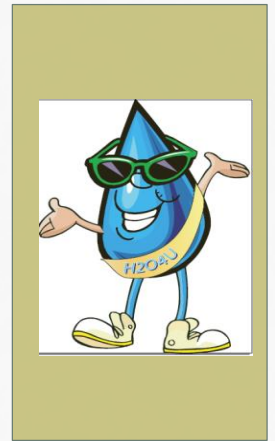




BMP TRAINS MODEL: A TRAINING WORKSHOP

BY: MARTY WANIELISTA, HARVEY HARPER, ERIC LIVINGSTON
AND MIKE HARDIN.



PURPOSE OF TRAINING IS TO:

- Understand why nutrient removal is important.
- Present the theory essential for estimating annual nutrient mass removal.
- Understand the basis of removal for 15 Stormwater Best Management Practices Options with BMPTRAINS.
- Define input data required for the BMPTRAINS program.
- Use BMPTRAINS for the selection of stormwater best management practices.
- Solicit comments for improvements to BMPTRAINS



BMPTRAINS MODEL AND USERS MANUAL

BMPTRAINS: an EXCEL and VB based model for sizing BMPs and estimating annual removal effectiveness.

It's acronym is derived from the analysis of stormwater BMPs in series, but can also evaluate parallel and series treatment.

The model is used to evaluate **B**est **M**anagement **P**ractice **T**reatment options for **R**emoval on an **A**nnual basis by those **I**nterested in **N**utrients in **S**tormwater.

Available from: www.stormwater.ucf.edu

What's New

BMPTRAINS Stormwater Best Management Practices Analysis Model (Version 7.5) Registration, [Model](#), and [User's Manual](#)



Credit and thanks for the programming skills of: Dr. Mike Hardin, Dr. Harvey Harper, Dr. Ikiensinma Gogo-Abite and Chris Kuzlo





BMPTRAINS MODEL: INTRODUCTION TO AND NAVIGATION OF THE MODEL

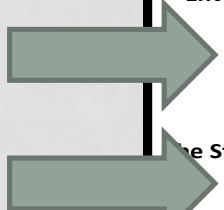
BY: MARTY WANIELISTA,,



NAVIGATING the BMPTRAINS Model

ENABLE the macros

Stormwater BMP Treatment Trains [BMPTRAINS©]		CLICK HERE TO START	HELP - INTRODUCTION
		INTRODUCTION PAGE	HELP AND BACKGROUND
<p>Model requires the use of Excel 2007 or newer</p>			<p>1) There is a users manual to help navigate this program and it is available at www.stormwater.ucf.edu</p>
<p>This program is compiled from stormwater management publications and deliberations during a two year review of the stormwater rule in the State of Florida. Input from the members of the Florida Department of Environmental Protection Stormwater Review Technical Advisory Committee and the staff and consultants from the State Water Management Districts is appreciated.</p>			<p>2) This spreadsheet is best viewed at 1280 BY 1080 PIXELS screen resolution. If the maximum resolution of your computer screen is lower than 1280 BY 1080 PIXELS you can adjust the view in the Excel VIEW menu by zooming out to value smaller than 100 PERCENT.</p>
<p>The State Department of Transportation provided guidance and resources to compile this program. The stormwater Management Academy is responsible for the content of this program.</p>			<p>3) This spreadsheet has incorporated ERROR MESSAGE WINDOWS. Your analysis is not valid unless ALL ERROR MESSAGE WINDOWS are clear.</p>
			<p>4) PRINTING INSTRUCTIONS: Many options. One is to print the page to MICROSOFT OFFICE DOCUMENT IMAGE WRITER (typically the default) or ADOBE PDF, save the page as an image document, then print the document you saved.</p>
			<p>5) Click on the button located on the top of this window titled CLICK HERE TO START to begin the analysis.</p>
<p>Disclaimer: These workbooks were created to assist in the analysis of Best Management Practice calculations. All users are responsible for validating the accuracy of the internal calculations. If improvements are noted within this model, please e-mail Marty Wanielista, Ph.D., P.E. at martin.wanielista@ucf.edu with specific information so that revisions can be made.</p>			
<p>The authors of this program were Christopher Kuzlo, Marty Wanielista, Mike Hardin, and Ikiensinma Gogo-Abite. This is version 7.5 of the program, updated on August 25, 2015. Comments are appreciated.</p>			
<p>HELP - HYDROGRAPH AND LEGACY PROGRAMS</p>			
<p>SMADA ONLINE</p>			



