the 75 parking areas identified by the survey volunteers.
- Identify opportunities for constructing stormwater management retrofits such as sand filters and rain gardens. Many areas identified as open space should be evaluated as potential sites for stormwater management retrofit projects.
- Stencil storm drains with "Don't Dump - Chesapeake Bay Drainage."
- Clean-up identified dump sites.

#### **Opportunities for Reforestation**

- Reforest as many open space areas as possible while taking into consideration recreational needs. This can only be accomplished after a more detailed inventory of the use of existing open space is conducted. Major reforestation opportunities exist at the Navy/Marine Corps Memorial Stadium, the Naval Academy, and St. John's College.

#### **Opportunities to Improve Environmental Stewardship**

- Develop and distribute fact sheets and conduct workshops designed to improve environmental stewardship within the Watershed.

### **TIDAL COLLEGE CREEK**

#### **Opportunities to Improve the Quality of Water Discharging into College Creek**

- Evaluate the quality of water discharged from the fifty outfall pipes. Focus on those outfall pipes that are discharging discolored or odorous liquids.
- Determine the source of water being discharged from these outfall pipes identified as potentially discharging harmful substances into College Creek

#### **Opportunities to Reduce Shore Erosion and Improve Wildlife Habitat**

- Determine if property owners with failing shore erosion control structures are interested in replacing these structures with more environmentally friendly alternatives such as tidal marshes.
- Manage nuisance plants within existing tidal marshes and replace them with more desirable plants for wildlife.

#### **Opportunities for Improving Recreation**

- Remove trash from identified dump sites and remove abandoned boats.

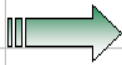



## **EXAMPLES OF COLLEGE CREEK WATERSHED RESTORATION INITIATIVES SINCE THE 1997 WATERSHED ASSESSMENT**

**Notably, several of the 1997 goals have been implemented, as well as new restoration projects.**

- In 2007, Anne Arundel County's Forestry Program removed invasive species on county and city land along the creek's headwaters and replaced them with nearly 1,000 native trees and shrubs, covering approximately 5 acres. This project was spearheaded by the Chesapeake Ecology Center.
- City of Annapolis and other partners planted a marsh area (which needs additional work) next to a pocket park at the tidal headwaters of College Creek. Public access at the headwaters is now possible with the removal of invasive species, implemented by Anne Arundel County's Forestry Program.
- The Chesapeake Ecology Center has installed 20 Native Plant Demonstration Gardens and Sites, including six rain gardens (three of which were formerly asphalt swales which were installed to channel water to College Creek as quickly as possible), and an extended riparian forest buffer on the 10-acre campus of Adams Academy at Adams Park, located at the tidal headwaters of College Creek.
- Maryland Department of Natural Resources has installed two large bioretention areas on their grounds.
- In 2006, St. John's College replaced approximately 800 feet of wooden bulkhead with a living shoreline. This is their second and largest of two living shoreline projects. St. John's College has also built 2 LEED certified green buildings/dorms; incorporated a network of rain gardens/infiltration areas between buildings; and installed porous pavers in a parking area.
- The new Severn Savings Bank building on Westgate Circle has a 12,500-square-foot green roof covered with drought-tolerant sedums to absorb rain water.
- The new Park Place development on Westgate Circle includes a man-made wetland to help drain and filter stormwater runoff.
- Renovations at the Navy-Marine Corps Memorial Stadium included planting scores of trees and the installation of several bioretention areas.
- Calvary United Methodist Church planted a buffer strip of herbaceous perennials along their shoreline.
- Bayscape plantings at Germantown Elementary School.
- Right Tree/Right Place and bayscape plantings along Poplar Trail.

