BASINS Exercise

Download BASINS Program

•Download the program files from EPA at http://www.epa.gov/waterscience/basins/b3webdwn.htm

- or -

•Order the CD from http://www.epa.gov/waterscience/basins/bsn3down.htm

BASINS Exercise

Locate Your Watershed

- Analysis on the Upper Rock Watershed in Dane County
- Determine Hydrologic Unit Code (HUC)
- Use EPA's Locate Your Watershed web page

BASINS Exercise

Locate Your Watershed

•Search By Map Command

•Choose Wisconsin

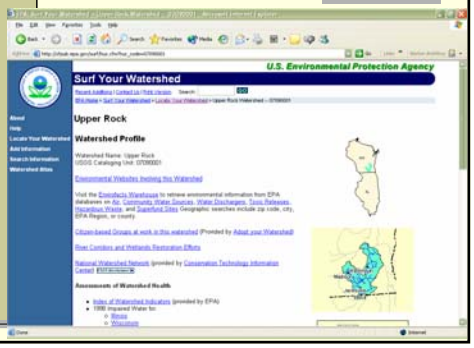
•Click on Madison area of Map

BASINS Exercise

Upper Rock Watershed Profile

•USGS Cataloging Unit (HUC) = 07090001

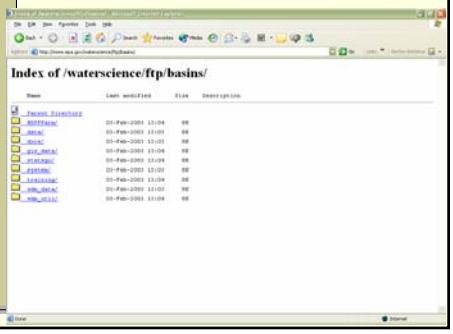
•Variety of information found for this watershed, including county data, stream flow & water use, and watershed indicators



BASINS Exercise

Download GIS Data for Watershed

•Core GIS data for this watershed is bundled and is located under the BASINS parent download directory at: http://www.epa.gov/waterscience/ftp/basins



BASINS Exercise

Download GIS Data for Watershed

•Select "GIS_Data" folder

•Select "HUC"

•Choose HUC folder for Upper Rock Watershed - "07090001"

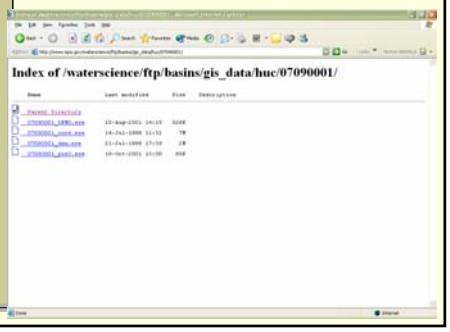
•Download each of these files & save to hard drive

•PCS=Permit Compliance System

•DEM=Digital Elevation Model

•DEMG=Digital Elevation Model Grids

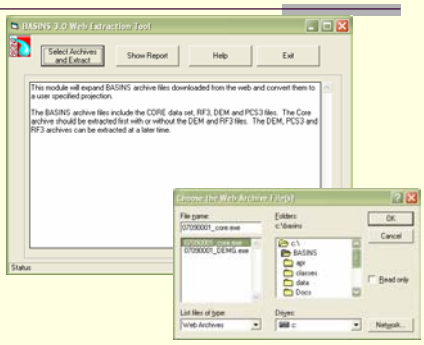
•CORE=basic watershed data



BASINS Exercise

Extract GIS Data

- Extract GIS data using BASINS 3.0 Web Extraction Tool
- Choose to extract data from "Web Archive"
- Click on the button to "Select Archives and Extract"
- Select file to Extract (core.exe first)
- A self-extracting program will run



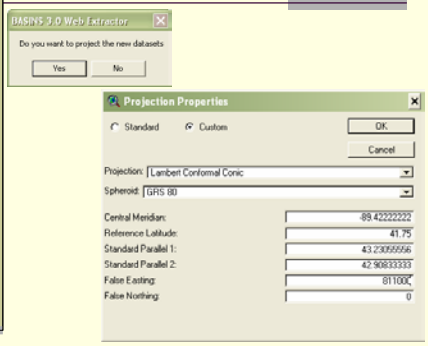
BASINS Exercise

Data Projection

•Screen to project data (useful if adding local data)

