

# SLAMM: Source Loading And Management Model

John Panuska

Wisconsin Department of Natural Resources

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## Source Loading and Management Model SLAMM

### Principal Use and Function

SLAMM is an urban watershed pollutant source area identification and management tool.

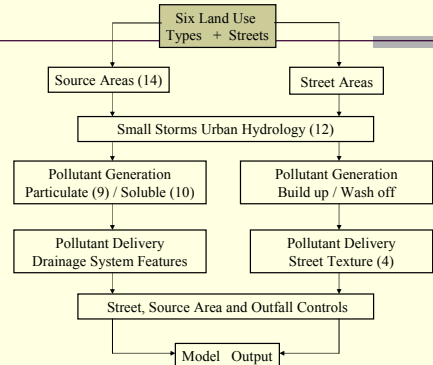
### Overview/Background

The SLAMM model was initially developed in the mid 1970s primarily as a data reduction tool for use in early street cleaning and pollutant source area identification projects sponsored by EPA's storm and combined sewer pollution control program. SLAMM was subsequently refined through additional field studies and program support by the Ontario Ministry of the Environment, WDNR, USEPA, and others. The principal authors of SLAMM are Dr. Robert Pitt and John Voorhees. The current version of SLAMM is a Windows, 32 bit application.

## Comments

- SLAMM can analyze an urban drainage area with up to 6 different land use and 14 source area types per land use.
- SLAMM's BMPs include: catch basins, swales, infiltration devices, porous pavement, wet detention ponds, street sweeping and user-defined devices.
- SLAMM can run batch mode that permits the simulation of additional subareas and/or different management scenarios.
- For additional wet detention pond analysis or design, SLAMM output can be entered into the DETPOND model.
- SLAMM is a continuous sequential event based model. SLAMM simulates rainfall runoff; snowmelt may be modeled with a modified rain file.
- SLAMM simulates runoff volume and loading for ten standard and six user-defined pollutants.
- SLAMM is ideally suited for pollutant source area identification and source area BMP evaluation. It is also useful for water balance studies in conjunction with DETPOND.

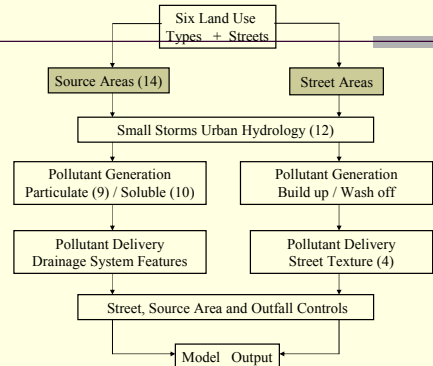
### SLAMM MODEL FLOW CHART



## SLAMM Land Uses

<b>Residential</b>	<b>Institutional</b>	<b>Commercial</b>
<b>Industrial</b>	<b>Open Space</b>	<b>Freeways</b>

### SLAMM MODEL FLOW CHART



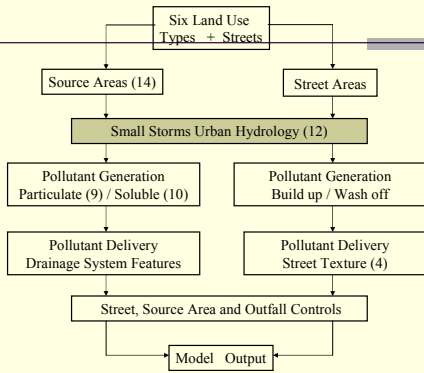
**SLAMM SOURCE AREA TYPES**  
For  
Residential, Institutional, Commercial, Industrial  
and Open Space

Roofs	Undeveloped Areas
Paved Parking/storage	Small Landscaped Areas
Unpaved Parking/Storage	Other Pervious Areas
Playgrounds	Other Areas
Driveways	Freeway Lanes / Shoulders
Sidewalks / Walks	Large Turf Areas
Street Areas	Large Landscaped Areas
Other directly connected impervious areas	
Other partially connected impervious areas	

**SLAMM Source Area Types for Freeways**

- Undeveloped Areas
- Other Pervious Areas
- Paved Lanes / Shoulder Areas
- Large Turf Areas
- Other directly connected impervious areas
- Other partially connected impervious areas

**SLAMM MODEL FLOW CHART**



**SLAMM Hydrology**

**Runoff Coefficient Area Types**

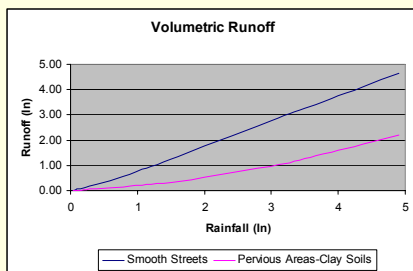
1. Connected flat roofs
2. Connected pitched roofs
3. Directly connected impervious areas
4. Directly connected unpaved areas
5. Pervious area - sandy (A/B) soils
6. Pervious area - clayey (C/D) soils
7. Smooth textured streets
8. Intermediate textured streets
9. Rough textured streets

