Anne Arundel County
Maryland

Protecting Watershed Resources and Quality through Utilization of GIS Tools and Models

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KCI TECHNOLOGIES

Project Background

- **Anne Arundel County, MD is developing a comprehensive Watershed Management Master Plan for the Severn River**
- **Project Team: CH2M HILL and KCI Technologies, Inc.**
- **Two Main Parts to project:**
  - traditional watershed management plan activities
  - development of Watershed Management Tool (WMT)
- **Focus of this presentation is on the WMT**

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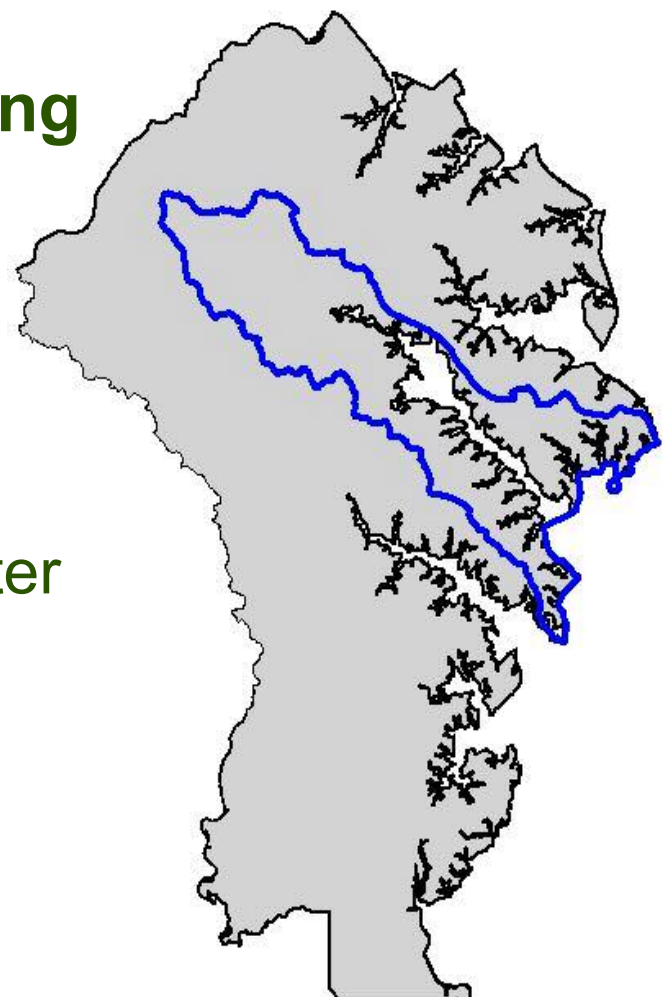
Project Area

- **Anne Arundel County, MD is feeling development pressures**
- **Severn River Watershed:**
  - includes Annapolis, USNA
  - drains to Chesapeake Bay
  - heavy reliance of community on water resources:
    - tourist industry
    - water recreation / sailing
    - fisheries



Additional Benefits of the Watershed Master Plan

- Balance environment and healthy economy
- Maintain Anne Arundel County's quality of life
- Analyze the land and watershed environments together
- Identify and protect environmentally sensitive areas