NAVIGATING the BMPTRAINS Model

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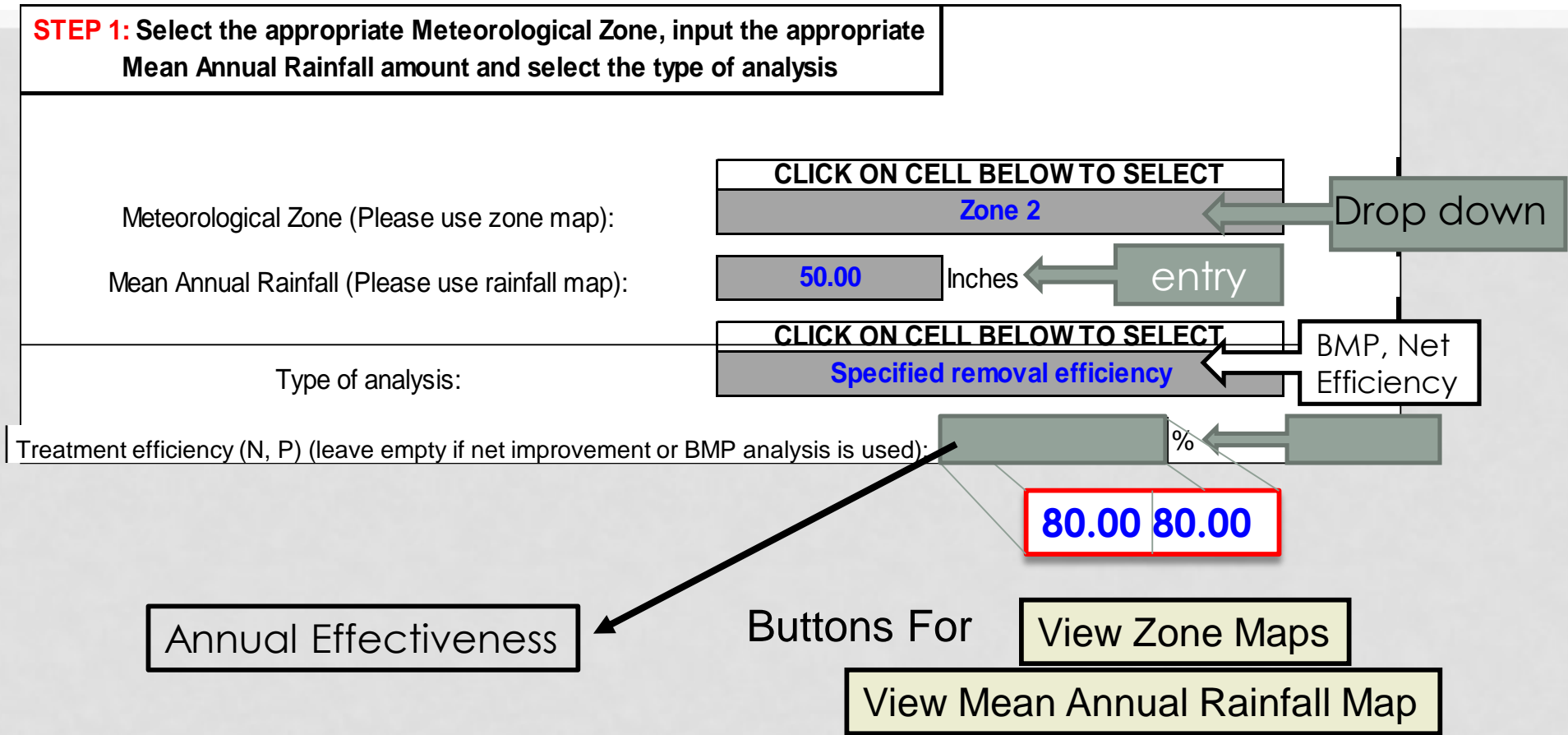
SMADA ONLINE

GENERAL SITE INFORMATION

GREY colored cell for input data

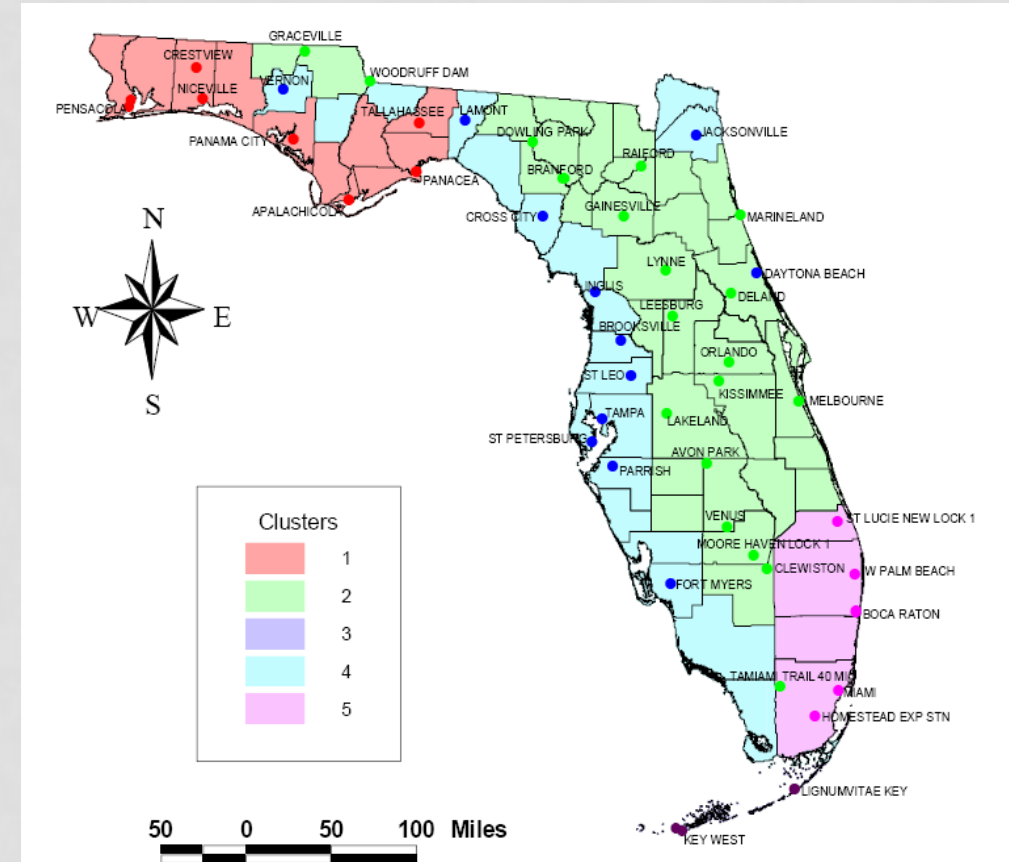
GENERAL SITE INFORMATION: V7.4		GO TO INTRODUCTION PAGE		Blue Numbers =	Input data
Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis		NAME OF PROJECT one watershed		HELP	
Meteorological Zone (Please use zone map):		CLICK ON CELL BELOW TO SELECT Zone 2		VIEW ZONE MAP	
Mean Annual Rainfall (Please use rainfall map):		50.00 Inches		VIEW MEAN ANNUAL RAINFALL MAP	
Type of analysis:		CLICK ON CELL BELOW TO SELECT BMP analysis		GO TO WATERSHED CHARACTERISTICS	
Treatment efficiency (N, P) (leave empty if net improvement or BMP analysis is used):		%			
Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.			Model documentation and example problems.		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> STORMWATER TREATMENT ANALYSIS </div> <p>Systems available for analysis:</p> <ul style="list-style-type: none"> Retention Basin with option for calculating effluent concentration Wet Detention Exfiltration Trench Pervious Pavement Stormwater Harvesting Underdrain Biofiltration Greenroof Rainwater Harvesting Floating Island with Wet Detention Vegetated Natural Buffer Vegetated Filter Strip Swale Rain Garden Lined reuse pond User Defined BMP 			<p>There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.</p>		
			METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY		
			METHODOLOGY FOR RETENTION SYSTEMS		METHODOLOGY FOR WET DETENTION SYSTEMS
			METHODOLOGY FOR GREENROOF SYSTEMS		METHODOLOGY FOR WATER HARVESTING SYSTEMS
<div style="border: 1px solid black; padding: 10px; background-color: #f0f0f0;"> <p style="color: red; font-weight: bold; font-size: 1.2em;">RESET INPUT FOR STORMWATER TREATMENT ANALYSIS</p> </div>					

RAINFALL AND TYPE OF EFFECTIVENESS ANALYSIS



RAINFALL DISTRIBUTIONS

- Rainfall distributions are regionally different.