**LAND COVER DISTRIBUTION FOR COLLEGE CREEK WATERSHED (CGC)  
AND SEVERN RIVER, FROM ANNE ARUNDEL COUNTY, 2005**

Select the subwatershed code from here					CGC, College Creek, Severn River		
					Severn River		
LAND COVER DISTRIBUTION FOR CGC				LAND COVER DISTRIBUTION FOR Severn River			
Land Cover Code	Type	Acres	Percent of Total	Land Cover Code	Type	Acres	Percent of Total
COM	Commercial	316.49	43.23	COM	Commercial	2500	5.64
IND	Industrial	0.57	0.08	IND	Industrial	854	1.93
OPS	Open Space	105.31	14.39	OPS	Open Space	2447	5.52
R11	Residential 1 Acre lots	1.16	0.16	R11	Residential 1 Acre lots	1352	3.05
R12	Residential 1/2 Acre lots	0.00	0.00	R12	Residential 1/2 Acre lots	8074	18.20
R14	Residential 1/4 Acre lots	179.73	24.55	R14	Residential 1/4 Acre lots	7297	16.45
R18	Residential 1/8 Acre lots	28.24	3.86	R18	Residential 1/8 Acre lots	1468	3.31
R21	Residential 2 Acre lots	0.00	0.00	R21	Residential 2 Acre lots	196	0.44
SRC	Single Row Crop	0.00	0.00	SRC	Single Row Crop	764	1.72
PAS	Pasture/Hay	0.00	0.00	PAS	Pasture/Hay	511	1.15
TRN	Transportation	51.76	7.07	TRN	Transportation	1834	4.14
WAT	Water	1.96	0.27	WAT	Water	182	0.41
WDS	Woods	46.79	6.39	WDS	Woods	16668	37.58
FRW	Forested Wetlands	0.00	0.00	FRW	Forested Wetlands	13	0.03
UTL	Utility	0.00	0.00	UTL	Utility	131	0.30
AIR	Airport	0.00	0.00	AIR	Airport	0	0.00
OPW	Open Wetlands	0.00	0.00	OPW	Open Wetlands	61	0.14
Impervious		418	57	Impervious		9289	21
Total Area		732	100	Total Area		44353	100

**1997 COLLEGE CREEK WATERSHED DATA SUMMARY**

**UPLAND SUB- WATERSHEDS**

**Land Use**

**# of Occurrences**

Developed Land – Residential	86
Developed Lands Commercial/Industrial	64
Developed Land - Parking Lots	75
Construction Sites	5
Fuel Storage Sites	6
Dump Sites	20
Vacant Lots	22
Open Space	43
Reforestation Sites	24
Storm Drains	260 approx.
Vacant Houses	9

**Percentage of Impervious Surface** 47%

**Estimated Percentages of Land Uses**

Residential	44%
Commercial/Industrial	31%
Open Space	25%

**TIDAL COLLEGE CREEK**

**Potential Pollution Problems**

Exposed Sewer Lines	1
Pipe Outfalls	50
Unusual Stream Conditions	3
Channelization	2
Unshaded Stream Section	
Evidence of Erosion	8
Trash Dumping Area	5

## **SUMMARY OF THE STATE OF THE COLLEGE CREEK WATERSHED PUBLIC FORUM, NOVEMBER 3, 2007**

**Compiled by Zora Lathan, Chesapeake Ecology Center**

On November 3, 2007, a College Creek Watershed Public Forum was held at Adams Academy at Adams Park. Approximately 60 community residents and others attended the half-day forum from 8:30 AM to Noon, thanks to extensive advertising via an article by Pam Wood in the Capital-Gazette Newspaper; several articles in newsletters and bulletins; email notices; a postcard mailing to watershed residents; posters placed throughout the watershed; CEC, CBT, TKF, and AnnapolisGreen website notices; and word-of-mouth.

The agenda format—of brief presentations, poster session, then reconvening for the final community input session—worked well. There was a good size crowd and lots of citizen input during the open session with citizens at the end of the program.

At the start of the program, Claudia Donegan introduced the program participants. Jeff Tillar welcomed folks, explained that Adams Academy is an alternative middle school for youngsters with behavioral problems, and encouraged community participation with the school. Vince Leggett gave a brief history of the school and surrounding community, as well as informed folks about the unique partnership between Blacks of the Chesapeake, the Chesapeake Ecology Center, and Adams Academy. Claudia Donegan then explained the program format and kept the program on track. Frank Dawson talked about the 1997 College Creek Watershed Assessment and how it was conducted with volunteers using pencil and paper, and that we now have new, more sophisticated tools. Frank, Jeff, and Vince, noted Bertina Nick's tremendous contribution to the Clay Street community. Notably, the Bertina A. Nick Memorial Garden Dedication Ceremony was held two years ago to the date on November 3, 2005 at Adams Academy/CEC.

Peter Bergstrom gave a more detailed presentation and informed folks about the various surveys that were conducted throughout the year, showed very interesting maps of the watershed—both old and new, gave a general impression of the results of the surveys, discussed actions citizens can easily take to make a difference, and described the various poster stations, and that there was more detailed information at each poster station. Importantly, he also explained that unlike the other Annapolis creek watersheds, the **College Creek watershed does not have a large citizen constituency due to the fact the almost all the waterfront is owned by institutions.**

The poster session lasted about an hour. The posters and handouts were outstanding and generated a great deal of interest. Ken Yetman and Julie Crudele encouraged citizens to identify points on a large map of the watershed and write down their concerns or comments.

