

Atkins BMP Assessment Tool

Presented by:

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Maryland Association of Floodplain and Stormwater Managers

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What are BMPs?

Best Management Practices focused on Stormwater Control



Many Different Types



Dripline Trench



Rain Garden



Baffled Trench



Retaining Wall

Atkins Stormwater Technologies

ATKINS Stormwater Data Collection System™

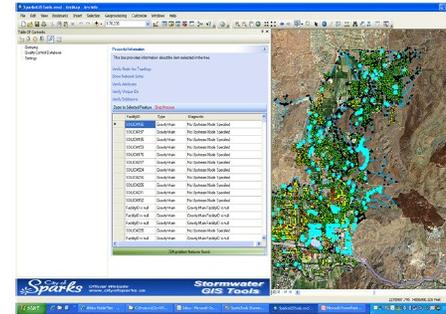
Show inspections with pending lab results Show inspections with completed lab results (for reporting) Logout

Inspection Id	Datashet No	Screening Date	Structure Number	Client City	Client State	Inspector Name
118	802	06/05/2013	4557	Marietta	GA	Joseph Lamberti
119	804	06/05/2013	1279	Marietta	GA	Joseph Lamberti
120	800	06/05/2013	1239	Marietta	GA	Joseph Lamberti
121	999	12/03/2013	223	Smyrna	GA	Joseph Lamberti
122	998	12/03/2013	1245	Smyrna	GA	Joseph Lamberti
123	997	12/03/2013	342	Marietta	GA	Joseph Lamberti
126	800	05/06/2014	127104	Marietta	GA	Joseph Lamberti
127	803	05/06/2014	40871	Marietta	GA	Joseph Lamberti
128	808	05/06/2014	42502	Marietta	GA	Joseph Lamberti
129	800	05/06/2014	412	Smyrna	GA	Joseph Lamberti



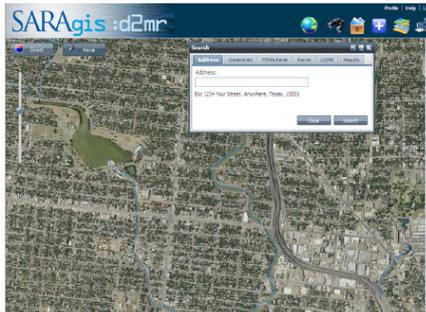
Stormwater DCS

for data collection at regulated stormwater outfalls
Multiple Municipalities, Atlanta GA



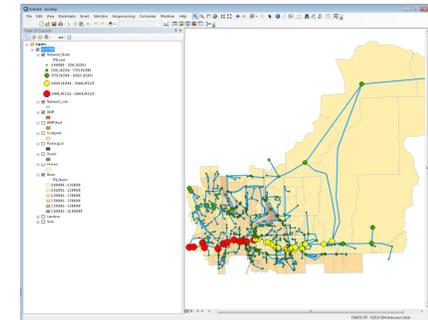
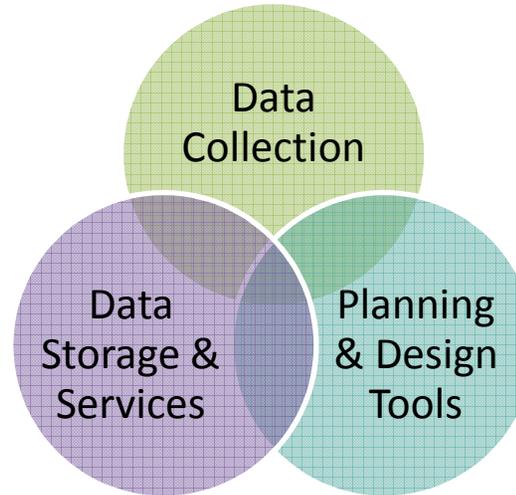
Sparks Tools

for stormwater system advanced querying and quality control
City of Sparks, NV



D2MR

for flood model storage
San Antonio River Authority (SARA)

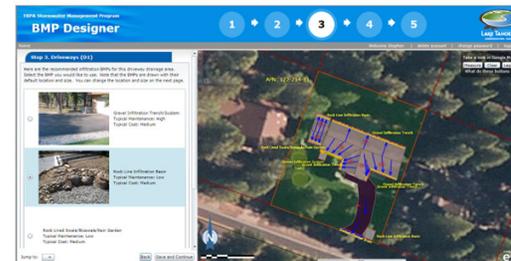


BMP Assessment Tool

a community-scale planning tool for stormwater pollution assessment and prevention
City of Bonita Springs, FL

