# The Effects of Retention Basins on Storm Water Quality

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# Water, Water Everywhere BUT Not a Drop to Drink!

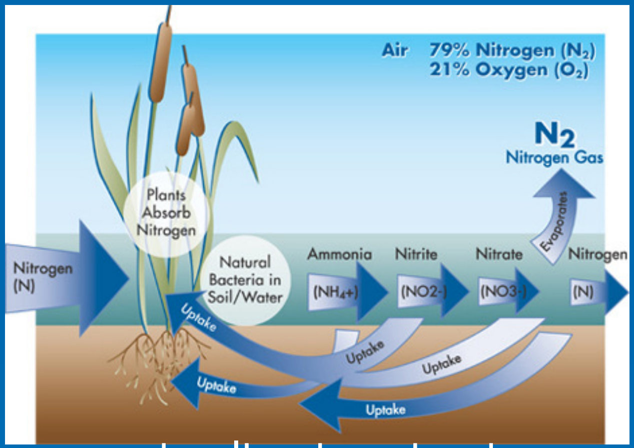
- Pollutants collect on impervious surfaces
- Rain water causes non point source (NPS) pollution by washing pollutants downstream

- Residential NPS contributes nutrient pollution in the form of nitrates, phosphates, and ammonium

- Excess nutrients lead to eutrophication downstream
  - Example - Chesapeake Bay

# The Bright Idea – Build a Retention Pond!

- Retention ponds are designed under the assumption that retention improves water quality
- Long retention times allow
  - Particle settling
  - Bio-uptake




www.naturaltreatmentsystem.org

- Removal efficiency standard
- Little work has been done to monitor water quality changes during storm events

# Research Goals

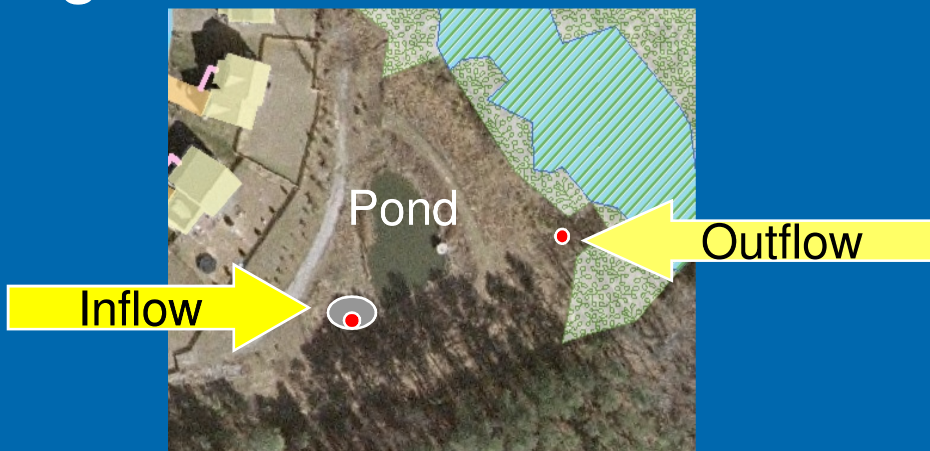
- Monitor water quality during storm periods
- Determine if retention basins improve water quality
- Calculate nutrient removal percentages

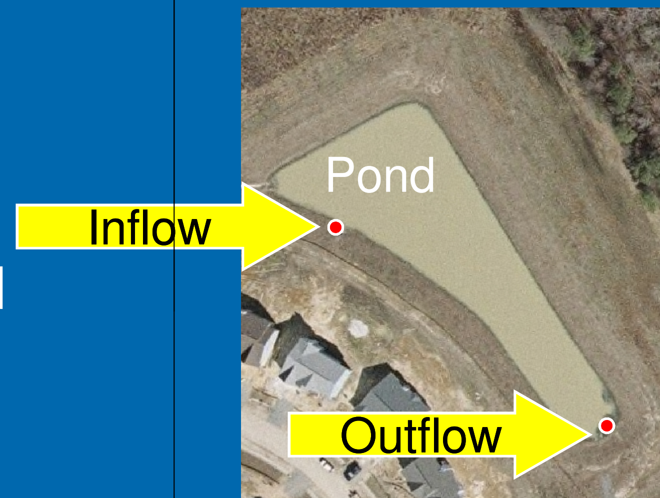
# Hypothesis

- Nutrient levels will be higher in water entering compared to water existing the retention basin.

