S I M P L E

(Spatially Integrated Model for Pollutant Loading Estimates)

Automating Pollutant Loading Estimation

Charlotte Harbor National Estuary Program

September 13, 2006

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Presentation Outline

- Model history and overview
- Discussion of current development efforts
- Optional model demonstration

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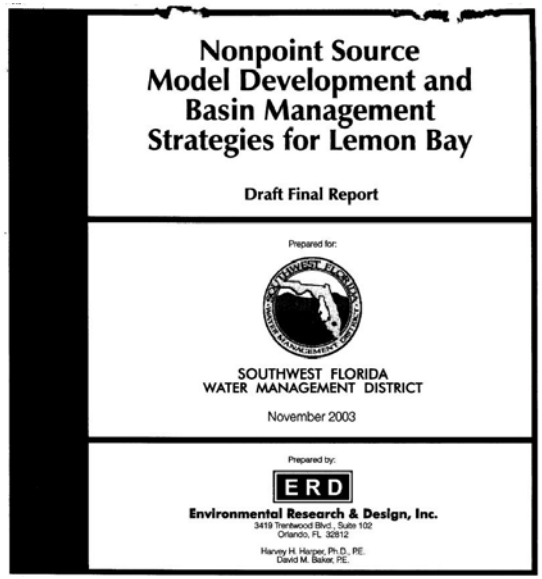
History

- Watershed Management Model (WMM)
  - Phase 1 MS4 NPDES Permit
  - SBEP
- Lemon Bay Model
- Differ in hydrologic methods and handling of BMPs
- Not spatially enabled


Nonpoint Source Model Development and Basin Management Strategies for Lemon Bay

Draft Final Report

Prepared for:

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

November 2003

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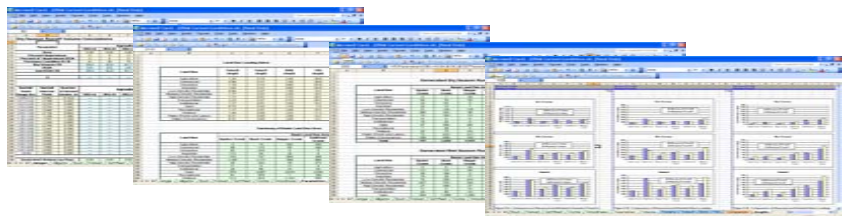

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SIMPLE Overview

- Combined strengths of previous models
- Spatially enabled within ArcGIS v.9.x
- Created BMP feature class
- Comprehensive point and non-point source pollutant loading model
- NPDES compliance with future uses

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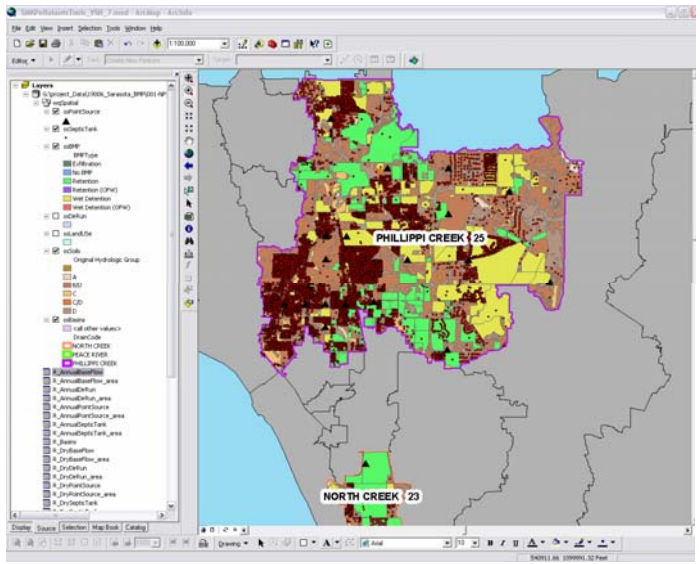
SIMPLE Overview

- Pollutant Loading currently considered:
  - Direct Runoff
  - Point Sources
  - Septic Tanks
  - Baseflow
- Constituents Modeled:
  - BOD, COD, TSS, TDS, 4 N-species, 2 P-species, 4 metals, Oil & Grease, Fecal Coliform



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Some Modeling Terminology…

- **EMC**

  Event Mean Concentration Model – Total load divided by total flow

- **BMP**

  Best Management Practice – stormwater ponds, swales, etc.

Creation of BMP Feature Class

- Compare recent aerial photography with NHAP 1984 photography
- SWFWMD ERP coverage
- Most ponds > 1 ac.
- Treatment Types
  - Retention
  - Detention
  - Others
  - Expandable

Direct Runoff LOADING =

Rainfall * Area * C * EMC * (1-BMP)

Rainfall	Area	C	EMC	(1-BMP)
User Input	Size of GIS drainage basin polygon	Depends on land use & soil	Based on previous studies in the area	Efficiency based on previous studies