M3

for flood model storage
Harris County Flood Control District



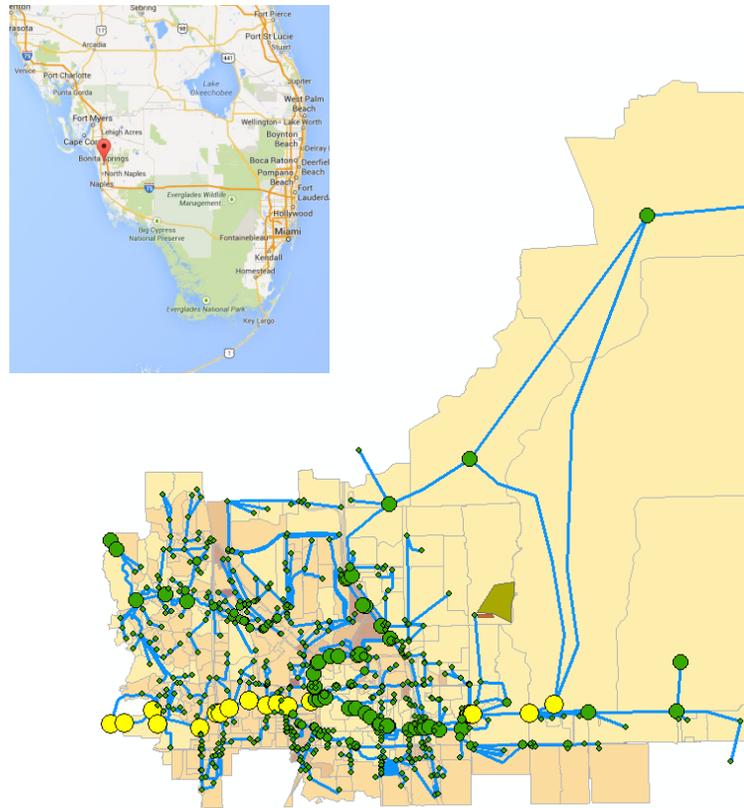
BMP Designer

for residents to design BMP retrofits
Tahoe Regional Planning Agency

BMP Assessment Tool (BAT)

Objective

Tool that estimates pollutant levels throughout stormwater system under different BMP Scenarios

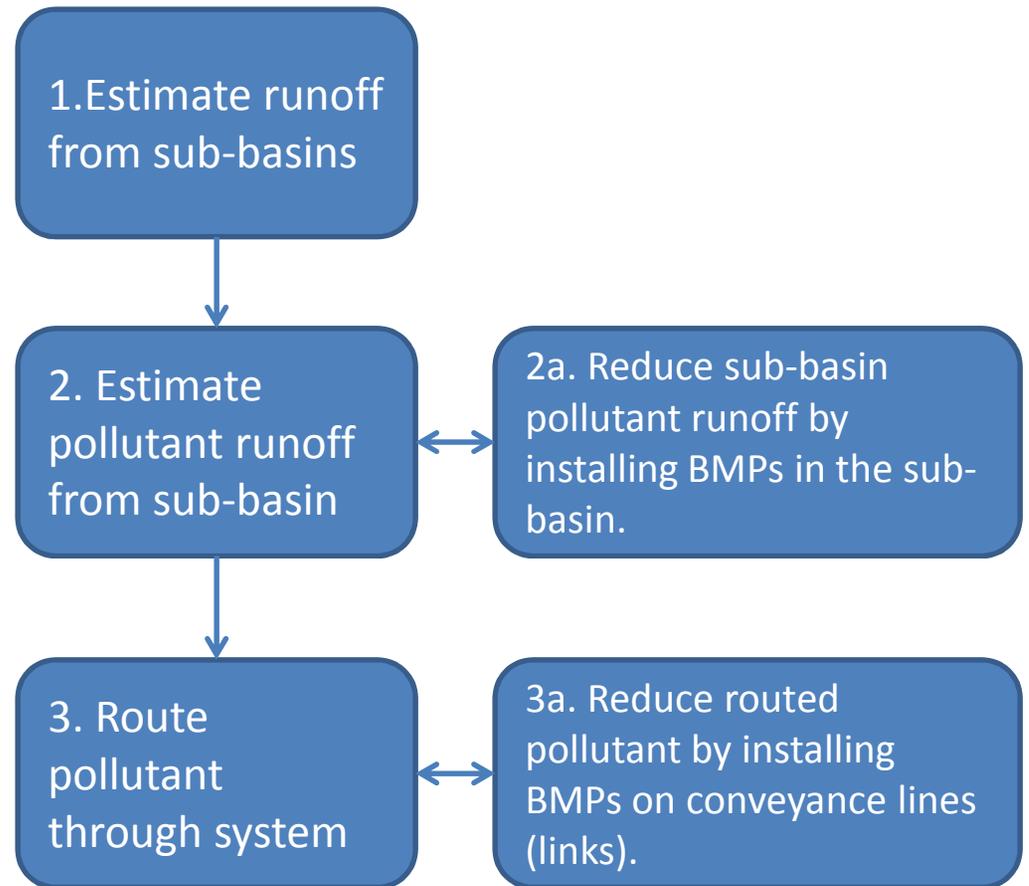
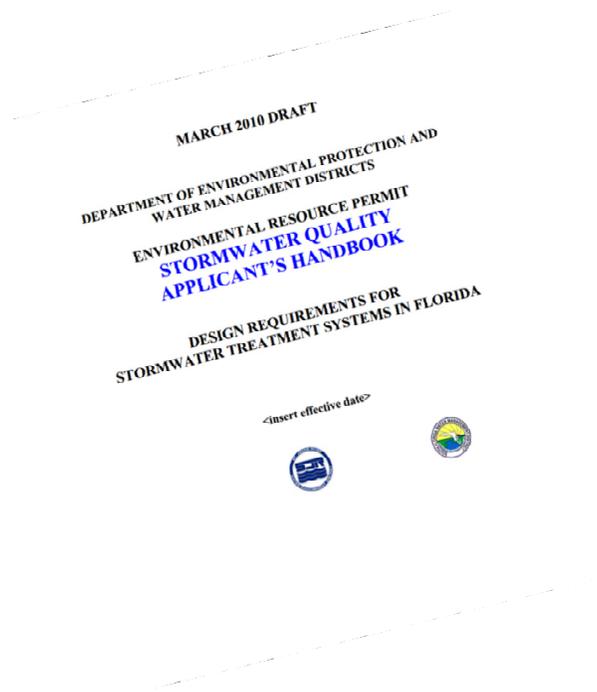