# Data Collection Methods

Placed ISCO samplers at inflow and outflow drainages

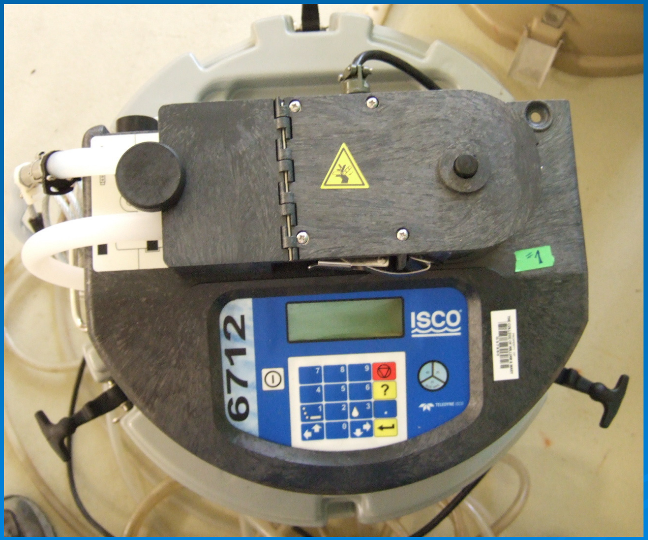




# Data Collection Methods

➢Activated ISCO's when a storm was detected.




➢Programmed to sample on 60 min. intervals

➢Except Pointe inflow on July 5, 45 min.