WATERSHEDS CATCHMENT INPUTS

WATERSHED CHARACTERISTICS V 7.5	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers =	Input data	HELP - LAND USES/EMC
		Red Numbers =	Calculated	
SELECT CATCHMENT CONFIGURATION	CLICK ON CELL BELOW TO SELECT CONFIGURATION	VIEW CATCHMENT CONFIGURATION		
	A - Single Catchment	SELECT		
CATCHMENT NO.1 CHARACTERISTICS:		VIEW AVERAGE ANNUAL RUNOFF "C" Factor		OVERWRITE DEFAULT CONCENTRATIONS USING:
Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Agricultural - Pasture: TN=3.470 TP=0.616	EMC(N):	PRE:	POST:
	CLICK ON CELL BELOW TO SELECT	<input type="text"/>	mg/L	<input type="text"/>
Post-development land use: with default EMCs	Highway: TN=1.640 TP=0.220	EMC(P):	mg/L	<input type="text"/>
		<input type="text"/>	mg/L	<input type="text"/>
		VIEW EMC & FLUCCS		
		USE DEFAULT CONCENTRATIONS		
Total pre-development catchment area:	4.00	Average annual pre runoff volume:		0.500
Total post-development catchment or BMP analysis area:	4.00	Average annual post runoff volume (note no BMP area):		6.563
Pre-development Non DCIA CN:	60.00	Pre-development Annual Mass Loading - Nitrogen :		2.140
Pre-development DCIA percentage:	0.00	Pre-development Annual Mass Loading - Phosphorus :		0.380
Post-development Non DCIA CN:	60.00	Post-development Annual Mass Loading - Nitrogen :		13.273
Post-development DCIA percentage:	50.00	Post-development Annual Mass Loading - Phosphorus :		1.781
Estimated BMPArea (No loading from this area)	0.25			

WATERSHEDS

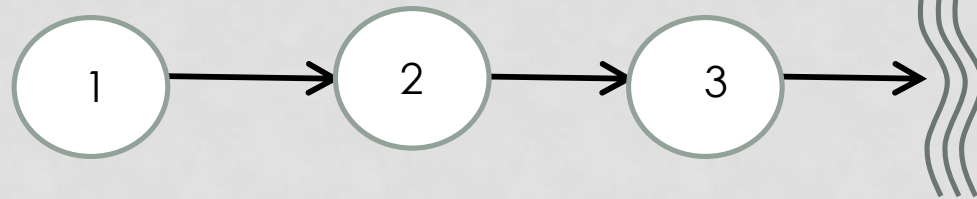
CATCHMENT CONFIGURATIONS

WATERSHED CHARACTERISTICS

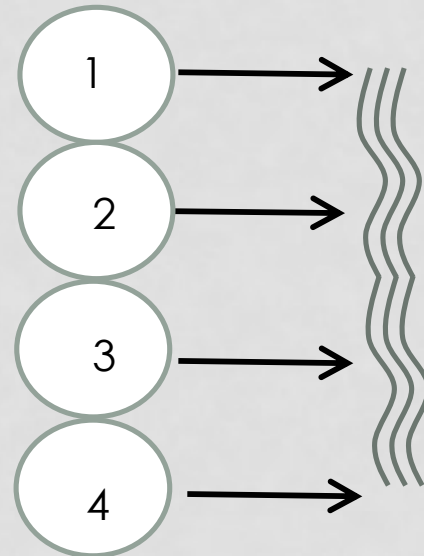
[SELECT CATCHMENT CONFIGURATION](#)

[VIEW CATCHMENT CONFIGURATION](#)

Series



Parallel



Up to 3 BMPs in
Each catchment

14 configurations

WATERSHEDS CATCHMENT INPUTS

WATERSHED CHARACTERISTICS V 7.5	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers =	Input data	HELP - LAND USES/EMC
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SELECT CATCHMENT CONFIGURATION	CLICK ON CELL BELOW TO SELECT CONFIGURATION	VIEW CATCHMENT CONFIGURATION		
	A - Single Catchment			
CATCHMENT NO.1 CHARACTERISTICS:	VIEW AVERAGE ANNUAL RUNOFF "C" Factor	OVERWRITE DEFAULT CONCENTRATIONS USING:		
Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Agricultural - Pasture: TN=3.470 TP=0.616	PRE:	EMC(N): <input type="text"/> mg/L	EMC(P): <input type="text"/> mg/L
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.640 TP=0.220	POST:	<input type="text"/> mg/L	<input type="text"/> mg/L
	POST & FLUCCS	USE DEFAULT CONCENTRATIONS		
Total pre-development catchment area:	4.00 AC	Average annual pre runoff volume:		0.500 ac-ft/year
Total post-development catchment or BMP analysis area:	4.00 AC	Average annual post runoff volume (note no BMP area):		6.563 ac-ft/year
Pre-development Non DCIA CN:	60.00	Pre-development Annual Mass Loading - Nitrogen:		2.140 kg/year
Pre-development DCIA percentage:	0.00 %	Pre-development Annual Mass Loading - Phosphorus:		0.380 kg/year
Post-development Non DCIA CN:	60.00	Post-development Annual Mass Loading - Nitrogen:		13.273 kg/year
Post-development DCIA percentage:	50.00 %	Post-development Annual Mass Loading - Phosphorus:		1.781 kg/year
Estimated BMPArea (No loading from this area)	0.25 AC			