City of Bonita Springs, Florida

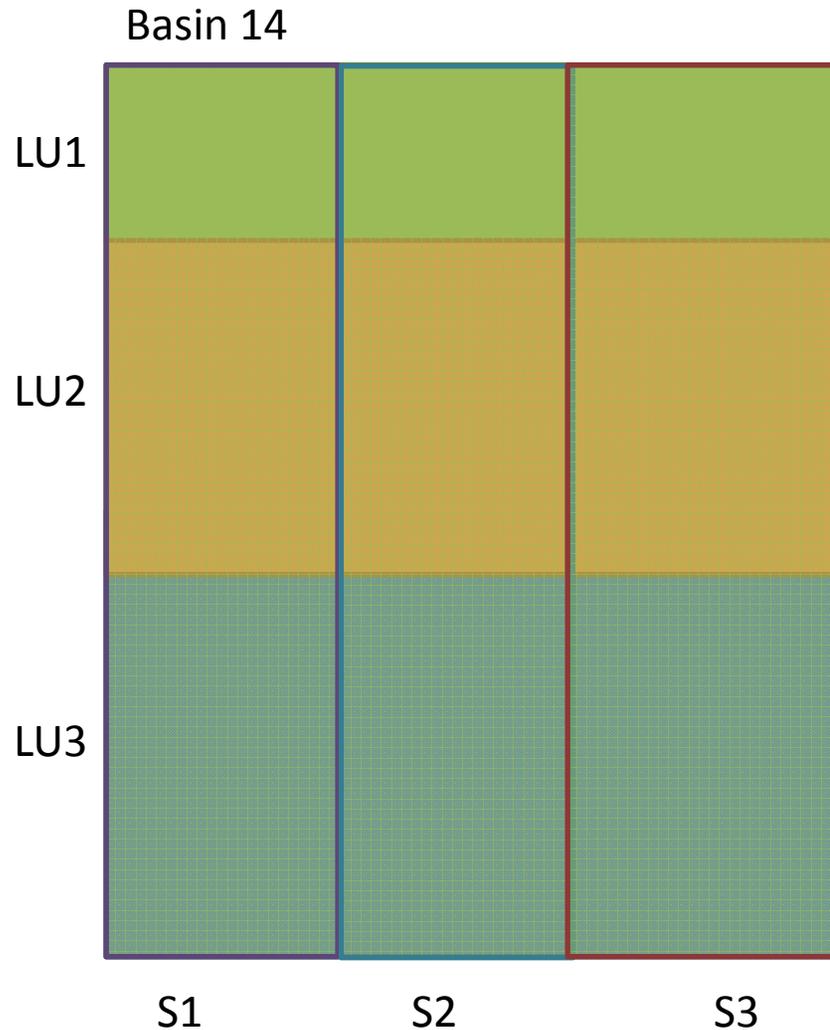
Basic Procedure for Estimating System-wide Stormwater Pollutant

Regulated by Florida Dept. of
Env. Protection (FLDEP)

2010 Stormwater Rule



Estimating Runoff from a Basin



1. For each land use (LU)

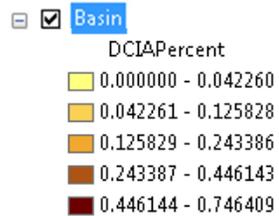
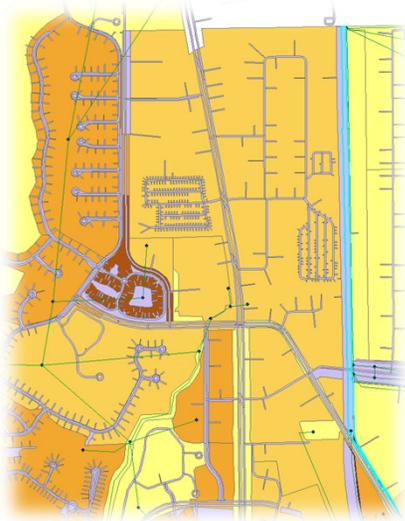
- Evaluate composite Curve Number (CN) over all soil types
- Evaluate DCIA (directly connected impervious area)
- C = lookup (composite CN and DCIA)
- Runoff = Area * AAR * C
- Evaluate total nitrogen (TN) and total phosphorus (TP) pollutant using literature conversion factors (e.g. single family residential, TN = 1.5 mg/l)