•Example - Project data to Custom Projection for Dane County Coordinates

•Choose "Custom Projection" then enter the following information into the Projection Properties windown

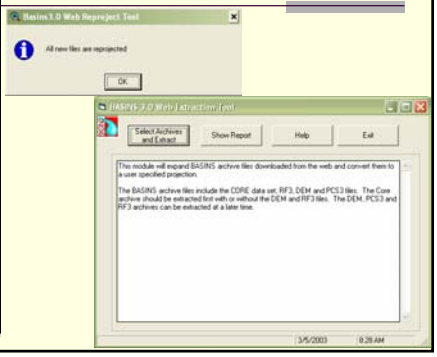


BASINS Exercise

Success

•Acknowledgement will be give when all files are reprojected

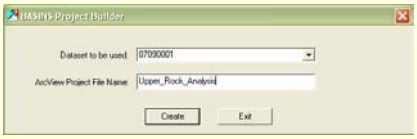
•Continue same process for other files downloaded from EPA by "Selecting Archives and Extract" button



BASINS Exercise

Create GIS Project

- Open BASINS Project Builder
- Select the Dataset to be used as the HUC for the Upper Rock Watershed: "07090001"
- Designate the ArcView Project File Name as "Upper_Rock_ Analysis"
- Press "Create" button

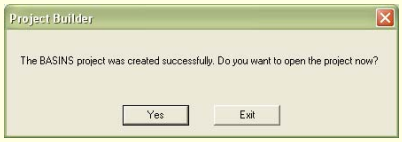


BASINS Exercise

Create GIS Project

•Message – project was created

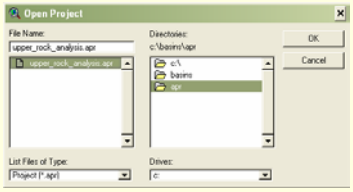
•Choose not to open project now – "EXIT"



BASINS Exercise

Build & Analyze GIS Project

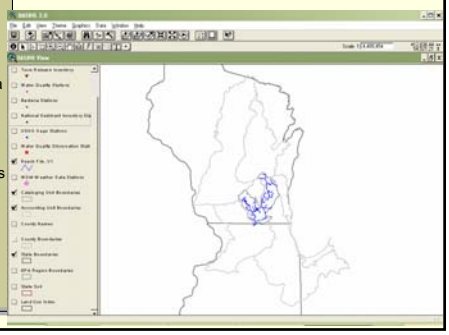
- Open BASINS Program
- Open the "Upper_Rock_ Analysis" project



Build & Analyze GIS Project

- ArcView / BASINS 3.0 will open with the data focused on the Upper Rock Watershed
- Examine the data and GIS themes that are in the project
- In most cases it is appropriate to add local data to assist with the analysis of local watersheds
- Save the Project

BASINS Exercise



BASINS Target, Assess, and Data Mining Tools

BASINS Exercise

This extension includes Target, Assess, and Data Mining tools to identify watersheds and point source discharges that are potential concerns.

TARGET is a watershed targeting tool that allows environmental managers to make a broad-based evaluation of a watershed's water quality and/or point source loadings. It operates on a large area such as a region or a state.

ASSESS operates on a single watershed (cataloging unit) or a limited set of watersheds and focuses on the status of specific water quality stations or discharge facilities and their proximity to water bodies.

DATA MINING is a tool that facilitates the building of dynamic links between the map interface and related data tables, allowing the user to visualize and retrieve BASINS water quality data, point source loading data, and bacteria monitoring station data.

TARGET Module

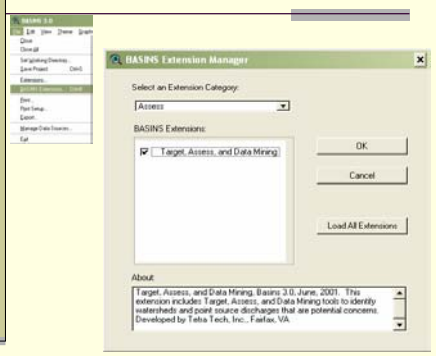
•In this example we will use the Target Water Quality command to create a view showing the 85th percentile statistical summary of mercury data collected between 1995 and 1997 for each watershed in the study area.

•Open the "BASINS Extension Manager"

•Choose the "Assess" Extension Category"

•Select "Target, Assess, and Data Mining" Extension.