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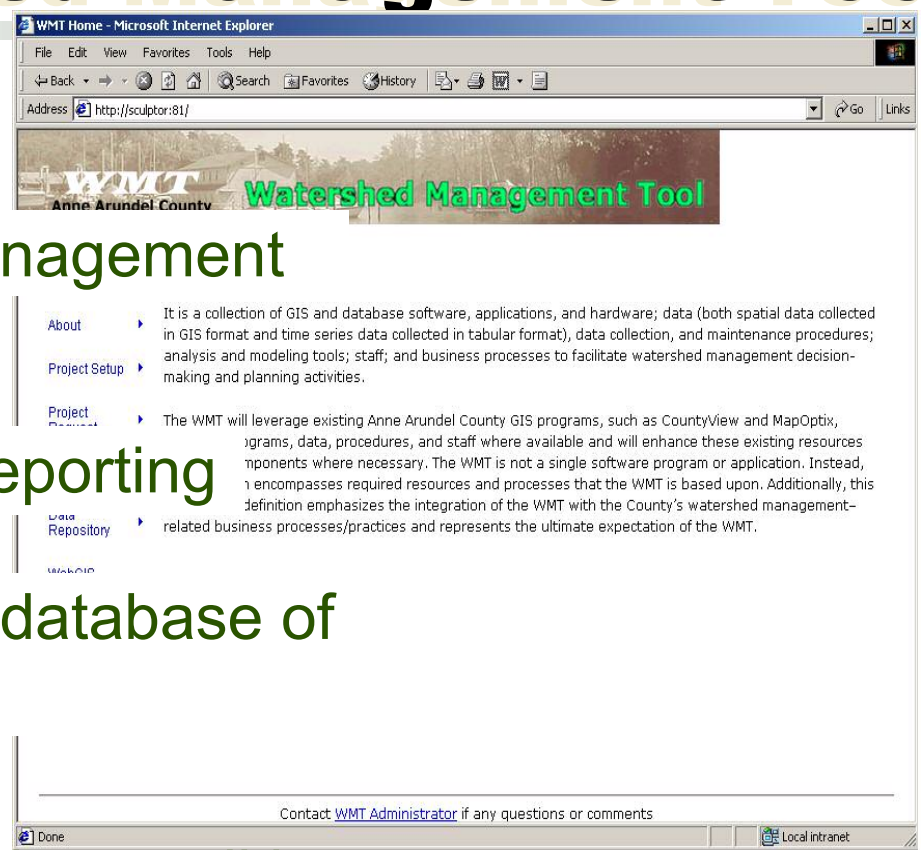
Vision

The Watershed Master Plan will provide a blueprint and tools to facilitate land use and infrastructure decisions by County Staff and Stakeholders to protect the resources of the Severn River.

Summary and Overview of Watershed Management Tool



- **Utilized for:**
  - Watershed-Based Land Management
  - Land Use Planning
  - Development Review
  - NPDES Compliance and Reporting
- **Components include:**
  - Comprehensive watershed database of GIS layers and field data
  - Visualization tool
  - Different models to assess the condition of the watershed in terms of water quality, flow regime, and habitat assessment

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Overview of Functional Components of WMT

Data Warehouse Component
Spatial and Non-spatial Databases

Database Administrators

Planning & Zoning | Inspections & Permitting | Public Works

Modeling Component
Models and Interfaces

Interfaces/Analysts

- Input Retrieval and Output Storage
- Import and Export Functions
- Model Run Control
- Result Presentation/Interpretation/Analysis

Models

- Pollutant Loading Tool
- Stream Assessment Tool
- Hydrology Models/Analysis Tool
- Hydraulic Models/Analysis Tool
- Soil Erosion Model/Analysis Tool
- Estuary Model/Analysis Tool
- Groundwater and Surface Water Interactions

Watershed Management Tool

Internal Viewing Component
Intranet MapOptix

Intranet MapOptix

With New Watershed
Data View/Query/Report Modules

Management Component
Interfaces and Administration

Data Integration

- Data Availability/Establishment
- Data Update/Monitoring

Workflow Management

- Modeling Requests
- Project Tracking and Fulfillment

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Components of the Anne Arundel County Watershed Management Tool

- **Comprehensive watershed database**
  - GIS layers
  - field inventory data
  - monitoring data
- **Visualization Tool**
  - graphical presentation of watershed info
- **Modeling Tool**
  - allows for qualitative and quantitative analyses
  - allows the reviewer to perform what-if scenarios

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Model Categories within WMT

- **Water Quality Modeling - Pollutant Loading**
  - models pollutants coming off land - runoff quality
  - PLOAD and GWLF (Generalized Watershed Loading Function)
- **Hydrologic & Hydraulic Modeling**
  - addresses flooding and changes in flow regime
  - TR-20 and HEC-RAS