2. Basin runoff = Sum (LU Runoff)

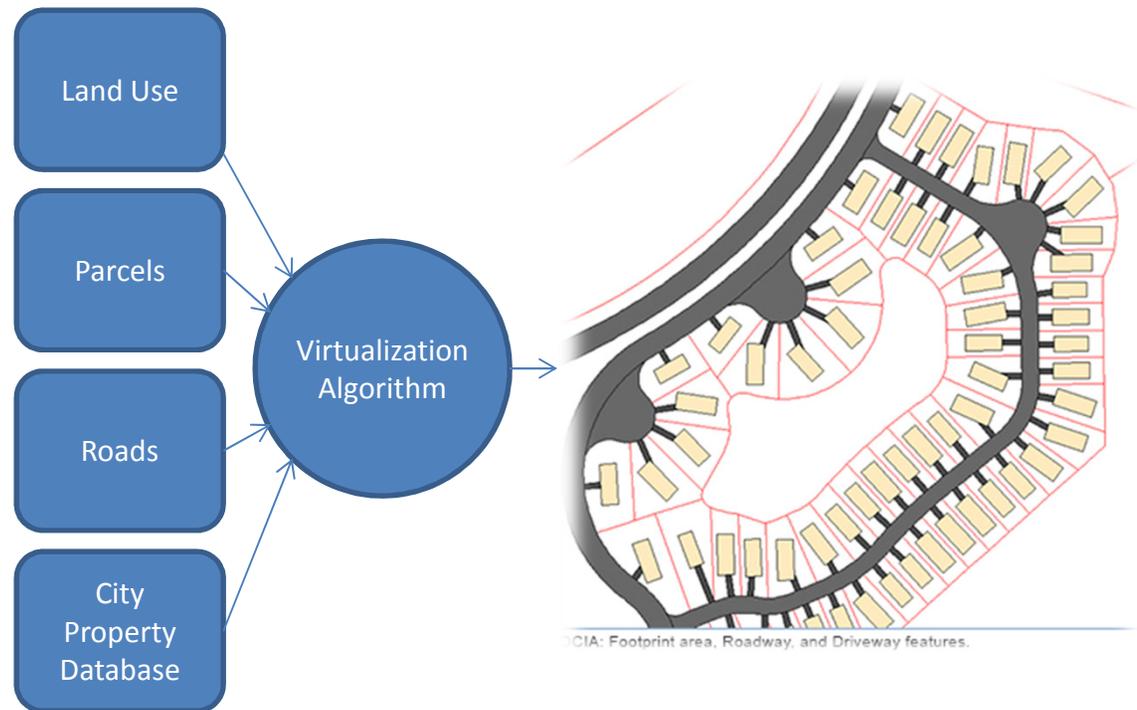
3. Basin pollutant = Sum (LU Pollutant)

Handling DCIA

Traditionally...
land use-based

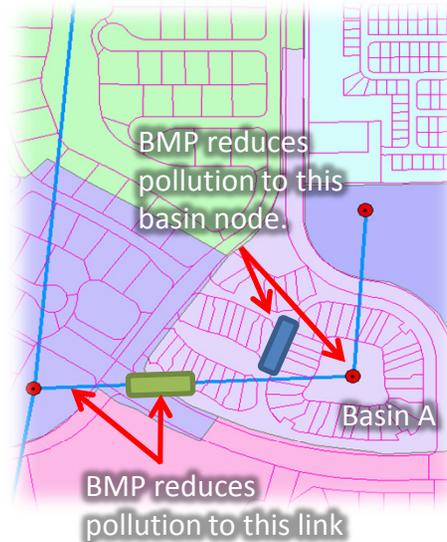


We wanted more accuracy...
so we virtualized it



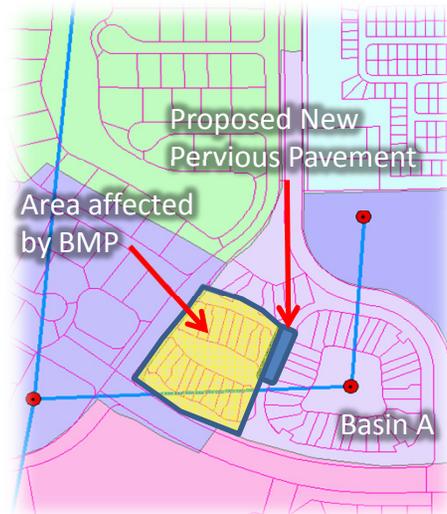
Handling BMPs

Two types of BMPs



1. **BMPs that reduce pollutant flowing to a basin NODE.**
 - BMP Shed required
 - Eg. pervious pavement
 - BMP must be associated with a Node
2. **BMPs that reduce pollutant flowing through a LINK.**
 - BMP Shed is not applicable
 - Eg. Detention basin, swale
 - BMP must be associated with a Link

The “BMP Shed”