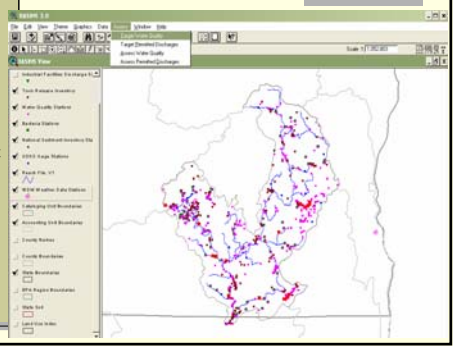
BASINS Exercise



TARGET Module

•To perform an analysis for Water Quality, navigate to "Assess" and select "Target Water Quality"

BASINS Exercise



TARGET Module

•A series of windows will appear to inquire the specifics of the analysis

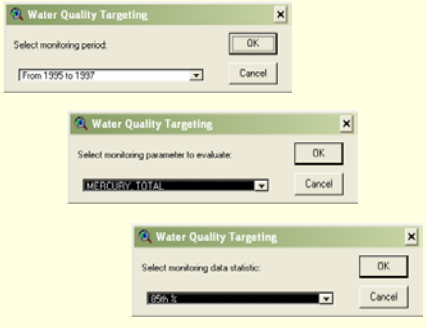
•Enter the following:

•"From 1995 to 1997"

•"Mercury, Total"

•"85th %"

BASINS Exercise



TARGET Module

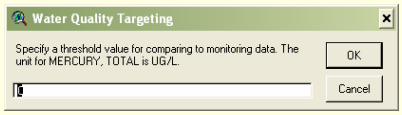
•The threshold value can be input as a regulatory water quality standard, a discharge standard, or a project-specific value

•The current or default value is zero

•The threshold value will be used to summarize the number of times the value is exceeded based on the monitoring data statistical summaries

•Click "OK" to keep the value at "0".

BASINS Exercise



Tip: Water quality criteria for selected parameters are available in BASINS under the Water Quality Criteria Lookup Table, which can be activated under the Lookup menu. See the BASINS Help for more information.

BASINS Exercise

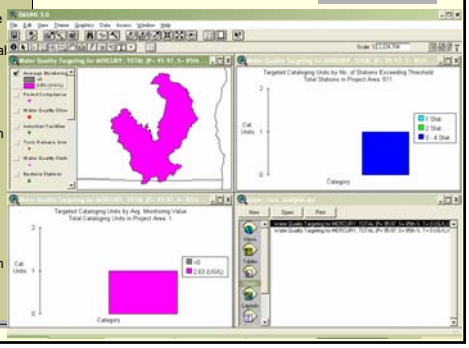
TARGET Module

•Results generated:

•1st- map with average monitoring value computed for each watershed (HUC) based on the user-specified parameter, statistical summary, & threshold value

•2nd- bar chart with distribution of cataloging units with respect to the number of stations exceeding selected threshold value

•3rd- bar chart summarizing distribution of cataloging units with respect to the average monitoring values



BASINS Exercise

ASSESS Exercise

•This example will walk through the use of the Assess Water Quality tool to create a view depicting the 85th percentile statistical summary of chloride data collected between 1995 and 1997 for the watershed in our study

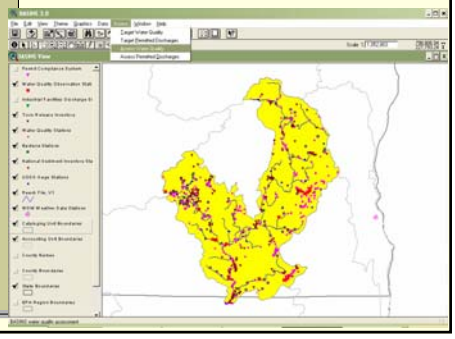
•We will also examine the use of the Assess Permitted Discharges command to identify the chloride dischargers for 1998

BASINS Exercise

ASSESS Exercise

•From the Cataloging Unit Boundaries theme, select a watershed for analysis using the Select Features button

•Under the Assess pull-down menu, select "Assess Water Quality"



BASINS Exercise

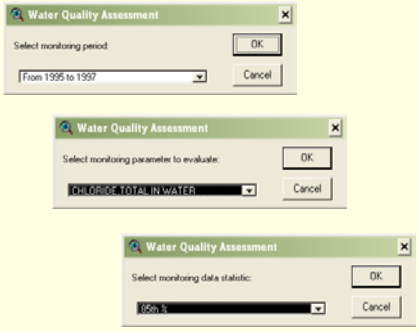
ASSESS Exercise

•In a series of window select the following:

•Monitoring period to be "From 1995 to 1997"

•Monitoring parameter to evaluate is "Chloride, Total in Water"

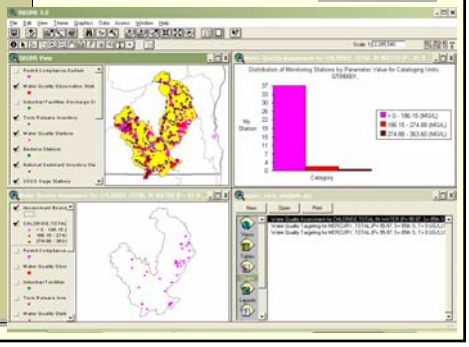
•Choose "85th %" for the "monitoring data statistic"



BASINS Exercise

ASSESS Exercise

•Two output windows will appear and summarize the results of this analysis:

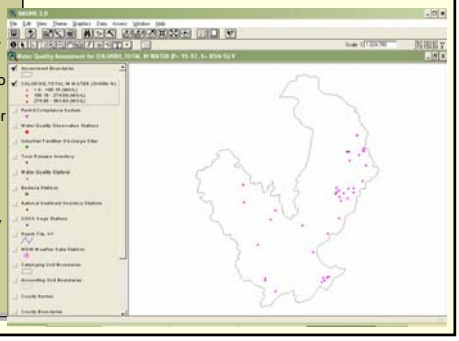


BASINS Exercise

ASSESS Exercise

Results:

•Map depicts water quality stations ranked according to the average monitoring value for the selected time period, selected water quality parameter, and corresponding statistical summary data

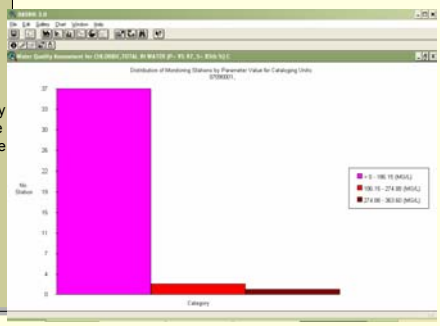


BASINS Exercise

ASSESS Exercise

Results

•Bar chart will display the distribution of the stations based on the monitoring value



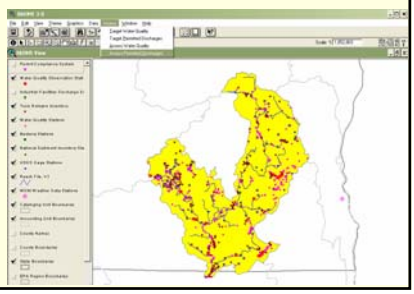
BASINS Exercise

ASSESS Exercise

•Return to the "BASINS View"

•From the Assess pull-down menu, select "Assess Permitted Discharges"

Tip: Use overlays of other BASINS data layers (e.g., land use, Permit Compliance System) to establish a preliminary relationship between in-stream water quality conditions and other upstream sources.

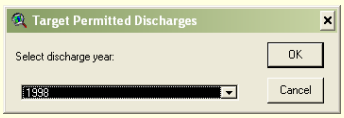


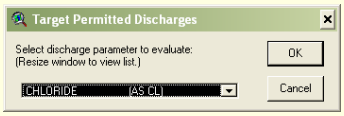
BASINS Exercise

ASSESS Exercise

•In the series of windows that follows, select the "discharge year" as "1998"

•Choose the "discharge parameter to evaluate" as "Chloride"

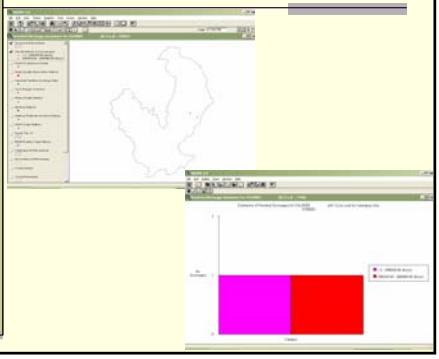




BASINS Exercise

ASSESS Exercise

•Examine the map and table which summarize the results of this analysis



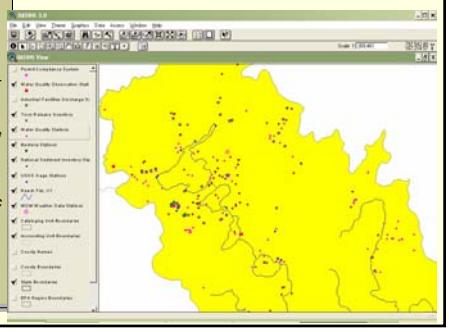
BASINS Exercise

DATA MINING Exercise

•This exercise will demonstrate how to do a simple analysis of water quality stations at a site-specific level