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Model Categories within WMT

- **Stream Assessment**
  - predicts future stream habitat conditions
  - based on regression analyses
  - WISE (Watershed Improvements through Statistical Evaluation)
  - data visualization tool - allows querying, categorizing
  - Stream Assessment Tool
- **Groundwater / Surface Water Interactions**
  - GWLF
- **Septic System Discharges**
  - GWLF

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Stream Assessment Tool

- data visualization tool
- querying and categorizing functionality for County to use in their analyses of stream assessment and bioassessment data
- contains baseline 2002 conditions
- original version developed in ArcView 3.2 and Access 2000
- now has been migrated to ArcGIS 8.2

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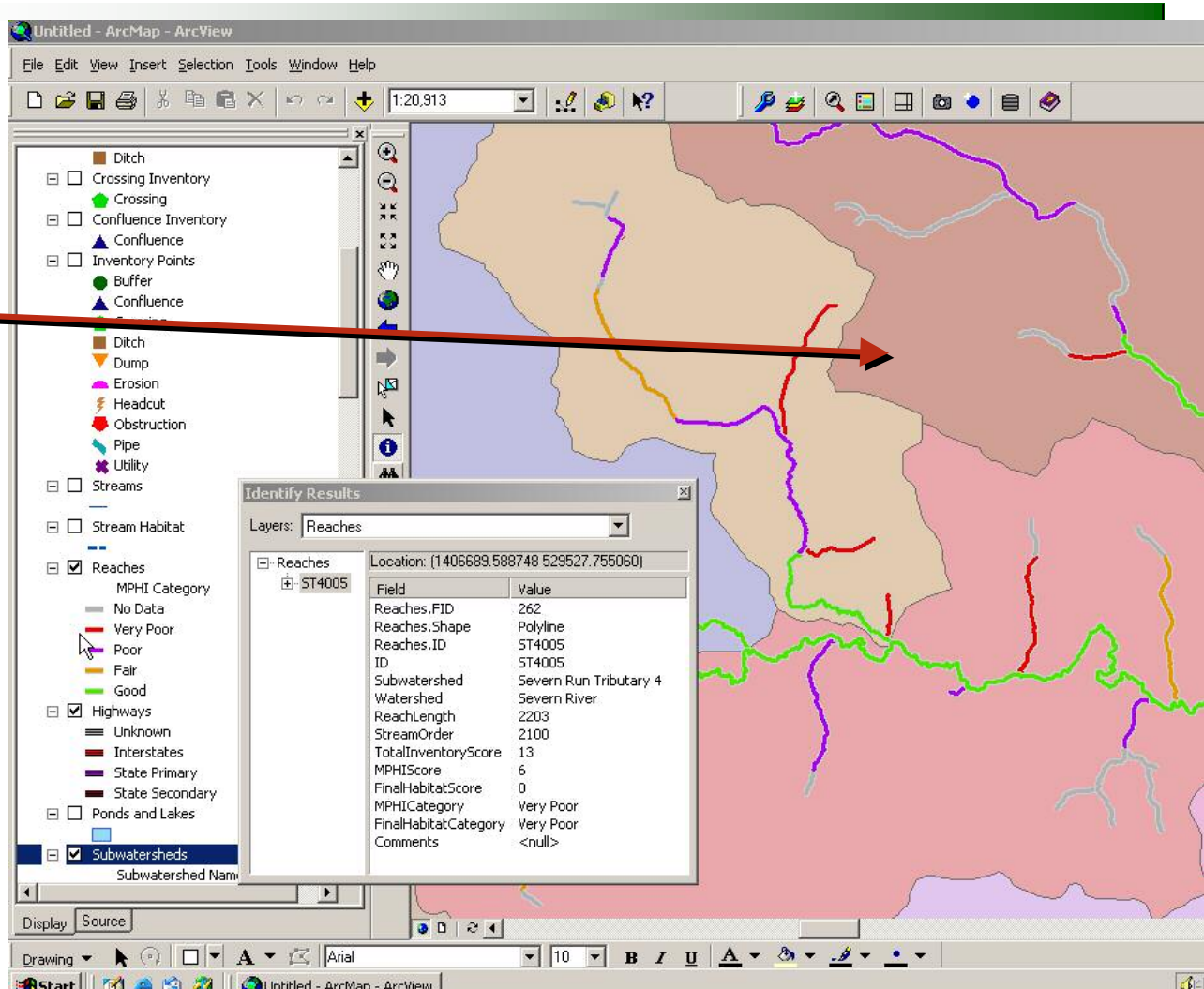
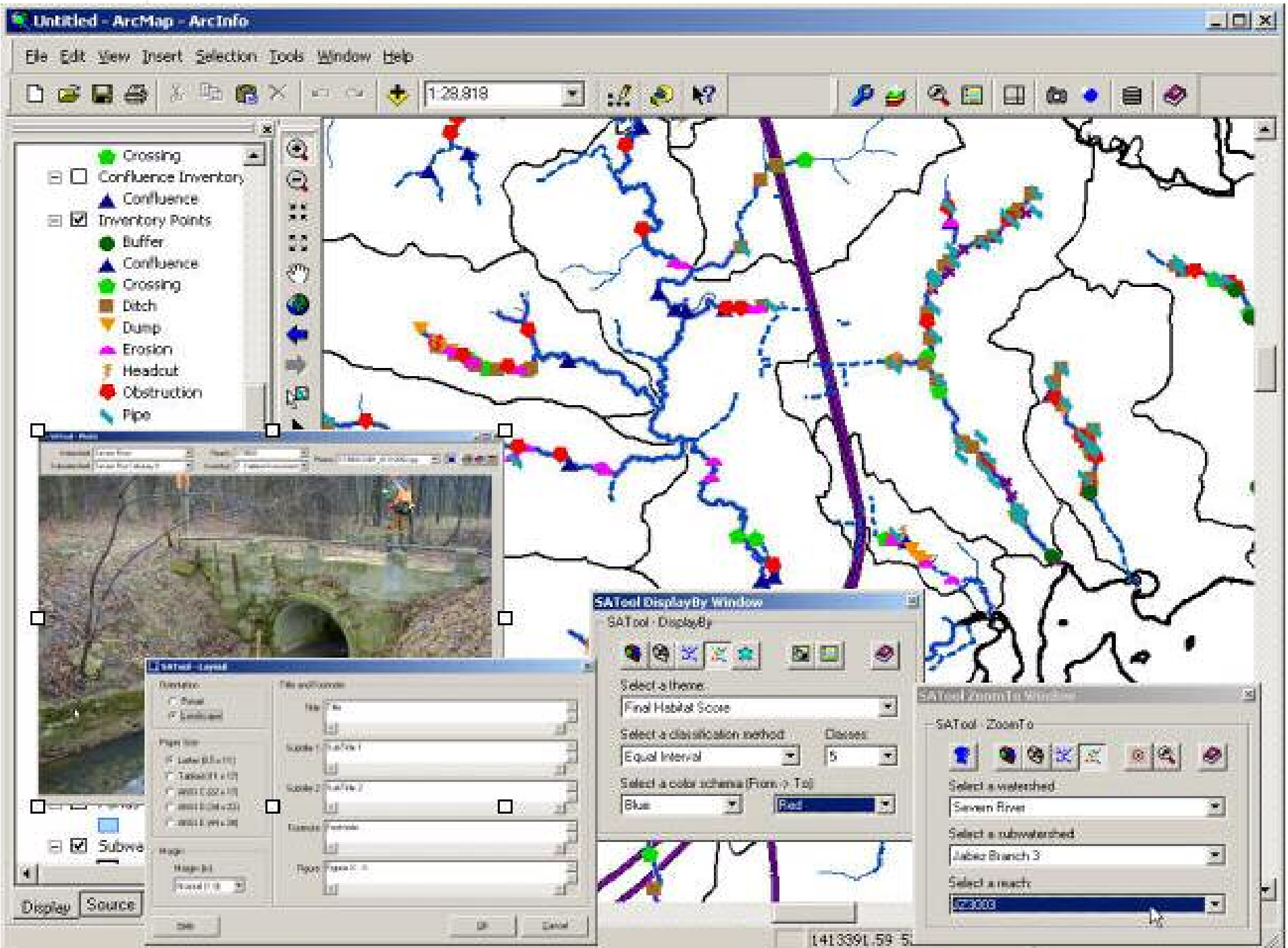
Stream Assessment Tool: Watershed Management - Data Visualization