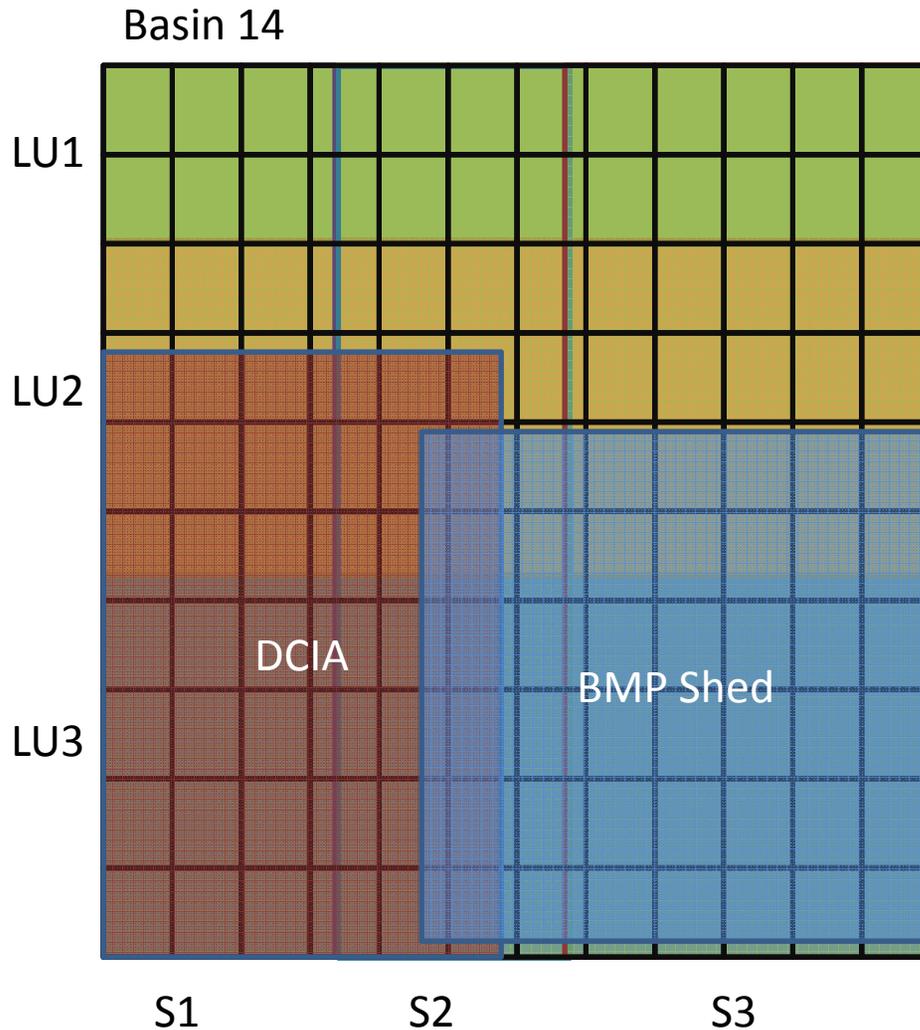


All node-based BMPs will have an affected “BMP Shed” (ie, area contributing to the BMP)

Therefore, in addition to sketching the BMP itself, the user must sketch the contributing runoff area using the **BMP Shed** tool

Note, this is different than a link-based BMP which requires only the BMP to be sketched

Inserting DCIA and BMPs into Pollutant Estimation



- Calculate using a grid approach
- DCIA affects only the grid cells the impervious area overlies
- Pollutant is reduced only within BMP Shed.

BMP Assessment Tool (BAT)

Screen Shots

Tool installs as an item in Table of Contents view of Esri ArcMap

The main control is a tab that contains **Scenario Modeler**, **Scenario Comparisons**, and **Settings** tabs.

Table Of Contents

Scenario Modeler Scenario Comparisons Settings

Default Source Data

The default source data is several geodatabases that represent the data of record for the City. When new scenarios are built by the BMP Assessment Tool, the data is copied from these data sources.

City Data GeoDatabase
C:\Project\BonitaSprings\Data\Record\CityData.gdb
Geodatabase containing official parcels, soil, landuse, and BMP GIS layers.

DCA GeoDatabase
C:\Project\BonitaSprings\Data\Record\DCA.gdb
Geodatabase containing parking lots, building footprints, and roads that form the model impervious area.

Basin Network (ICPR Model) GeoDatabase
C:\Project\BonitaSprings\Data\Record\ICPR.gdb
Geodatabase containing the Basin, Node, and Link GIS layers that describe the network.

Scenarios Folder
C:\Project\BonitaSprings\Data\Record\Scenarios
This is the location on the network where scenarios geodatabases are created.

710384.174 786491.37 Feet

BMP Assessment Tool (BAT) Screen Shots (cont)

Scenario Modeler Scenario Comparisons **Settings**

Default Source Data

The default source data is several geodatabases that represent the data of record for the City. When new scenarios are built by the BMP Assessment Tool, the data is copied from these data sources.

City Data GeoDatabase

C:\Projects\BonitaSprings\DataOfRecord\CityData.gdb ...
Geodatabase containing official parcels, soil, landuse, and BMP GIS layers.

DCIA GeoDatabase

C:\Projects\BonitaSprings\DataOfRecord\DCIA.gdb ...
Geodatabase containing parking lots, building footprints, and roads that form the model impervious area.

Basin Network (ICPR Model) GeoDatabase

C:\Projects\BonitaSprings\DataOfRecord\ICPR.gdb ...
Geodatabase containing the Basin, Node, and Link GIS layers that describe the network.

Lookup Tables GeoDatabase

C:\Projects\BonitaSprings\DataOfRecord\BMPLookUpTables.gdb ...
Geodatabasing contains the required lookup tables for runoff and pollutant loading estimation

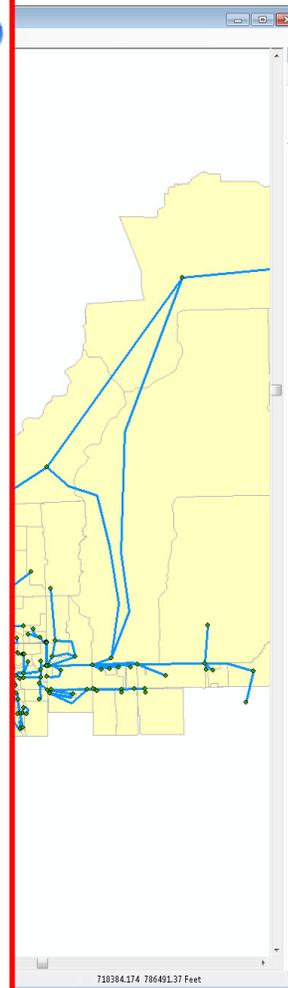
Verify All Data Sources

Working Folders

These are the folders the tool uses as locations for storing working data and outputs.

Scenarios Folder

C:\Projects\BonitaSprings\DataOfRecord\Scenarios ...
This is the location on the network where scenarios geodatabases are created.