•Highlight the "Water Quality Station" theme
(A similar analysis can be done for the Bacteria Station, or Permit Compliance System themes)

•*Zoom into a specific project site area- far enough so that individual water quality stations can be identified*



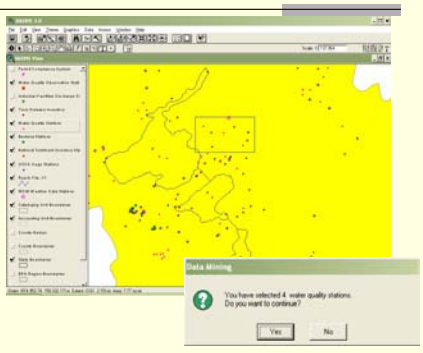
BASINS Exercise

DATA MINING Exercise

•Using the Data Mining Feature tool button, create a box around water quality stations to be analyzed
(Note: The Data Mining Tool can operate on an unlimited number of monitoring stations, it is best to limit the selected stations to a reasonable number to maximize the functionality of the tool)

•Data Mining Tool will determine the number of water quality stations that you have selected

•Click "Yes" to confirm and continue



BASINS Exercise

•Data Mining will build relational data tables that correspond to the selected stations

•The following tables and maps will be linked:

- ▪Water Quality Station Table
- ▪Water Quality Parameter Table
  - ▪Water Quality Data Tables (one table for each statistical summary table)
- ▪Water Quality Data Mining

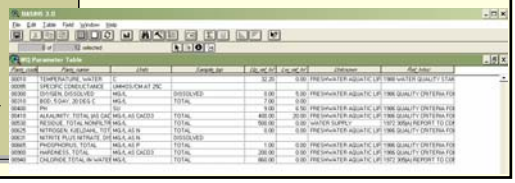
DATA MINING Exercise

BASINS Exercise

•Inside look at Water Quality Station Table

and

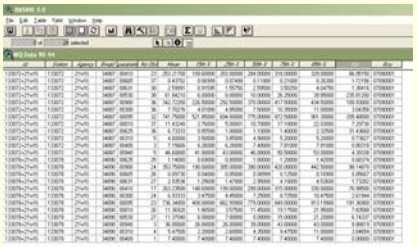
•Inside look at Water Quality Parameter Table



BASINS Exercise

DATA MINING Exercise

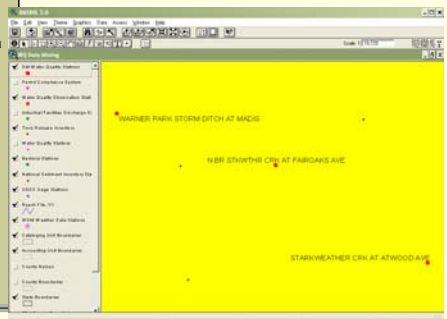
•Water Quality Data Table for 90-94



BASINS Exercise

DATA MINING Exercise

•Water Quality Data Mining View



BASINS Exercise

DATA MINING Exercise

Data Mining analysis of bacteria stations will generate a similar set of tables with bacteria data. PCS Data Mining analysis will generate up to six permitted discharges data tables for the years 1991 through 1996 that include annual loading rates.

Tip: Only the data tables that contain data for the selected station(s) or facilities will be displayed. For example, if water quality data are available for only 1975 to 1989 for the selected station(s), only three water quality data tables will be displayed in the Data Mining results (1975-1979, 1980-1984, and 1985-1989).

Tip: Data tables and maps generated by Data Mining will be overwritten every time this function is run; therefore, the results will not be permanently saved when the project is saved.

BASINS Exercise

BASINS Lookup Extension

The Lookup Module includes interpretive information for water quality criteria, SIC (Standard Industrial Classification) codes, STORET agency codes, and projection parameters.