### **Manned poster displays included:**

- **Upland Stream Survey:** Ken Yetman, MD DNR
  - **Water Quality Monitoring and SAV Survey:**  
Dr. Peter Bergstrom, NOAA
  - **Fish Survey:** Dr. Jana Davis, CBT, and Steve Giordano, NOAA
  - **Macroinvertebrate Survey:** Karl Hellmann, MD DNR
  - **Upland Survey:** Cindy Wallace, SRF, and Zora Lathan, CEC
  - **Living Shoreline at St. John's College**
  - **Stormwater Impacts / Stormwater Mitigation at MD DNR, Navy Stadium, CEC, and Severn Bank Building:** Zora Lathan
  - **Anne Arundel County Invasive Species Removal / Reforestation Initiative at Adams Academy, CEC projects, watershed model:** Zora Lathan
  - **Spa Creek Conservancy Rain Barrel Lesson:** Suzanne Pogell
  - **Calvary United Methodist Church's plans for restoration projects:** Elizabeth Ley
  - **Severn River Association:** Thistle Cone
  - **City of Annapolis:** Steve Carr
  - **Blacks of the Chesapeake:** Vince Leggett
  - **Adams Academy student project:** Four posters covering student restoration activities, artifact finds during restoration activities and later research on the artifacts, and a reflection board
  - **Describing the Physical and Biological Environment in College Creek; Contributions from USNA's Center for Chesapeake Bay Observation and Modeling:** Prof. Cecily Steppe, USNA
- Laura Sheldon represented the Germantown-Homewood Community.



Throughout the event, refreshments were served. Coffee was generously donated by Rick Erber, Espresso Outfitters, Inc. Coffee and donuts were served first thing in the morning, managed by Rick Erber, Claudia Donegan, and La Von Boston. During the poster session, additional refreshments were provided by Zora Lathan.

Community residents and others reconvened for the final session, which was conducted by Julie Crudele and Elizabeth Ley, who moderated and recorded comments from the audience. Comments were primarily about five topics: trash; invasive species; public access; the desire for greater assistance in acquiring native shrubs and trees from the City of Annapolis; and public awareness raising efforts and education. The majority of comments were about trash. During this session, a slide show of photos of the College Creek watershed, taken by Zora Lathan, was run in the background. It provided interesting viewing for the audience as folks made comments, and did not detract from the discussion.

In summary, the public forum was very successful, thanks to all who participated in the more than year-long process of assembling information, attending meetings, conducting surveys and monitoring, and putting together and conducting the public forum. We are very grateful to all the individuals and groups that helped FOCC advertise the event. The program presenters, poster contributors, and special assistance from La Von Boston, Bill Sanders, Ricky Meyer, Cindy Wallace, and the behind the scenes folks who could not attend, but contributed all the same, such as Peter Gray, Ginger Ellis, and others—all added up to a job well done. We thank the City of Annapolis for their participation. A special thank you to Adams Academy for their participation, including: students; principal Jeff Tillar; teachers, Monica MacDonald, Betty Griffin, and Robert Scarborough; and Theo Gray and Clarice Bridges for their tremendous assistance with setting up and rearranging afterwards. Additionally, Jen Fletcher and Peter Lampell contributed outstanding graphic design assistance to help make the program a success.

Lastly, we are very grateful to the Lower Western Shore Tributary Team for their support of the Friends of College Creek Watershed Initiative, and especially to Frank Dawson, Assistant Secretary, Maryland Department of Natural Resources, for his critical support and participation.



**CITIZENS' COMMENTS—CONCERNS IDENTIFIED BY THE COMMUNITY AT THE  
STATE OF THE COLLEGE CREEK WATERSHED PUBLIC FORUM, NOV. 3, 2007**  
Compiled by Julie Crudele and Elizabeth Ley

**TRASH**

- encourage the use of lids on recycling bins to limit wind blown trash (specifically plastic bottles which end up floating in the water)
- promote the availability of tall/large recycling bins
- provide access to trash cans on both public and private property
- emphasize personal responsibility for trash pick-up when people are out walking
- organize regular trash clean-ups for early Spring (February, March, or April)
- look at the sources of trash problems (such as special events) and consider temporary trash cans for large events such as those at the Naval Academy Stadium

**INVASIVE PLANTS**

- provide incentives for removing invasive trees
- coordinate invasive plant removal efforts with re-planting programs (under city leadership)
- explore ways to combine invasive plant removal with trash removal
- raise awareness and provide education on invasive species issues