Runoff Volume

Point, Septic, Baseflow LOADING =

Flow * Concentration

User Input

Use Average D… FDEP/WMD Individual Plants

Spatial Locati… WMD/County

Average for Entire Study Area WMD/County

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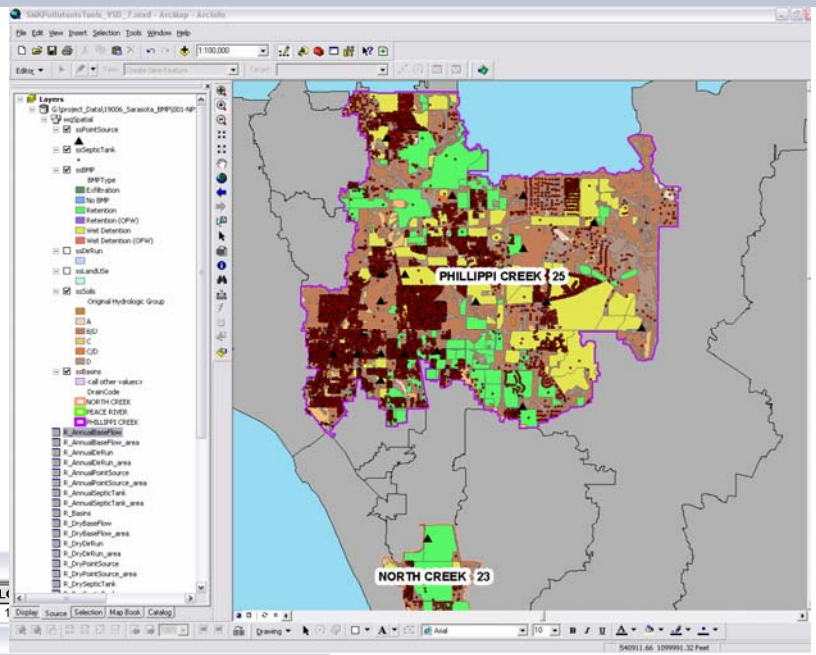
Model Output

- lbs/year or lbs/acre/year
- Spatially referenced



Attributes of R_AnnualPointSource

OBJECTID*	DRAINID	BOD_LOAD	COD_LOAD	TSS_LOAD	TDS_LOAD	TP_LOAD	DP_L
1	23	121.628444	255.420249	89.403663	19866.332797	47.679199	1

Attributes of R_AnnualSepticTank

OBJECTID*	DRAINID	BOD_LOAD	COD_LOAD	TSS_LOAD	TDS_LOAD	TP_LOAD	DP_LOAD
1	24	1335.542422	2804.639086	890.361615	4451.808073	64.753572	16.188393
2	25	300310.505119	630652.060749	200207.003412	1001035.017062	15276.292959	3819.073240

Attributes of R_AnnualDirRun

OBJECTID*	DRAINID	BOD_LOAD	COD_LOAD	TSS_LOAD	TDS_LOAD	TP_LOAD	DP_LOAD
1	23	13469.064626	93581.032935	188367.667196	161980.587995	392.749768	167.348150
2	24	1178.876076	8600.203195	27821.343043	14481.706695	22.670577	10.284595
3	25	464971.182924	3350403.657381	5994210.219849	5496890.181090	13349.497234	5547.097162

Attributes of R_AnnualBaseFlow

OBJECTID*	DrainID	BOD	COD	TSS	TDS	TP	DP
7	23	10971.591426	21943.182852	27428.978565	2029744.413844	1645.738714	1097.159143
8	24	4508.419311	9016.838622	11271.048278	834057.572544	676.262897	450.841931
9	25	166950.339369	333900.678738	417375.848422	30885812.78325	25042.550905	16695.033937

Attributes of RF_AnnualBasinLoad

OBJECTID*	DrainID	BOD	COD	TSS	TDS	TP	DP
1	23	24562.284496	115779.636036	215886.049425	2211591.334636	2086.167681	1276.427093
2	24	7022.837809	20421.680903	39982.752935	852991.087311	763.687046	477.314919
3	25	1043717.904711	4538782.882179	6721908.761240	41018489.585574	73030.979887	31768.029823

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Loading (lbs/yr) for Selected Basins and Pollutants

Major Basin	BOD	TSS	TP	Nitrate	Metals	NH3	N
Catfish Creek	206,292	896,081	53,297	12,267	2,292	88,664	109,013
Hudson Bayou	135,102	1,277,631	4,475	8,802	4,040	8,502	31,857
Matheny Creek	70,675	639,197	3,303	4,242	1,190	20,978	32,541
Phillippi Creek	1,486,962	12,710,876	84,233	88,212	22,718	456,481	696,424
Sarasota Bay Coastal	305,256	3,101,444	15,306	20,253	6,163	39,991	103,007
Whitaker Bayou (Sar. Co.)	199,531	2,083,368	8,432	11,723	4,334	36,492	70,281
Palma Sola Drain	46,114	478,783	2,461	4,507	1,047	2,044	12,128
Cedar Hammock	221,855	2,447,206	8,853	13,384	4,856	8,049	49,916
Anna Maria Island	62,463	712,018	2,801	4,604	1,297	2,395	14,630

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Current Model

- Seasonal and average annual loads
- Single rainfall input
- Standard GIS output
- No calibration/verification

Current Development Efforts

- Calibration/verification
  - Selected monitoring
  - Refinements in selected land uses
  - Local, intermediate, and bayshed
- Model enhancements
  - NEXRAD rainfall input
  - Monthly output
  - Improved reporting
- Peer review

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