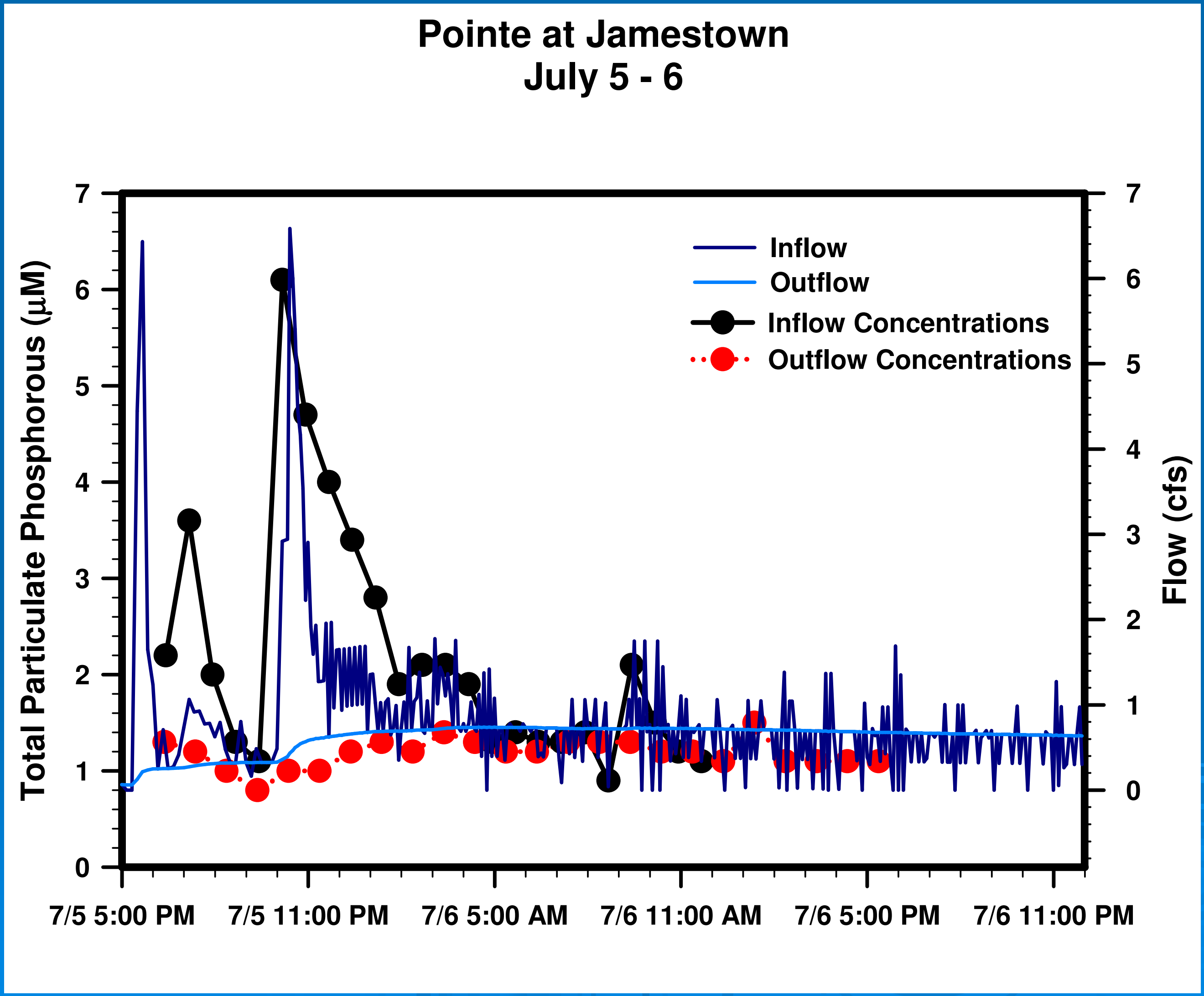
# Water Quality Parameters Investigated

- Dissolved Inorganic Phosphate (DIP)
- Total Particulate Phosphorous
- Nitrate + Nitrite
- Ammonium


A standard colormetric water analysis was completed to determine concentrations


- Conductivity – Measured with YSI 30 Probe
- Total Suspended Solids (TSS) – Measured by filtration mass method

# Results


Pointe at Jamestown
July 5 - 6
Inflow
Outflow
Inflow Concentrations
Outflow Concentrations
Total Particulate Phosphorous (µM)
Flow (cfs)
0
1
2
3
4
5
6
7
7/5 5:00 PM
7/5 11:00 PM
7/6 5:00 AM
7/6 11:00 AM
7/6 5:00 PM
7/6 11:00 PM

# Results

## Mulberry Place

| Total Particulate Phosphorous | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 20 g | 12 g | 38% |
| July 5, 2006 | 24 g | 1 g | 98% |

| Dissolved Inorganic Phosphate | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 184 g | 24 g | 87% |
| July 5, 2006 | 182 g | 95 g | 48% |

| Ammonium | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 53 g | 12 g | 78% |
| July 5, 2006 | 35 g | 36 g | No Removal |

| Nitrate + Nitrite | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 865 g | 332 g | 62% |
| July 5, 2006 | 778 g | 560 g | 28% |

# Results

## Pointe at Jamestown

| Total Particulate Phosphorous | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 36 g | 33 g | 8% |
| July 5, 2006 | 168 g | 56 g | 66% |

| Dissolved Inorganic Phosphate | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 155 g | 84 g | 46% |
| July 5, 2006 | 537 g | 72 g | 87% |

| Ammonium | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 75 g | 69 g | 9% |
| July 5, 2006 | 92 g | 80 g | 12% |

| Nitrate + Nitrite | | | |
|---|---|---|---|
| Date | In | Out | Removal |
| June 27, 2006 | 2444 g | 869 g | 63% |
| July 5, 2006 | 4099 g | 293 g | 93% |