The lookup table of water quality criteria provides key threshold values that are useful in using the TARGET tool.

The lookup table for the map projection is a helpful reference to determine the map projection parameters.

The agency codes lookup table assists in the identification of the source of BASINS monitoring data.

The SIC codes lookup table is a useful reference to identify the classification of a point source discharger.

BASINS Exercise

BASINS Lookup Extension

•For this example we will simply look at the projection parameters lookup table

•Open BASINS Extension Manager

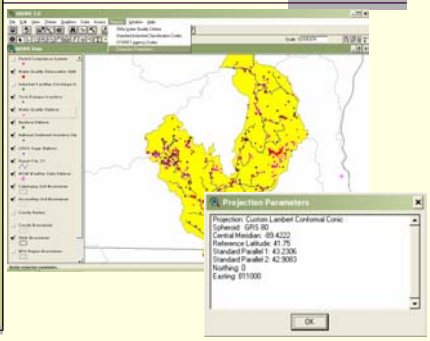
•Under the "Reports" Category" select the "Lookup" Extension

BASINS Exercise

BASINS Lookup Extension

•Click on "Reports" then select "Projection Parameters"

•A window will appear identifying the parameters of the data projection. Click "OK" when finished viewing.



BASINS Exercise

BASINS Report Extension Without Spatial Analyst

BASINS Watershed Report Extension (option that does not Require Spatial Analyst) includes the following reports: Point Source, Water Quality, TRI Air Emission Land Use Distribution, State Soil Characteristic, and Watershed Topographic Reports.

(Note: One version of the Watershed Report Extension requires Spatial Analyst. This extension includes land use distribution and topographic reports for watersheds. Spatial Analyst is required to run these reports.)

In this example we will examine the Point Source Inventory Report.

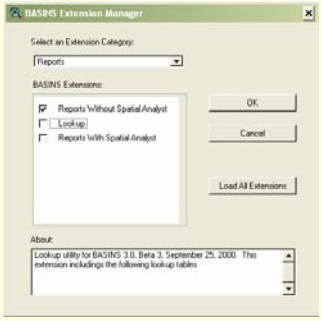
This report provides a summary of discharge facilities in a given watershed. The report relies on the EPA Permit Compliance System (PCS) database to identify permitted facilities in the selected study area and summarizes their discharge loading for a given pollutant. A discharge loading summary is provided for a given year.

BASINS Exercise

Report Without Spatial Analyst

•Open BASINS Extension Manager

•Choose "Reports" and select the "Reports without Spatial Analyst" Extension



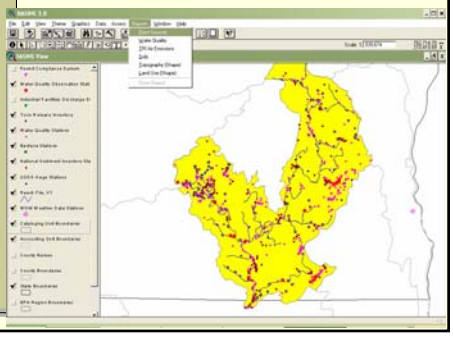
BASINS Exercise

Report Without Spatial Analyst

•In the "BASINS View" window, select the watershed for which the Point Source Inventory Report is being created

•Be certain the "Cataloging Unit Boundaries" is active (highlighted) then use the Select Features tool

•Under the Report pull-down menu, select "Point Sources" command



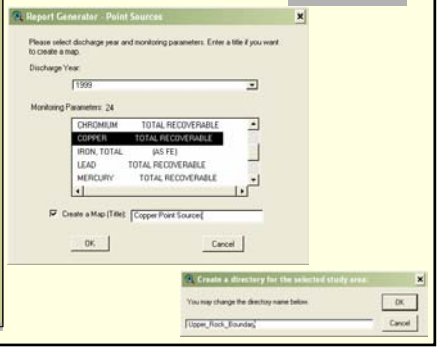
BASINS Exercise

Report Without Spatial Analyst

•A "Report Generator" window will appear

Enter the Following:
•"1999"
•"Copper"
•Set the "Map (Title)" as "Copper Point Sources"

