Water Quality in a Retention Pond During a Storm Event

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Background Information

Retention Pond:
A pond created to “retain” the increased runoff once land is developed.

Purpose of retention ponds:
- to release the increased water volume into natural streams at a lower flow
- to reduce sediment and nutrient loads in water through sedimentation

- In James City County all land development plans are required to have a storm water management plan.
- Retention Ponds are currently the most popular management plan option.
Research Question:
Do retention ponds improve water quality during storm events?

Hypothesis:
Water quality will decrease upon entering the retention pond.
Ironbound Village Retention Pond

- Wet Pond
- New Development dominated by single family houses and small office buildings
- In the College Creek Watershed
- Built in 2001
Methods

• Collected water samples during storms using ISCO Automated Water Samplers placed at both the inflow and outflow areas.
• Inflow machines were turned on once storms were detected.
• Outflow machines were connected to flow meters.
• After storms all samples were analyzed in the lab for:
  – Conductivity
  – Fecal Coliform
  – TSS
  – Ammonium
  – Nitrate/Nitrite
  – Phosphate
Limitations

- Very little rainfall events
- Problems occurred with correctly setting up machines
- Collected concurrent inflow and outflow data for only 1 storm event at 1 retention pond
- The pond has had major design problems
Results

- Coliform tests showed NO fecal coliform present in the pond
- Conductivity of the inflow always above the outflow
- Percent organic matter show no real pattern
- Total dissolved phosphate are higher in the outflow than inflow
Suspended Sediments

Peak together
Suspended Sediments (cont.)

Quick inflow peak

Inflow brought in: 11763 g
Pond Adding: 2847 g
Outflow released: 14610 g (32 lbs.)
Ammonium
Nitrate/Nitrite

Outflow higher
HOW??

Graph showing nitrate/nitrite levels over days with peaks and troughs.
Ammonium and Nitrate/Nitrite

Inverse Oscillations

Graph showing the inverse oscillations of ammonium and nitrate/nitrite concentrations over time.
So does Ironbound work??

**NO!**

- The main purpose of retention ponds is to reduce suspended sediment loads in runoff water; however, Ironbound increases suspended sediment loads.

- The increased suspended sediments is creating nitrification in the pond.
Future Research

• Allow the study to cover a longer time period to increase the chances of more rainfall events.

• Connect the ISOCOs to rain gauges to actuate inflow samplers.

• Look at a greater number of retention ponds.
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