EMC DEFAULT VALUES

AVERAGE ANNUAL DATA

LAND USE CATEGORY	Event Mean Concentration (mg/l)	
	TOTAL Nitrogen	TOTAL Phosphorus
Low-Density Residential	1.61	0.191
Single-Family	2.07	0.327
Multi-Family	2.32	0.52
Low-Intensity Commercial	1.13	0.188
High-Intensity Commercial	2.4	0.345
Light Industrial	1.2	0.26
Highway	1.52	0.2
Agricultural - Pasture	3.51	0.686
Agricultural - Citrus	2.24	0.183
Agricultural - Row Crops	2.65	0.593
1. Agricultural - General Agriculture	2.8	0.487
Undeveloped	1.15	0.055
Mining / Extractive	1.18	0.15
Conventional Roof tops	1.05	0.12

1. Mean of pasture, citrus, and row crop land uses

WATERSHEDS CATCHMENT INPUTS

WATERSHED CHARACTERISTICS V 7.5		GO TO STORMWATER TREATMENT ANALYSIS		Blue Numbers =	Input data	HELP - LAND USES/EMC
				Red Numbers =	Calculated	
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		A - Single Catchment				
CATCHMENT NO.1 CHARACTERISTICS:		VIEW AVERAGE ANNUAL RUNOFF "C" Factor		OVERWRITE DEFAULT CONCENTRATIONS USING:		
Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	Agricultural - Pasture: TN=3.470 TP=0.616		PRE: EMC(N):	mg/L	POST: mg/L
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	Highway: TN=1.640 TP=0.220		EMC(P):	mg/L	mg/L
Total pre-development d		VIEW EMC & FLUCCS		USE DEFAULT CONCENTRATIONS		
Total post-development				USE DEFAULT CONCENTRATIONS		
Pre-development Non D				USE DEFAULT CONCENTRATIONS		
Pre-development DCIA				USE DEFAULT CONCENTRATIONS		
Post-development Non I				USE DEFAULT CONCENTRATIONS		
Post-development DCIA				USE DEFAULT CONCENTRATIONS		
Estimated BMP Area (No				USE DEFAULT CONCENTRATIONS		

	4.00	AC	
	4.00	AC	
	60.00	%	
	0.00	%	
	60.00	%	
	50.00	%	
	0.25	AC	

Average annual pre runoff volume:	0.500	ac-ft/year
Average annual post runoff volume (note no BMP area):	6.563	ac-ft/year
Pre-development Annual Mass Loading - Nitrogen:	2.140	kg/year
Pre-development Annual Mass Loading - Phosphorus:	0.380	kg/year
Post-development Annual Mass Loading - Nitrogen:	13.273	kg/year
Post-development Annual Mass Loading - Phosphorus:	1.781	kg/year

Input Data in Grey Field And For Each Worksheet in BLUE COLOR

WATERSHEDS CATCHMENT INPUTS

WATERSHED CHARACTERISTICS V 7.5	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers =	Input data	HELP - LAND USES/EMC
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SELECT CATCHMENT CONFIGURATION	CLICK ON CELL BELOW TO SELECT CONFIGURATION	VIEW CATCHMENT CONFIGURATION		
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CATCHMENT NO.1 CHARACTERISTICS:	VIEW AVERAGE ANNUAL RUNOFF "C" Factor	OVERWRITE DEFAULT CONCENTRATIONS USING:		
Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Agricultural - Pasture: TN=3.470 TP=0.616	← NEW	PRE: <input type="text"/> mg/L	POST: <input type="text"/> mg/L
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.640 TP=0.220		EMC(N): <input type="text"/> mg/L	EMC(P): <input type="text"/> mg/L
	VIEW EMC & FLUCCS	← NEW	USE DEFAULT CONCENTRATIONS	
Total pre-development catchment area:	4.00 AC		Average annual pre runoff volume:	0.500 ac-ft/year
Total post-development catchment or BMP analysis area:	4.00 AC		Average annual post runoff volume (note no BMP area):	6.563 ac-ft/year
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Post-development Non DCIA CN:	60.00		Post-development Annual Mass Loading - Nitrogen :	13.273 kg/year
Post-development DCIA percentage:	50.00 %		Post-development Annual Mass Loading - Phosphorus :	1.781 kg/year
Estimated BMPArea (No loading from this area)	0.25 AC			

STREAM GAGING DATA

- Actual Data from a stream nearby UCF, gage operated by USGS.
- Average Streamflow = 1.926 CFS/SQ MI/yr = 26.19 inches streamflow/yr
 - Conversion factor is 13.6 inches on the watershed = 1 CFS/SQ MI.
- Hydrograph separation is 50% runoff or 13.1 inches runoff per year
- Annual "C" factor is $13.1/50 = 0.262$
- We are in Zone 2

22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

Zone 2
Mean Annual Runoff Coefficients (C Values) as a Function
of DCIA Percentage and Non-DCIA Curve Number (CN)

NDCIA CN	Percent DCIA																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
30	0.002	0.043	0.083	0.123	0.164	0.204	0.244	0.285	0.325	0.366	0.406	0.446	0.487	0.527	0.567	0.608	0.648	0.688	0.729	0.769	0.809
35	0.004	0.044	0.085	0.125	0.165	0.205	0.246	0.286	0.326	0.366	0.407	0.447	0.487	0.528	0.568	0.608	0.648	0.689	0.729	0.769	0.809
40	0.007	0.047	0.087	0.127	0.167	0.207	0.248	0.288	0.328	0.368	0.408	0.448	0.488	0.528	0.569	0.609	0.649	0.689	0.729	0.769	0.809
45	0.010	0.050	0.090	0.130	0.170	0.210	0.250	0.290	0.330	0.370	0.410	0.450	0.490	0.530	0.570	0.610	0.650	0.690	0.729	0.769	0.809
50	0.015	0.055	0.095	0.134	0.174	0.214	0.254	0.293	0.333	0.373	0.412	0.452	0.492	0.531	0.571	0.611	0.651	0.690	0.730	0.770	0.809
55	0.022	0.061	0.101	0.140	0.179	0.219	0.258	0.298	0.337	0.376	0.416	0.455	0.494	0.534	0.573	0.613	0.652	0.691	0.731	0.770	0.809
60	0.030	0.069	0.108	0.147	0.186	0.225	0.264	0.303	0.342	0.381	0.420	0.459	0.498	0.537	0.576	0.615	0.654	0.693	0.731	0.770	0.809
65	0.042	0.080	0.119	0.157	0.195	0.234	0.272	0.311	0.349	0.387	0.426	0.464	0.502	0.541	0.579	0.618	0.656	0.694	0.733	0.771	0.809
70	0.057	0.095	0.133	0.170	0.208	0.245	0.283	0.321	0.358	0.396	0.433	0.471	0.509	0.546	0.584	0.621	0.659	0.697	0.734	0.772	0.809
75	0.079	0.116	0.152	0.189	0.225	0.262	0.298	0.335	0.371	0.408	0.444	0.481	0.517	0.554	0.590	0.627	0.663	0.700	0.736	0.773	0.809
80	0.111	0.146	0.181	0.216	0.251	0.285	0.320	0.355	0.390	0.425	0.460	0.495	0.530	0.565	0.600	0.635	0.670	0.705	0.740	0.774	0.809
85	0.160	0.192	0.225	0.257	0.290	0.322	0.355	0.387	0.420	0.452	0.485	0.517	0.550	0.582	0.614	0.647	0.679	0.712	0.744	0.777	0.809
90	0.242	0.270	0.299	0.327	0.355	0.384	0.412	0.440	0.469	0.497	0.526	0.554	0.582	0.611	0.639	0.667	0.696	0.724	0.753	0.781	0.809
95	0.404	0.424	0.444	0.464	0.485	0.505	0.525	0.546	0.566	0.586	0.606	0.627	0.647	0.667	0.688	0.708	0.728	0.749	0.769	0.789	0.809
98	0.595	0.605	0.616	0.627	0.638	0.648	0.659	0.670	0.680	0.691	0.702	0.713	0.723	0.734	0.745	0.756	0.766	0.777	0.788	0.799	0.809