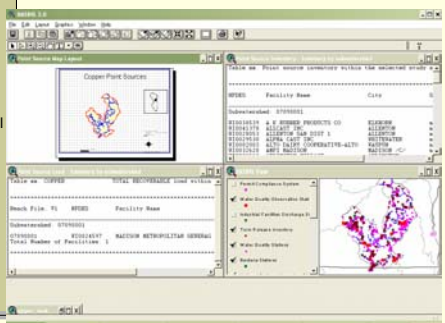
•Create a directory called "Upper_Rock_ Boundary"



BASINS Exercise

Report Without Spatial Analyst

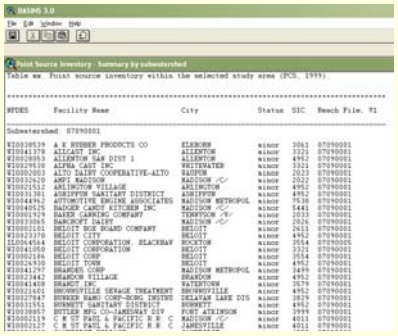
•The Point Source Inventory Report will generate two tables and a map layout



BASINS Exercise

Report Without Spatial Analyst

•The first table, "Point Source Inventory - Summary by subwatershed" provides a list of all discharge facilities within the watershed and corresponding information such as location (city, subwatershed, and reach number), status (major vs. minor facility), and Standard Industrial Classification (SIC) number.



BASINS Exercise

Report Without Spatial Analyst

•The second table, "Point Source Load - Summary by subwatershed," provides the list of discharge facilities that actually discharged the selected pollutant for the selected year

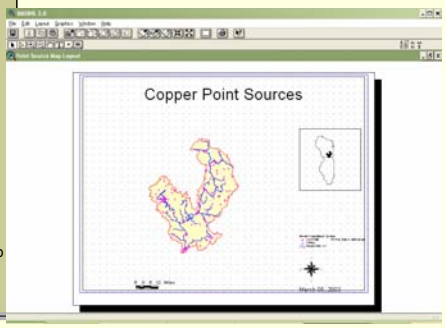
BASINS Exercise

Report Without Spatial Analyst

•The map layout details the locations of all discharge facilities within the watershed

•Unique map symbols distinguish the facilities that discharged the selected pollutant for the given year, from those facilities that did not

•The Reach File network is also depicted on the map for reference purposes

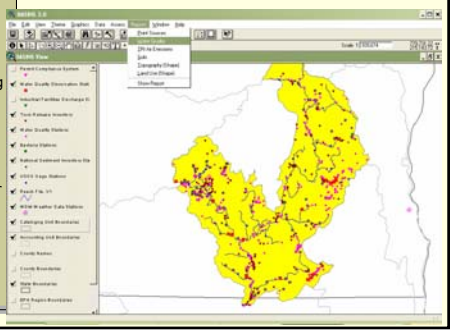


BASINS Exercise

Report Without Spatial Analyst

•Select the Upper Rock Watershed from the "Cataloging Unit Boundaries" theme

•Under the "Reports" pull-down menu, select "Water Quality"



BASINS Exercise

Report Without Spatial Analyst

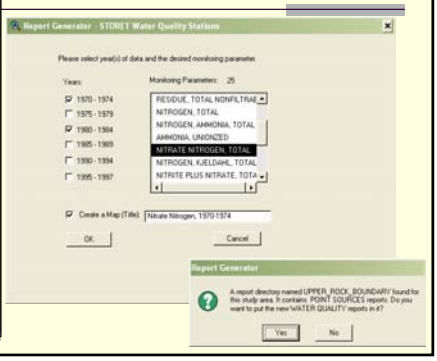
•The "Report Generator" screen will appear

•Select the years "1970-1974"

•Choose "Monitoring Parameters" as "Nitrate Nitrogen, Total"

•"Create the Map Title" as "Nitrate Nitrogen, 1970-1974"

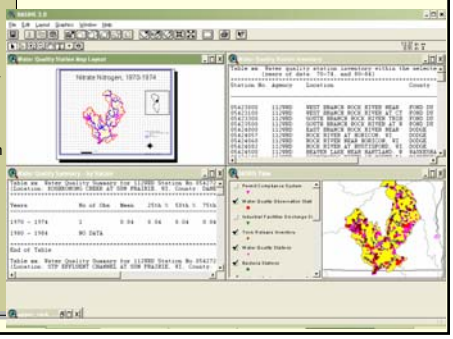
•Another "Report Generator" screen will be displayed - Click "Yes"