- Assessed streams
- Classification of stream reaches by MPHI category
- Ranking of County stream reaches
- Development requirements (e.g. floodplains)
- BMP locations
- Infrastructure locations - including illicit discharges




Untitled - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
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Crossing
Confluence Inventory
Confluence
Inventory Points
Buffer
Confluence
Crossing
Ditch
Dump
Erosion
Headcut
Obstruction
Pipe
Display
Source
SATool DisplayBy Window
SATool - DisplayBy
Select a theme
Final Habitat Score
Select a classification method
Equal Interval
Classes
5
Select a color scheme (From -> To)
Blue
Red
SATool ZoomTo Window
SATool - ZoomTo
Select a watershed
Select a subwatershed
Select a reach
1413391.59

Stream Assessment Tool: Development Review

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File Edit View Insert Selection Tools Window Help

1:12,221

- Stream Assessment
  - ROSGEN Points
  - Buffer Inventory
    - Buffer
  - Headcut Inventory
    - Headcut
  - Utility Inventory
    - Utility
  - Pipe Inventory
    - Pipe
  - Obstruction Inventory
    - Obstruction
  - Erosion Inventory
    - Erosion
  - Dump Inventory
    - Dump
  - Ditch Inventory
    - Ditch
  - Crossing Inventory
    - Crossing
  - Confluence Inventory
    - Confluence
  - Inventory Points
    - Buffer
    - Confluence
    - Crossing
    - Ditch
    - Dump
    - Erosion
    - Headcut
    - Obstruction
    - Pipe
    - Utility
  - Streams

Display Source

Select By Attributes

Query Wizard...

Layer: Erosion Inventory

Method : Create a new selection

Fields:

"ID"
"ReachID"
"FieldDate"
"InventoryID"
"Bank"
"LinearFootage"
"ImpactScore"
"RestorePotential
"Comments"

= < > Like
> > = And
< < = Or
_ % ( ) Not

Unique sample values

5
7

SQL Info... Complete List

SELECT * FROM InventoryPt_v_GISErosion WHERE:

"ImpactScore" > 7

Clear Verify Help Load... Save...

Apply Close

Drawing Arial 10

Start Untitled - ArcMap - ArcView 8:24 AM

Stream Assessment Tool: Database Interface

Stream Assessment

Stream Assessment and Watershed Management Database

Reach ID: AQC002
Watershed: Seven River
Subwatershed: Asquith Creek
Reach Length (ft): 1906 Stream Order: 0500
Comment:

Reach Score | 303d Listing

Total Inventory Score: 6
MPHI Score: 85.3 Category: Good
Final Habitat Score: 82.3 Category: Good
Update Score

Habitat Assessment | Rosgen Assessment | Buffers | Confluence | Crossings | Ditches/Pipes | Dumpsites | Erosion | HeadCut | Obstructions | Utility

Date: 04/19/2002
Investigators: MJ/PNSD
Recent Weather: Rain
Current Weather: Clear
Flow Present?: yes
Habitat Assessment: yes
Why not?:
Infrastructure Inventory: yes
Why not?:
Water Quality: clear
Water Odor: none
Sediment Odor: none
Fish Presence: None
Fish Size (in):
Comments:

Aquatic Plants Area: 1-10%
Aquatic Plants Attachment: attached
Aquatic Plants Location: stream margi
Algae Cover (Slime): none
Algae Color (Slime):
Algae Cover (Filamentous): none
Algae Color (Filamentous):
Algae Cover (Floating): none
Algae Color (Floating):
Other Algae:
Bacteria Presence: light
Bacteria Character: iron flocculen
Dominant Land Use: forest
Other Land Use:

Dominant Riparian Veg.
Riparian Veg. Width (ft)
Bank Stability

Record: 1 of 1

Impact Score Report

Reporting Criteria
Watershed (one or many):
Subwatershed (none or many):

Summary Report

Reporting Criteria
Watershed (one or many):
Subwatershed (none or many):

Reach Report

Single Reach Reporting Criteria
Reach ID: 021001
Report Type: Obstructions
Date From: To:
Set From Date = To Date to report a single date.
Set blank for both From Date and To Date to report all dates.

Multiple Reaches Reporting Criteria
Watershed: Seven River
Subwatershed: Jabez Branch 1
Report Type: Habitat Assessment

Pollutant Loading Model: PLOAD

- Developed by CH2M HILL in 1999
- Now included in the EPA BASINS package - linked to ArcView 3.2
- Has been migrated to ArcGIS 8.3
- New version includes a scenario wizard and personal geodatabase to better manage the input and output data associated with a model run scenario

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Pollutant Loading Model: PLOAD

- Models runoff quality using Simple Method
- Event Mean Concentration literature review performed, MDE and NURP data used among others
- BMP point coverage developed during this project from County database
- Point source coverage developed with County and utilized EPA Permit Compliance System data
- Current conditions modeled to date, future conditions in process, then additional scenarios coordinated with County

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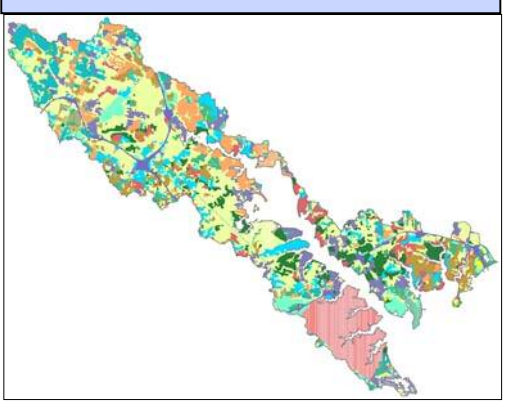
Modeling Tool: Pollutant Load Modeling