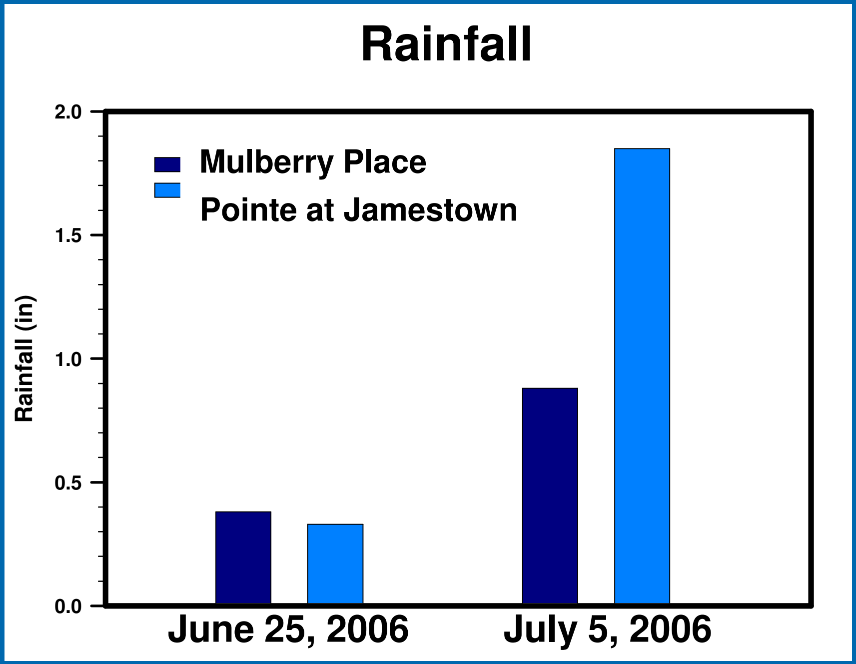
# Discussion

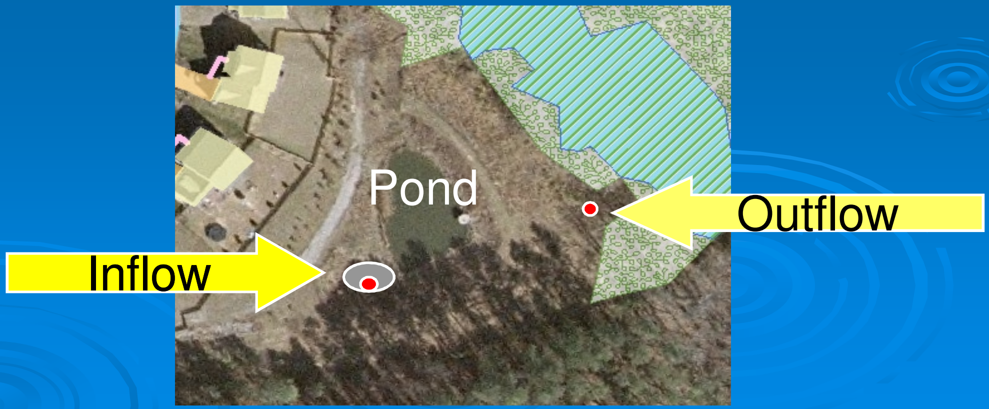
- Storms of different sizes
- No observed 1yr 24 hr. storm

- Varying retention times

- Forms of Phosphorous

- Different pond designs



# Conclusions

- Removal of nutrients is occurring in both retention ponds examined
- Removal efficiencies are variable
- Greater study of the topic is necessary

# Future Work

- Program ISCO's to activate in response to rainfall and flow

- Conduct study for greater period of time to collect data on more storms

- Monitor more retention ponds

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