NOTE: Pre-application meeting frequent discussion

0.262

FLUCCS CODES AND MODEL LAND USES

CODE

2210	Citrus groves	Citrus	AG - CITRUS
2220	Fruit Orchards	Citrus	AG - CITRUS
1400	Commercial and Services	Commercial	HIGH INTENSITY COMMERCIAL
1410	Retail Sales and Services	Commercial	HIGH INTENSITY COMMERCIAL
3212	Dry Prairie	Dry Prairie	DRY PRAIRIE*
3220	Coastal Strand	Dry Prairie	DRY PRAIRIE*
3300	Mixed Rangeland	Dry Prairie	DRY PRAIRIE*
1300	Residential, High-Density	High-Density Residential	MULTI FAMILY RES
1310	Fixed Single Family Units	Single Family Residential	SINGLE FAMILY RES
1330	Residential, High-Density; Multiple Dwelling Units, Low Rise <Two stories or less>	High-Density Residential	MULTI FAMILY RES

Reference:

Refining the Indian River Lagoon TMDL- Tech Memo Report Assessment and Evaluation of Model Input Parameters Prepared by ERD, July 2013

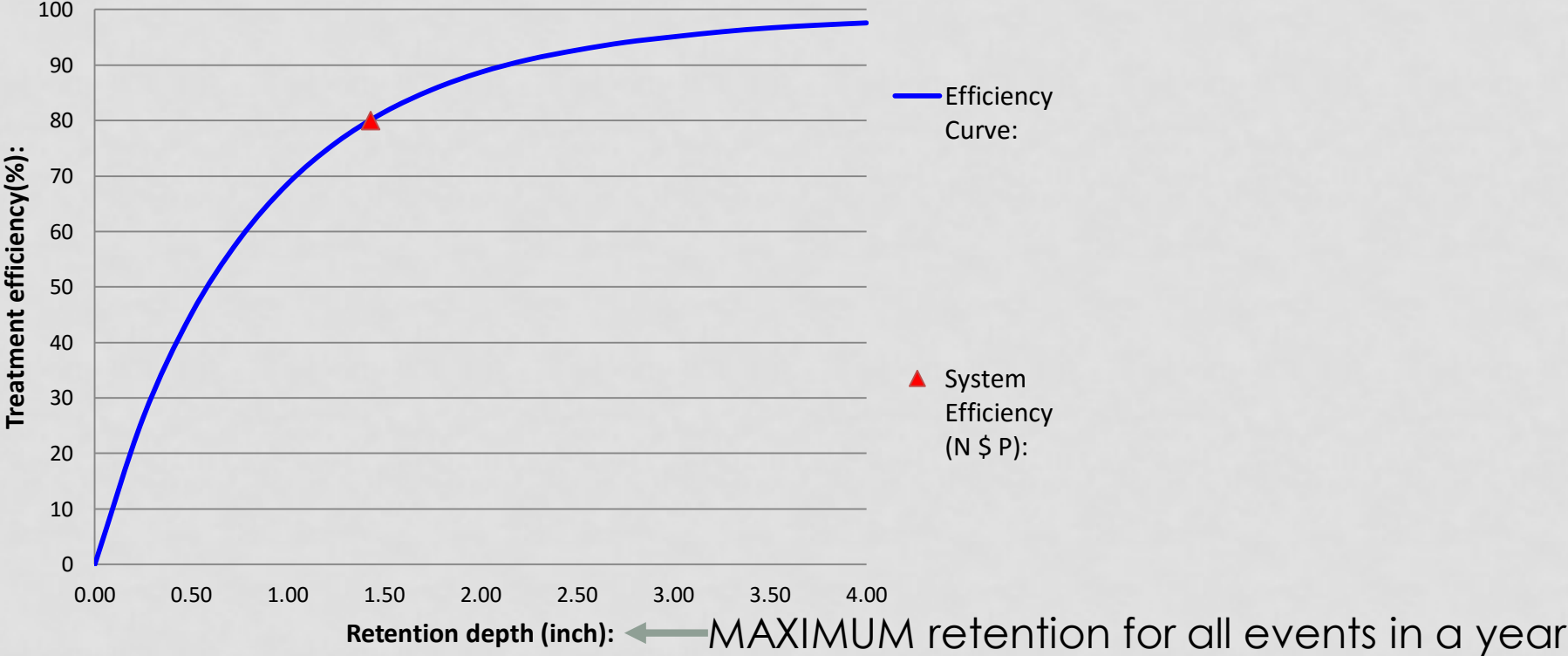
* Can also use the general undeveloped rangeland.