**NATIVE PLANTS AND TREES**

- install rain gardens for stormwater management
- install a "living shoreline" similar to the St. John's project (Naval Academy)
- seek funding for a special project to grow out trees for distribution to watershed residents (Tributary Team)

**PUBLIC ACCESS**

- increase public access to College Creek
- communicate ways to utilize existing public access points to College Creek
- install signage to identify the watershed at key points

**OTHER**

- fix erosion problem at Brewer Cemetery on West Street, where the land is receding at the "valley" between it and Brewer Hill. (Comment from local resident: "Coffins are going to come through soon.")
- install a green roof on the Naval Academy library
- work with local legislators to secure funding for these projects as well as more public awareness projects about trash, invasives, etc.
- consider the Chesapeake Bay Trust for funding these projects
- conduct rain barrel sessions for Cedar Park and others
- coordinate projects with the City GreenScape program in April



## Problem Areas



5-15-07 trash by outfall in upper portion of College Creek

✓ 10-2-07 students remove several bags of trash from Adams Academy grounds



✓ 10-2-08 Ricky Meyer loads up truck with trash, metal parts...



8-25-07 several bags of bottles and cans were removed from Adams Academy grounds



9-23-07 Beth Santin and Girl Scouts remove trash from Adams Academy grounds



10-2-07 students remove several piles of trash from Adams Academy grounds



9-14-07 invasive species along Poplar Trail



9-24-07 street cave-in at Glenwood Senior Housing



9-14-07 invasive species along Poplar Trail



8-4-07 sea of impervious surface at Navy Stadium



^ 9-22-07 retaining wall at Brewer Cemetery, erosion occurring below



9-30-07 Graul's Market and parking lot, no stormwater mitigation



# Restoration Projects

5-15-07 St. John's College Living Shoreline



5-15-07 St. John's College Living Shoreline



9-30-07 St. John's College Living Shoreline by Boathouse



8-4-07 rain garden at Navy Stadium



9-30-07 St. John's College Living Shoreline



8-4-07 rain garden at Navy Stadium



8-4-07 rain garden at Navy Stadium



8-16-07 rain garden (deeper bioretention) at MD Department of Natural Resources



8-16-07 curb cut allows stormwater runoff to flow to rain garden at Navy Stadium



8-16-07 curb cut allows stormwater runoff to flow into rain garden



11-3-07 rain garden at Admiral Cleaners

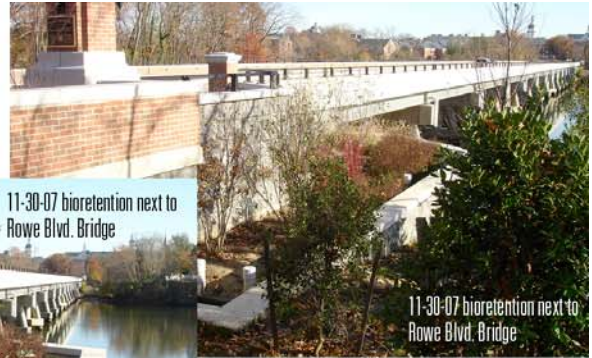


8-16-07 curb cut allows stormwater runoff to flow into rain garden





11-30-07 bioretention next to Rowe Blvd. Bridge



11-30-07 bioretention next to Rowe Blvd. Bridge

11-30-07 bioretention next to Rowe Blvd. Bridge



11-30-07 after Rowe Blvd. Bridge reconstruction



11-30-07 opposite view of bioretention next to Rowe Blvd. Bridge



9-30-07 bioretention at US Naval Academy



9-24-07 green roof on Park Place building



9-28-07 green roof on Severn Bank Building



9-28-07 green roof on Severn Bank Building



9-28-07 green roof on Severn Bank Building



9-28-07 green roof on Severn Bank Building



11-3-07 Bayscape planting at Germantown Elementary





# Chesapeake Ecology Center



9-23-06 Native Grass Garden



9-25-07 Xeriscape Garden at CEC, Adams Academy



8-16-07 Sweetbay Magnolia Rain Garden



9-1-06 Biolog Rain Garden (left)  
Bertina A. Nick Memorial Garden (right)



7-9-07 Meadow (foreground)  
Rain Gardens (background)



8-25-07 River Birch Rain Garden



7-6-07 invasive species removal



7-5-07 Meadow leading to Forest Buffer



7-6-07 invasive species removal



7-6-07 invasive species removal



10-2-07 students help with reforestation



9-21-07 beginning of reforestation