- Scenarios
- BMPLookupTables.gdb
 - CNbySoilLU
 - PctDCbyLU
 - PollutantLoadingByLanduse
 - RunoffC
 - SoilClasses
- CityData.gdb
 - BMP
 - BMPShed
 - Landuse
 - Parcels
 - Soils
- DCIA.gdb
 - Footprint
 - ParkingLot
 - Roads
- ICPR.gdb
 - Basin
 - Network_Link
 - Network_Node

BMP Assessment Tool (BAT) Screen Shots (cont)

The **Scenario Modeler** tab is where the user (1) manages scenarios, (2) defines the GIS Layers and names of the required Lookup Tables, and (3) runs the pollutant loading evaluations.

1. Open/Create Scenario Modeler – management of scenarios: open existing, create new, duplicate, and delete scenarios.

BMP Assessment Tool (BAT) Screen Shots (cont)

2. Specify Inputs

Input Layers and Lookup Tables **BMPs**

GIS Layers

BMP: Footprint

Parcel: Parcels

Soil: Soils

Landuse: Landuse

Roads: Roads

Building Footprint: Footprint

Parking Lots: ParkingLot

ICPR Basins: Basin

ICPR Nodes: Network_Node

ICPR Links: Network_Link

LookUp Tables

% Impervious Area Directly Connected by Landuse: PctDCbyLU

Runoff Coefficient (C) [DCIA %, nonDCIA CN]: RunoffC

Pollutant Loadings by Landuse: PollutantLoadingByLanduse

Curve Number by LandUse/Soils: CNbySoilLU

2. Specify Inputs –

- GIS Layers
- Lookup Tables

BMP Assessment Tool (BAT) Screen Shots (cont)

2. Specify Inputs –

- BMP manager tab

2. Specify Inputs

Input Layers and Lookup Tables | **BMPs**

Add BMP by drawing on Map

BMP	Type	Area [Sq.Ft]	Node	Link	TN Efficien	TP Efficien	BMPshe Area
BMP00001	Gene...	0	Not Set	WF0...	0.85	0.85	Not ...
BMP00002	Gene...	0	NF0010	Not Set	0.85	0.85	1860...
*							

Zoom to BMP | Draw BMP Shed | Delete BMP Shed | Select Affected Node | Select Affected Link | Delete BMP

BMP00002 (node-based) with BMPshed

BMP00001 (link-based)

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BMP Assessment Tool (BAT) Screen Shots (cont)

3. Calculate Pollutant Loadings – tools for evaluating pollutant loadings and viewing results. Two steps:

- 1) Evaluate runoff for each basin and corresponding pollutant load at node
- 2) Route pollutants through link-node network.

3. Calculate Pollutant Loadings

1. Evaluate Pollutant at Basin Nodes 2. Route Through Network

Show

- Nitrogen
- N-Normalized
- Phosphorus
- P-Normalized

BMP Assessment Tool (BAT) Screen Shots (cont)

The screenshot shows the BMP Assessment Tool (BAT) interface within ArcMap. The interface is divided into three main sections:

- 1. Open/Create Scenario:** Includes a dropdown for 'Scenario Name' (TestScenario) and buttons for 'Open', 'Create New Scenario', 'Duplicate Scenario', and 'Delete Scenario'.
- 2. Specify Inputs:** Includes 'Input Layers and Lookup Tables' for 'BMPs'. It lists various GIS layers (BMP, Parcel, Soil, Landuse, Roads, Building Footprint, Parking Lot, ICPR Basins, ICPR Nodes, ICPR Link) and Lookup Tables (Impervious Area, Runoff Coefficient, Pollutant Loadings, Curve Number).
- 3. Calculate Pollutant Loadings:** This section is highlighted with a red box. It contains two buttons: '1. Evaluate Pollutant at Basin Nodes' and '2. Route Through Network'. Below these buttons are two progress bars: 'Loading Raster Data into Arrays' (Task: 72%, Overall: 57%) and 'Task: 72%' (Overall: 57%). To the right, there are radio buttons for 'Show' options: Nitrogen (selected), N-Normalized, Phosphorus, and P-Normalized.

Since this process takes a while to complete (especially step 1), liberal feedback is provided to the user to inform them of progress, including a two progress bar display to show sub-task and overall progress.

BMP Assessment Tool (BAT) Screen Shots (cont)

1. Open/Create Scenario

Scenario Name: TestScenario [Open]

Create New Scenario Duplicate Scenario Delete Scenario

2. Specify Inputs

Input Layers and Lookup Tables [BMPs]

GIS Layers

BMP:	Footprint
Parcel:	Parcels
Soil:	Soils
Landuse:	Landuse
Roads:	Roads
Building Footprint:	Footprint
Parking Lot:	ParkingLot
ICPR Basins:	Basin
ICPR Nodes:	Network_Node
ICPR Link:	Network_Link

LookUp Tables

% Impervious Area Directly Connected by Landuse:	PctDCbyLU
Runoff Coefficient (C) [DCIA %, nonDCIA CN]:	RunoffC
Pollutant Loadings by Landuse:	PollutantLoadingByLanduse
Curve Number by LandUse/Soil:	CNbySoilLU