NOTE: Pre-application meeting frequent discussion

GENERAL SITE INFORMATION

GENERAL SITE INFORMATION: V7.4		GO TO INTRODUCTION PAGE	Blue Numbers =	Input data
Red Numbers =		Calculated or Carryover		
Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis		NAME OF PROJECT	HELP	
		one watershed	VIEW ZONE MAP	
Meteorological Zone (Please use zone map): <input type="button" value="CLICK ON CELL BELOW TO SELECT"/> Zone 2			VIEW MEAN ANNUAL RAINFALL MAP	
Mean Annual Rainfall (Please use rainfall map): <input type="text" value="50.00"/> Inches			GO TO WATERSHED CHARACTERISTICS	
Type of analysis: <input type="button" value="CLICK ON CELL BELOW TO SELECT"/> BMP analysis				
Treatment efficiency (N, P) (leave empty if net improvement or BMP analysis is used): <input type="text"/> <input type="text"/> %				
Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.		Model documentation and example problems.		
<input type="button" value="STORMWATER TREATMENT ANALYSIS"/>		There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu . The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.		
Source: <i>Evaluation of Current Stormwater Design Criteria within the State of Florida</i> dated June 2007 by Harvey H. Harper, P.E., PhD., available at: http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/SW_TreatmentReportFinal_71907.pdf		Methodologies		
		METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY		
		METHODOLOGY FOR RETENTION SYSTEMS	METHODOLOGY FOR WET DETENTION SYSTEMS	
		METHODOLOGY FOR GREENROOF SYSTEMS	METHODOLOGY FOR WATER HARVESTING SYSTEMS	

Example Demonstration Retention in Series

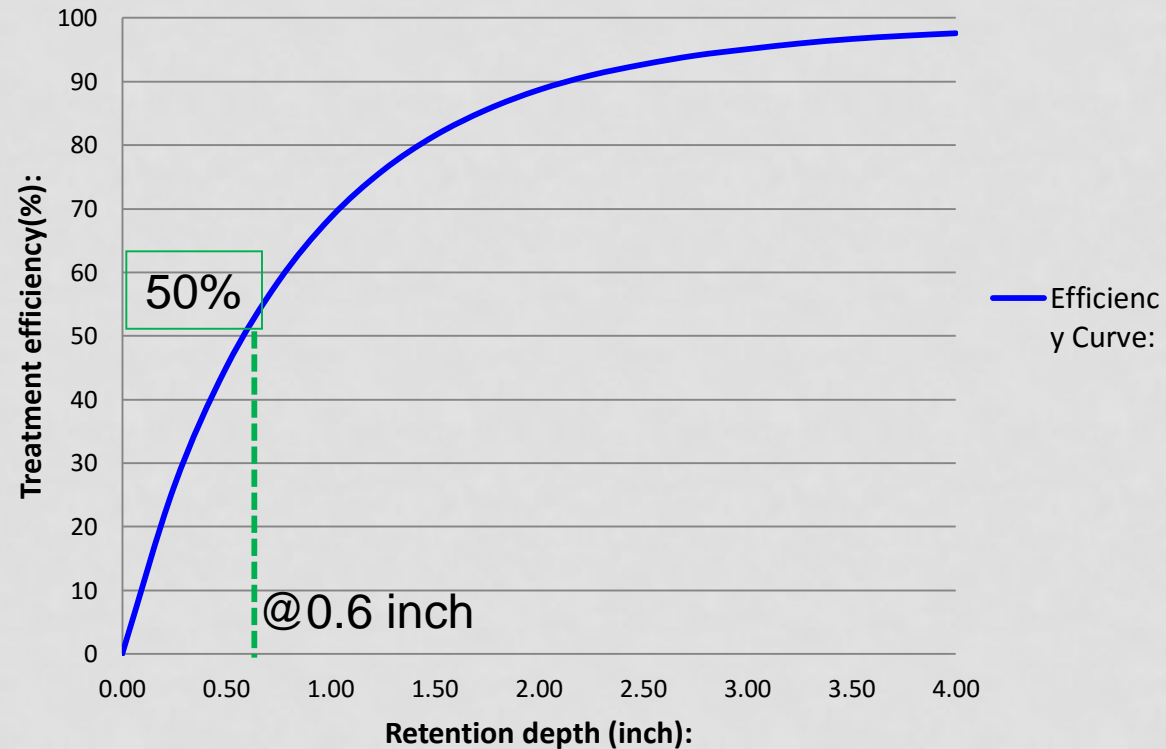


Retention depth over the watershed area is 1.43 inches for the watershed conditions and rainfall zone.

BUT not sufficient area for one retention basin

But may use 3 BMPs for each catchment in Series in one Watershed

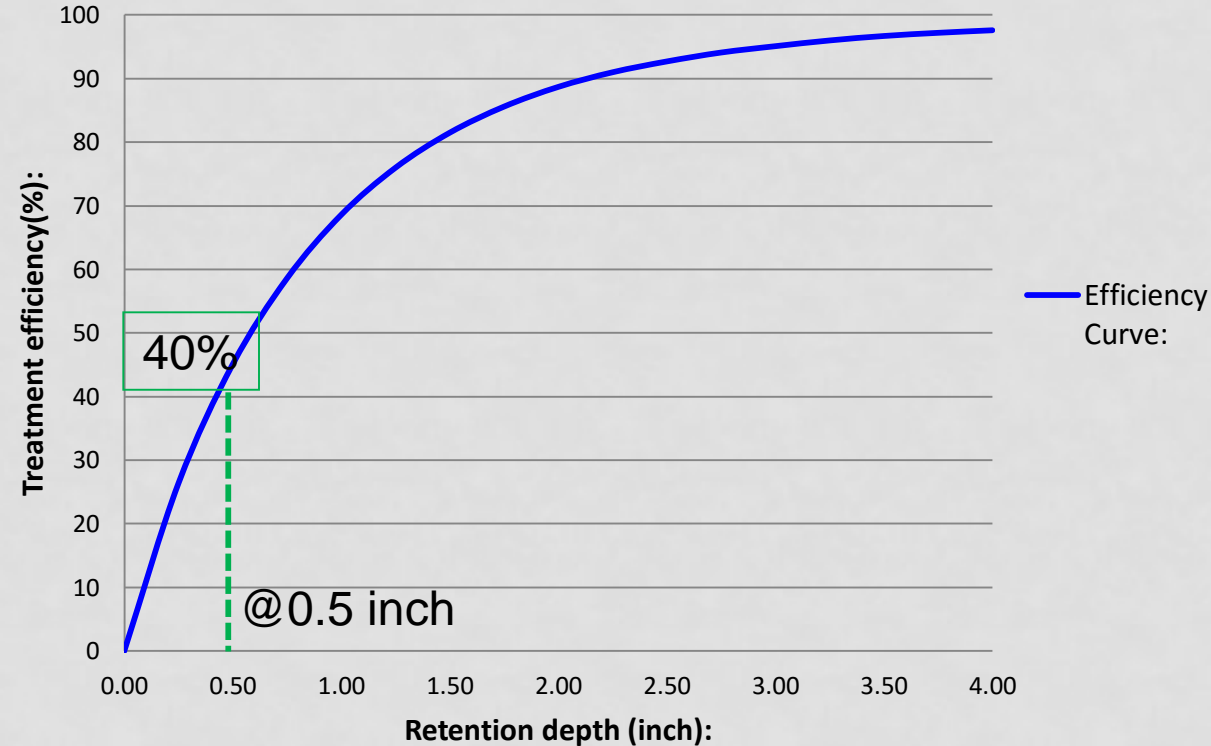
1st BMP is pervious pavement @ 0.6 inch treatment