Land use



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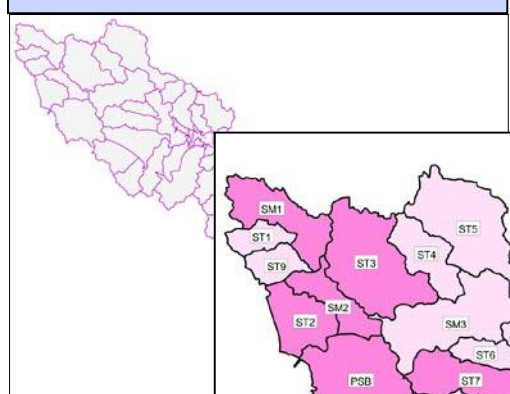
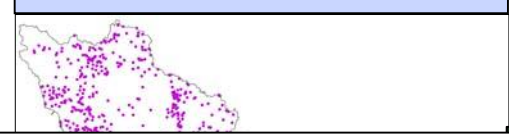
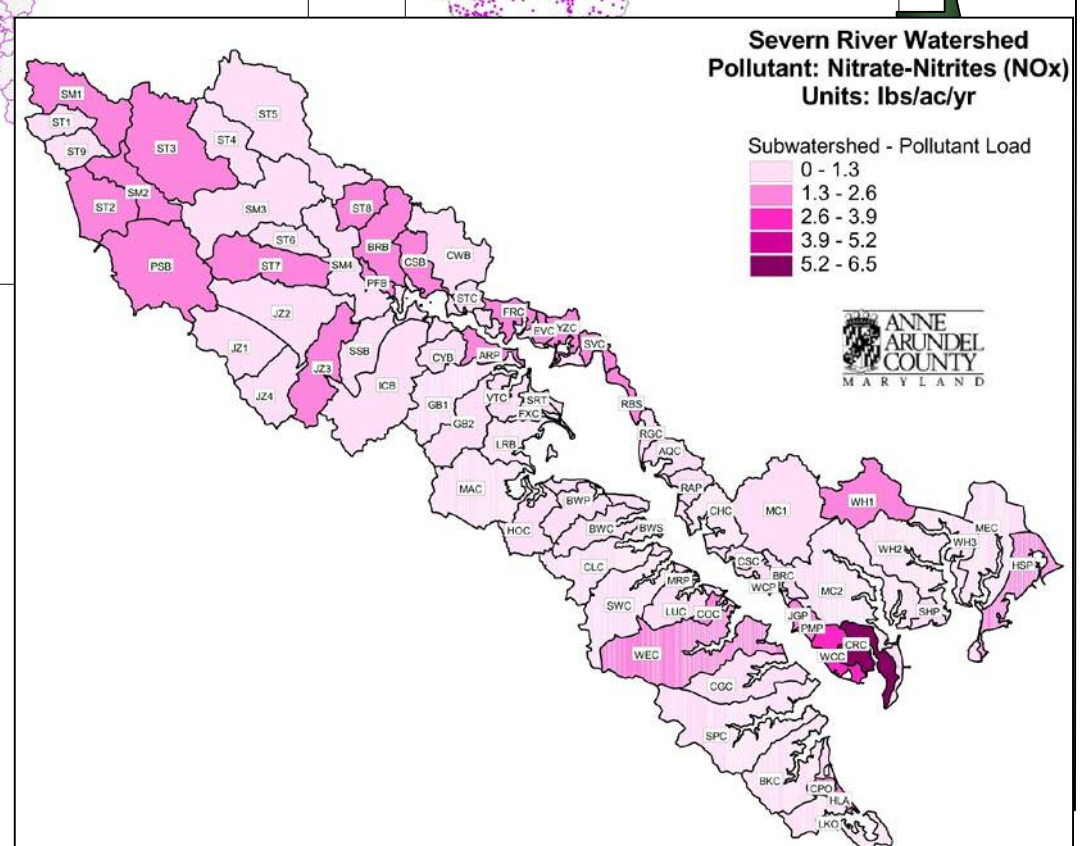
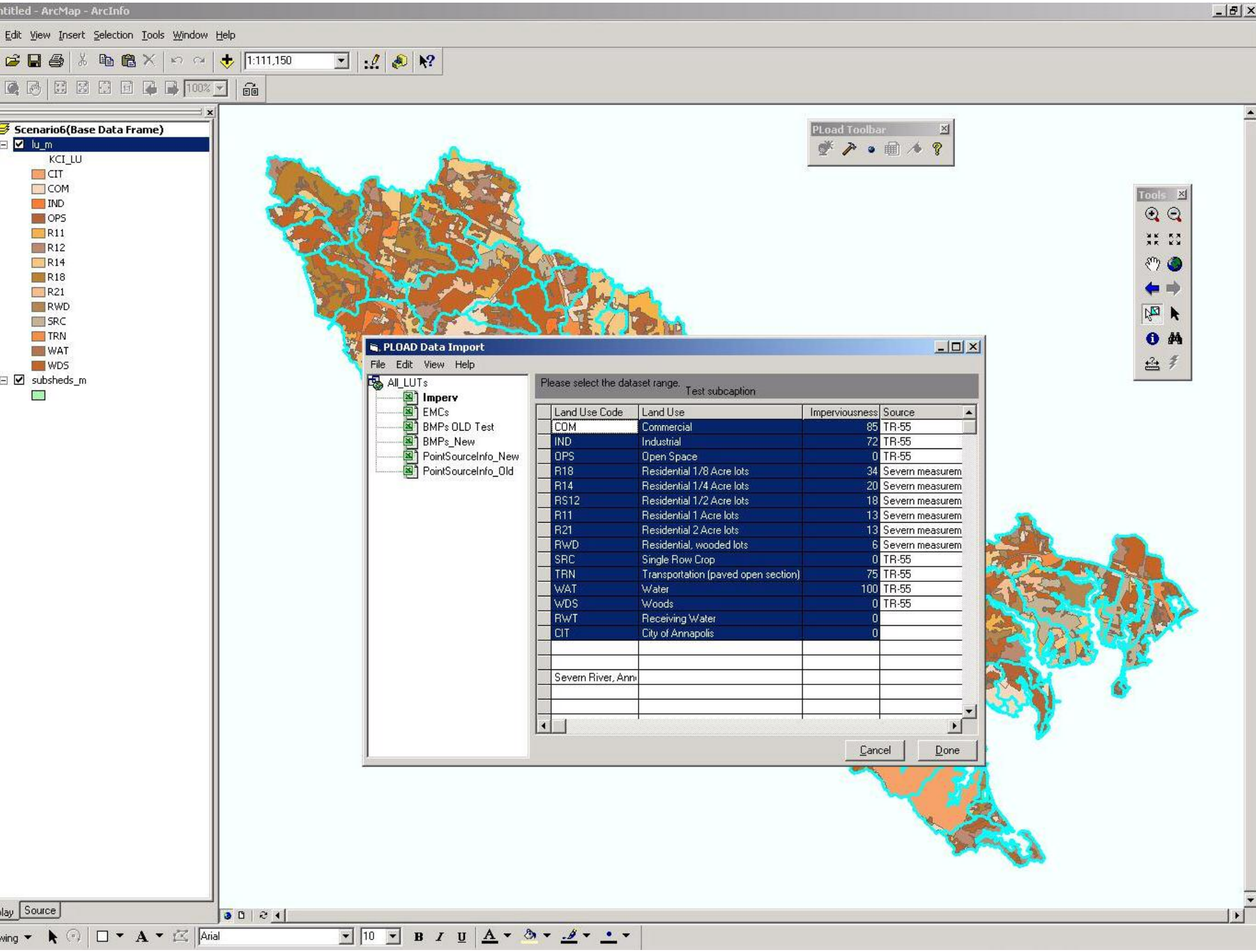
Subwatersheds