BASINS Exercise

Report Without Spatial Analyst

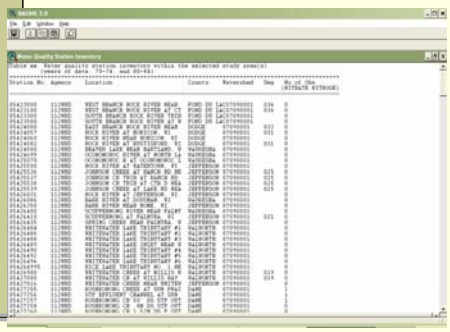
•Examine the Water Quality Station Inventory table, the Water Quality Summary by Station table, and the Map Layout



BASINS Exercise

Report Without Spatial Analyst

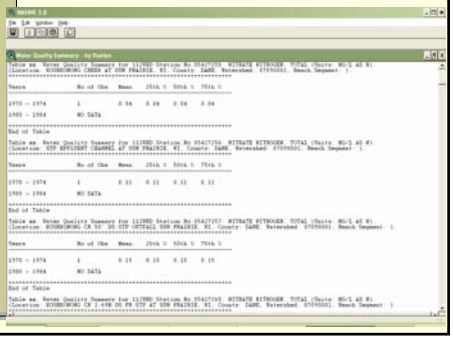
•A closer look at the Water Quality Station Inventory table



BASINS Exercise

Report Without Spatial Analyst

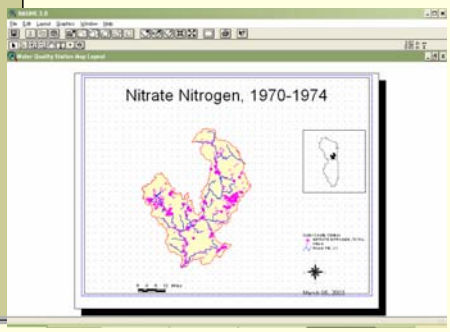
•A closer look at the Water Quality Summary by Station table



BASINS Exercise

Report Without Spatial Analyst

•The Map Layout



Other BASINS Features

PLOAD Extension

•A Tool for Estimating Non-Point-Source and Point-Source Pollutant Runoff

PLOAD estimates nonpoint loads (NPS) of pollution on an annual average basis, for any user-specified pollutant.

The user may calculate the NPS loads using either the export coefficient or the EPA's Simple Method approach.

Optionally, best management practices (BMPs), which serve to reduce NPS loads, and point source loads may also be included in computing total watershed loads.

Finally, there are several product alternatives that may be specified to show the NPS pollution results as maps and tabular lists, and to compare multiple sessions.

Other BASINS Features

PLOAD Extension

•A Tool for Estimating Non-Point-Source and Point-Source Pollutant Runoff

The PLOAD application requires pre-processed GIS and tabular input data as listed below:

- GIS land use data
- GIS watershed data
- GIS BMP site and area data (optional)
- Pollutant loading rate data tables
- Impervious terrain factor data tables
- Pollutant reduction BMP data tables (optional)
- Point source facility locations and loads (optional)

PLOAD was designed to be generic so that it can be applied as a screening tool in a wide range of applications including NPDES stormwater permitting, watershed management, or reservoir protection projects.

Its organization and structure of the application facilitates modification and customization. It was designed to be an analytical tool for end users. *(BASINS 3.0 documentation)*

BASINS Exercise

Manual Watershed Delineation Extension

This extension provides a set of tools for manually delineating and editing watershed subbasins, stream networks and outlets.

These themes can be used as input to models.

BASINS Exercise

Automatic Delineation Extension

This extension provides a set of tools for automatic (based on DEM) delineating and editing watershed subbasins, stream networks and outlets.

These themes can be used as input to models. This extension requires Spatial Analyst Extension ver.1.1 or later.

BASINS Exercise

LandUse, Soils Class, and Overlay Extension

This extension provides a set of tools for reclassifying and overlaying land use and soil themes.

The overlay is applied over boundary theme (subbasin theme).

The overlay result allows user to determine soil and land use combination for each subbasin.

This extension requires Spatial Analyst Extension ver.1.1 or later.

BASINS Exercise

LandUse Reclassify Extension

This extension provides a tool to reclassify land use shape themes based on user selections.

BASINS Exercise

Grid Projector Extension

This extension provides a set of tools for reprojecting and datum converting grid data.

This extension requires Spatial Analyst Extension ver.1.1 or later.