NOTE: This is the effectiveness curve if pervious pave is only used.
Retention depth over the area is 0.60 inches
For a pervious pavement with reservoir.

Example 3 BMPs in Series in one Watershed

2nd BMP in series is exfiltration @ 0.5 inch treatment

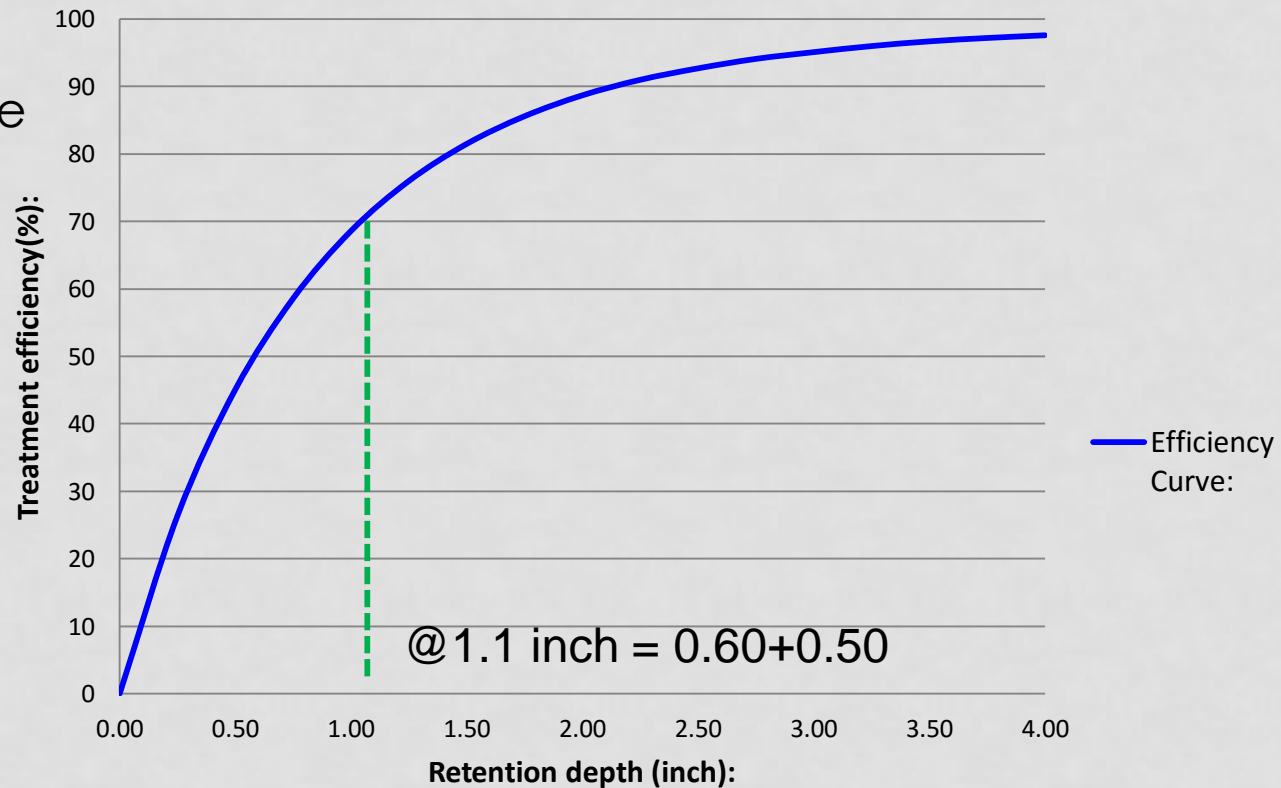


NOTE: This is the effectiveness curve if exfiltration is only used. Retention depth over the equivalent impervious area is 0.50 inches for an exfiltration system.