BMPs



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Scenario6(Base Data Frame)
lu_m
KCI_LU
CIT
COM
IND
OPS
R11
R12
R14
R18
R21
RWD
SRC
TRN
WAT
WDS
subsheds_m
Source
PLoad Toolbar
Tools
PLOAD Data Import
File Edit View Help
All_LUTs
Imperv
EMCs
BMPs OLD Test
BMPs_New
PointSourceInfo_New
PointSourceInfo_Old
Please select the dataset range.
Test subcaption
Land Use Code | Land Use | Imperviousness | Source
COM | Commercial | 85 | TR-55
IND | Industrial | 72 | TR-55
OPS | Open Space | 0 | TR-55
R18 | Residential 1/8 Acre lots | 34 | Severn measurem
R14 | Residential 1/4 Acre lots | 20 | Severn measurem
RS12 | Residential 1/2 Acre lots | 18 | Severn measurem
R11 | Residential 1 Acre lots | 13 | Severn measurem
R21 | Residential 2 Acre lots | 13 | Severn measurem
RWD | Residential, wooded lots | 6 | Severn measurem
SRC | Single Row Crop | 0 | TR-55
TRN | Transportation (paved open section) | 75 | TR-55
WAT | Water | 100 | TR-55
WDS | Woods | 0 | TR-55
RWT | Receiving Water | 0
CIT | City of Annapolis | 0
Severn River, Ann
Cancel
Done
Arial
10

In conclusion: General Advantages of the WMT

- Better access and use of existing mapping and related data throughout the County
- Ability to make more informed decisions
- More consistent review and analysis
- Supports existing business practices and software (MapOptix)
- Provides an overall watershed perspective
- Dynamic tool
- Win-win situation for the environment and the economy

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Questions & Answers

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