3. Calculate Pollutant Loadings

1. Evaluate Pollutant at Basin Nodes 2. Route Through Network

Show

- Nitrogen
- N-Normalized
- Phosphorus
- P-Normalized

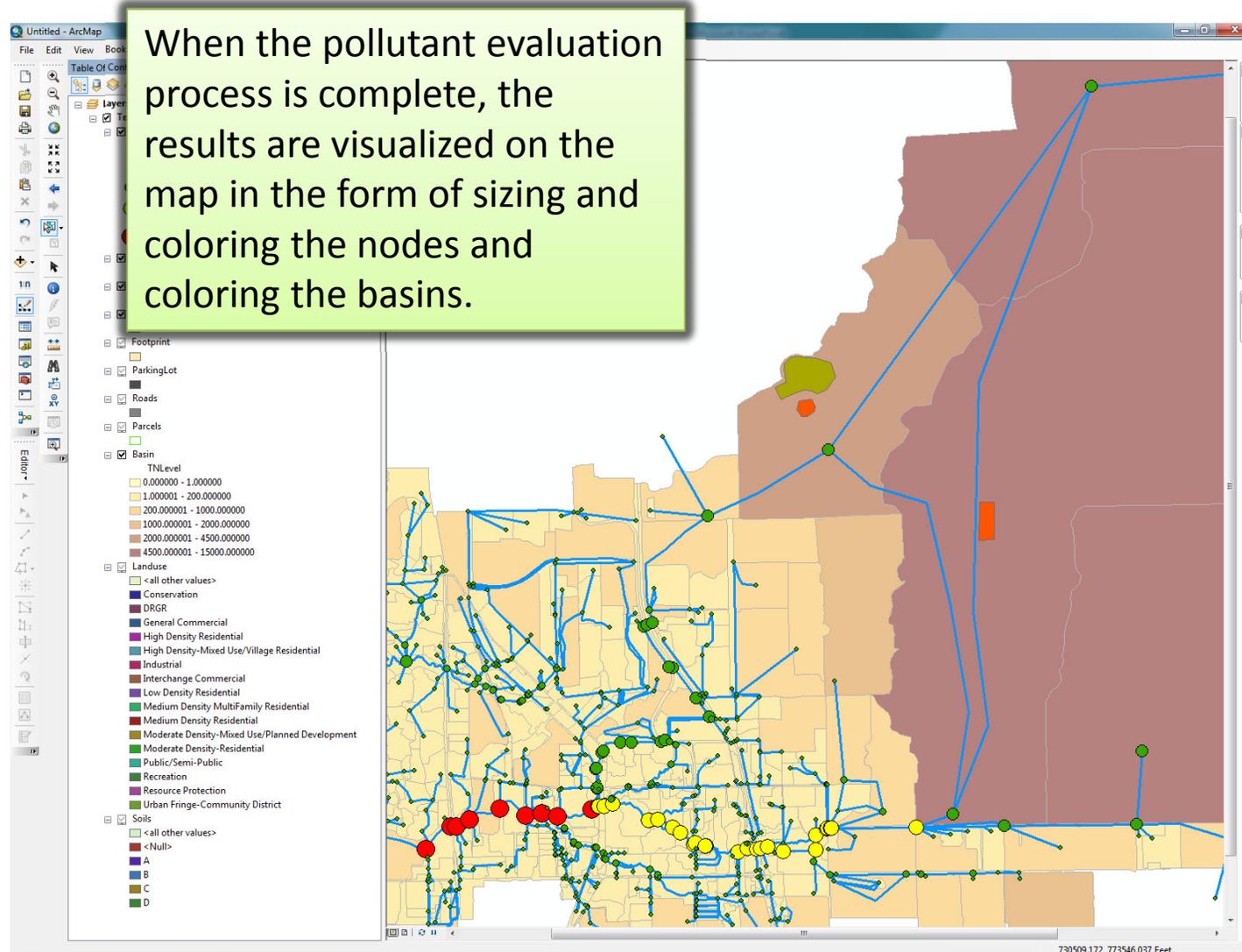
710717.508 696126.707 Feet

The **Show** radio buttons specify which pollutant loadings to display on the map. User can toggle between different types.

- Basins are colored according to level of pollution
- Nodes are sized and colored according to their level

[]-Normalized describes the pollutant loading per acre.

BMP Assessment Tool (BAT) Screen Shots (cont)



BMP Assessment Tool (BAT) Screen Shots (cont)

The screenshot displays the BMP Assessment Tool (BAT) interface. On the left, a 'Table Of Contents' window is open, showing a list of layers and their properties. The 'Network_Node' layer is expanded, showing five TNLevel categories with corresponding colored circles: 0.000000 - 1506.101563 (green), 1506.101564 - 5759.562988 (dark green), 5759.562989 - 16010.101563 (light green), 16010.101564 - 39441.453125 (yellow), and 39441.453126 - 69984.453125 (red). The 'Basin' layer is also expanded, showing five TNLevel categories with corresponding colored squares: 0.000000 - 1.000000 (lightest yellow), 1.000001 - 200.000000 (light yellow), 200.000001 - 1000.000000 (yellow), 1000.000001 - 2000.000000 (orange), and 2000.000001 - 15000.000000 (dark orange). The main map area shows a network of blue lines representing the network, with nodes colored according to the legend. The map also shows various land use zones in different colors, such as Village Residential (light orange), Family Residential (light yellow), and Office/Planned Development (dark red). A green callout box is overlaid on the map, containing text about legends.

The legends that specify the coloring and sizing for the node and basin layers are contained within a legends directory stored in the executable directory – usually at C:\Program Files (x86)\BAT\Legends. The legends can be customized at any time as long as the final legend is saved to this directory.