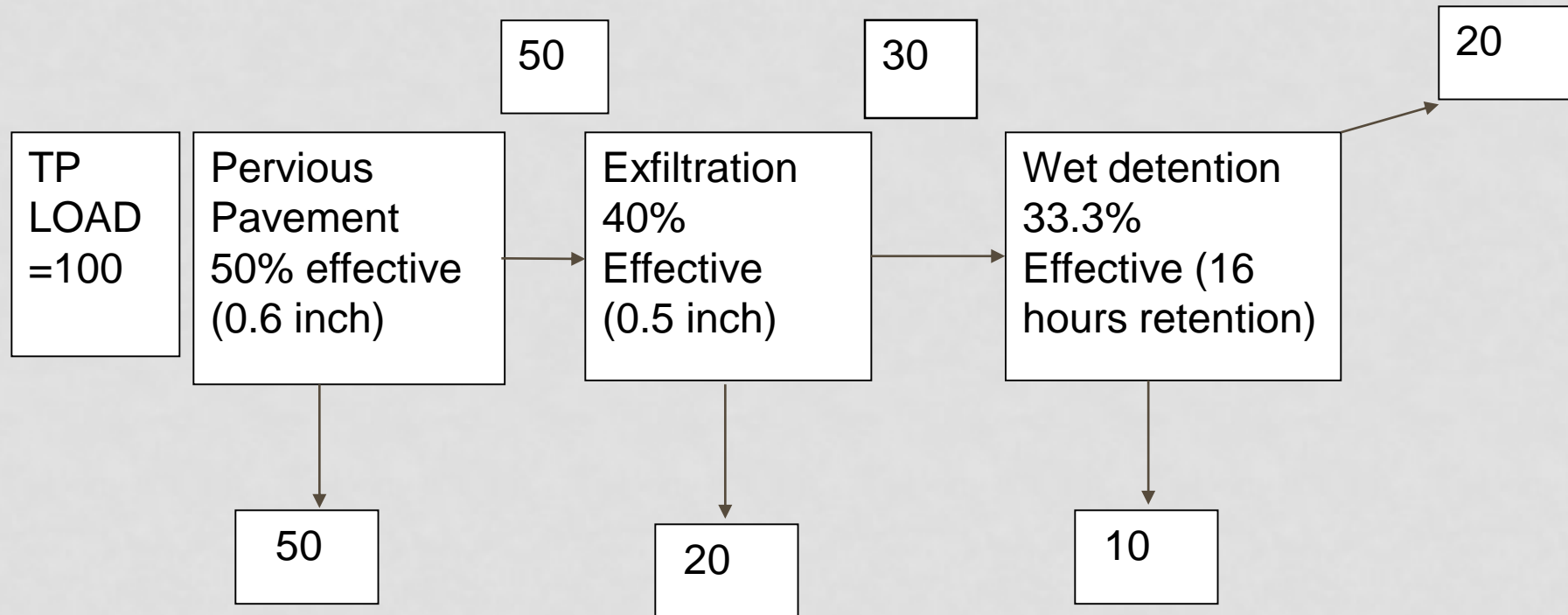
FOR RETENTION STAY TRUE TO THE UNDERLYING PRINCIPLES

Annual effectiveness is **not** the sum of the two efficiencies (50+40= 90%)
It is however the annual effectiveness at 1.1 inch retention or 70%.

NOTE: order of retention
BMPs has no affect on the
removal.



BMP TREATMENT TRAIN CREDITS WHEN THREE EFFICIENCIES ARE IN SERIES



$$M = 100 [1 - \{(1-0.5)(1-0.4)(1-.33)\}] = 100[1-.20] = 80 \% \text{ removed}$$

NOT $50+40+33.3=123.3\%$

- NOTES
1. Example flow diagram for this problem only.
 2. There was no input or additional catchment flow between BMPs

15 BMPS AND ONE USER DEFINED

STEP 2: Select one of the systems below to analyze efficiency.

RETENTION BASIN	WET DETENTION	EXFILTRATION TRENCH	RAIN (BIO) GARDEN	SWALE	USER DEFINED BMP
PERVIOUS PAVEMENT	STORMWATER HARVESTING	FILTRATION including BIOFILTRATION	LINED REUSE POND & UNDERDRAIN INPUT	<p>NOTE !!!: All individual system must be sized prior to being analyzed in conjunction with other systems. Please read instructions in the MULTIPLE WATERSHEDS AND TREATMENT SYSTEMS ANALYSIS tab for more information.</p>	
GREENROOF	RAINWATER HARVESTING	FLOATING ISLANDS WITH WET DETENTION			
VEGETATED NATURAL BUFFER	VEGETATED FILTER STRIP	VEGETATED AREA Example tree well	<p>CATCHMENT AND TREATMENT SUMMARY RESULTS</p>		

HOW TO USE THE USER DEFINED BMP WORKSHEET?

STARTING WORKSHEET

Name of BMP		
Contributing catchment area:	9.500	AC
Required treatment efficiency (Nitrogen):	TBD	%
Required treatment efficiency (Phosphorus):	TBD	%
Is this a retention or other system*?		
If retention, storage depth is:		in
The calculated storage volume is:	0.000	AC-Ft
Treatment efficiency (Nitrogen):		
Treatment efficiency (Phosphorus):		
Provided treatment efficiency (Nitrogen):		
Provided treatment efficiency (Phosphorus):		
* Examples of other systems are street sweeping, dry detention, chemical treatment, and pre-treatment devices		
Enter a short description of BMP below (no more than 200 characters)		

INPUT EXAMPLE

Name of BMP	PIPE R
Contributing catchment area:	9.500
Required treatment efficiency (Nitrogen):	TBD
Required treatment efficiency (Phosphorus):	TBD
Is this a retention or other system*?	Retention
If retention, storage depth is:	0.250
The calculated storage volume is:	0.198
Treatment efficiency (Nitrogen):	43.400
Treatment efficiency (Phosphorus):	43.400

Notes: Units defined on full worksheet and Blue font denotes input data for that worksheet

USER DEFINED BMP

STARTING WORKSHEET

Name of BMP	
Contributing catchment area:	9.500
Required treatment efficiency (Nitrogen):	TBD
Required treatment efficiency (Phosphorus):	TBD
Is this a retention or other system*?	
If retention, storage depth is:	
The calculated storage volume is:	0.000
Treatment efficiency (Nitrogen):	
Treatment efficiency (Phosphorus):	
Provided treatment efficiency (Nitrogen):	
Provided treatment efficiency (Phosphorus):	

* Examples of other systems are street sweeping, dry detention, chemical treatment, and pre-treatment devices

Enter a short description of BMP below (no more than 200 characters)

INPUT EXAMPLE

Name of BMP	Up-Flow Filters
Contributing catchment area:	9.500
Required treatment efficiency (Nitrogen):	TBD
Required treatment efficiency (Phosphorus):	TBD
Is this a retention or other system*?	Other
If retention, storage depth is:	
The calculated storage volume is:	
Provided treatment efficiency (Nitrogen):	54.00
Provided treatment efficiency (Phosphorus):	67.00



1. BMPTRAINS model is used to size treatment systems and estimate an average annual nutrient removal effectiveness.
2. The average annual effectiveness is site and BMP specific incorporating rainfall conditions, impervious cover, soil conditions, type of land use, and type of BMP.
3. BMPs can be analyzed in either series or parallel structure. The estimates stay “true” to the underlying rainfall and catchment conditions.





QUESTIONS, REMARKS AND DISCUSSION

THANK YOU!