BMP Assessment Tool (BAT) Screen Shots (cont)

The screenshot displays the 'Scenario Comparisons' tab in the BMP Assessment Tool. It is divided into three main sections:

- 1. Designate Existing and Future Scenarios and Open Scenarios to Compare**: A table with columns for 'Future', 'Existing', and 'Name'. The 'Testing01' scenario is selected in the 'Existing' column. A 'Refresh Scenarios List' link is present.
- 2. Select Variable to Compare and Calculate Difference in Scenarios**: A dropdown menu is set to 'Total Nitrogen', and a 'Calculate Difference' button is visible.
- 3. Explore Results**: A 'Select Node on Map' button is shown above a bar chart. The chart compares 'Pollutant [lbs/yr]' for 'N' and 'P' between two scenarios: 'Node: NE0279: Scenario - Testing01' (red bars) and 'Node: NE0279: Scenario - TestScenario' (green bars).

Future	Existing	Name
<input type="checkbox"/>	<input type="checkbox"/>	test9000
<input type="checkbox"/>	<input type="checkbox"/>	testbmp
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Testing01
<input checked="" type="checkbox"/>	<input type="checkbox"/>	TestScenario
<input type="checkbox"/>	<input type="checkbox"/>	

Pollutant	Node: NE0279: Scenario - Testing01	Node: NE0279: Scenario - TestScenario
N	~2000	~1000
P	~550	~250

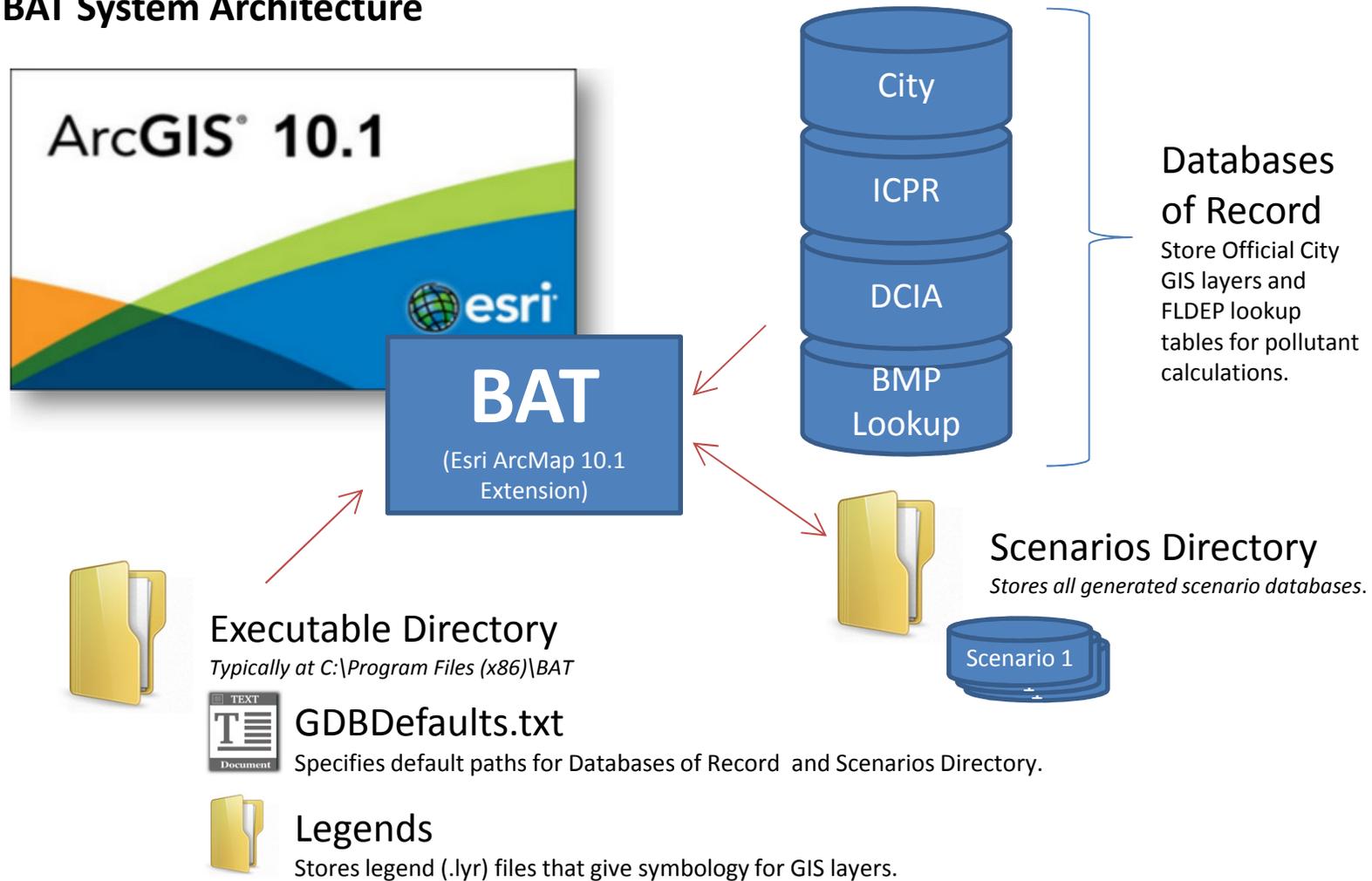
The **Scenario Comparisons** tab is where the user selects different modeling scenarios for comparison.

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1. Select and open designated scenarios
2. Calculate the differences
3. Chart the results by selected node

BAT System Architecture

BAT System Architecture



More Information and Questions

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