**Drainage Efficiency Factors**

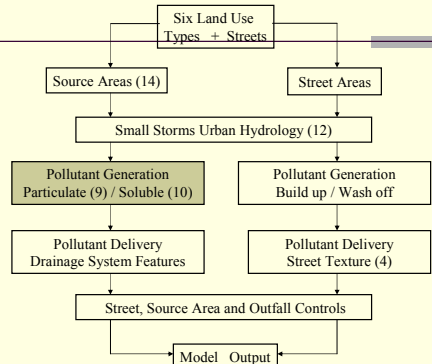
1. w/o alleys, medium to high density land use
2. w/ alleys, medium to high density land use
3. strip commercial and shopping center land use

**SLAMM Volumetric Runoff Coefficients (Rv)**

Runoff = Rainfall x Rv



**SLAMM MODEL FLOW CHART**



## SLAMM Pollutant Generation

### Particulate Forms

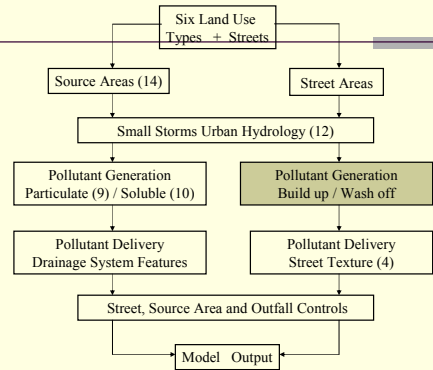
Particulate Solids (kg/kg) (1)  
 Phosphorus (mg/kg)  
 Total Kjeldahl Nitrogen(mg/kg)  
 Chemical Oxygen Demand (mg/kg)  
 Chromium (micrograms/kg)  
 Copper (micrograms/kg)  
 Lead (micrograms/kg)  
 Zinc (micrograms/kg)  
 Fecal Coliform Bacteria (#/100 ml) (2)

+ Ammonia for Madison.

### Filterable (Soluble) Forms

Filterable Solids (mg/L)  
 Phosphorus (mg/L)  
 Total Kjeldahl Nitrogen(mg/L)  
 Chemical Oxygen Demand (mg/L)  
 Chromium (micrograms/L)  
 Copper (micrograms/L)  
 Lead (micrograms/L)  
 Zinc (micrograms/L)

## SLAMM MODEL FLOW CHART



## SLAMM Pollutant Generation for Street Areas

- The user is asked to determine if initial street dirt and street dirt accumulation are determined by the model based on land cover type and street texture or user input values.
- Pollutants are then washed off street surfaces by storm events.

## SLAMM Pollutants For Street Areas

### Particulate Forms

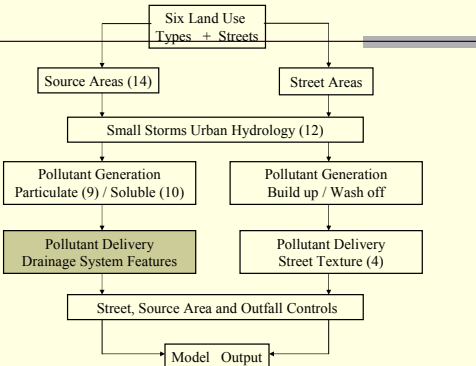
Particulate Solids (kg/kg) (1)  
 Phosphorus (mg/kg)  
 Total Kjeldahl Nitrogen(mg/kg)  
 Chemical Oxygen Demand (mg/kg)  
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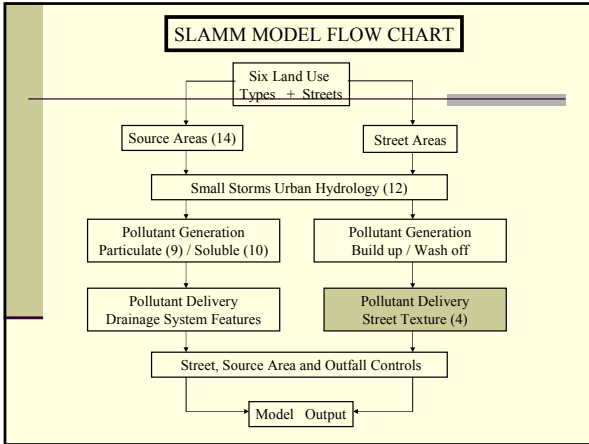


## SLAMM Pollutant Delivery Drainage System Features

1. Grass swales
2. Undeveloped roadside
3. Curb and gutters, 'valleys', or sealed swales

The condition options for curbs and gutters are:

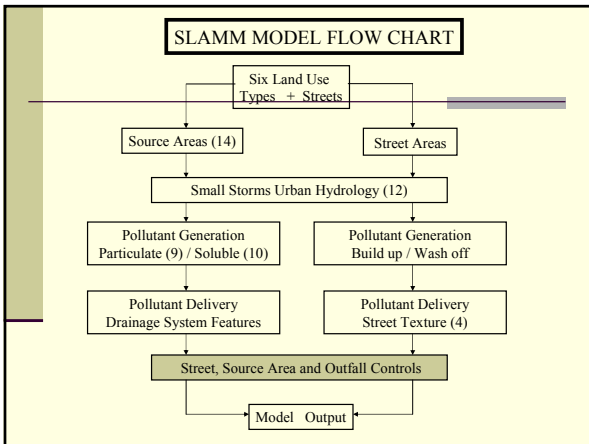
1. Poor condition (or very flat)
2. Fair condition
3. Good condition (or very steep)



## SLAMM Street Pollutant Delivery: Street Texture

### Street Texture Classes

1. Smooth
2. Intermediate
3. Rough
4. Very Rough (including oil and screens)



### SLAMM Street, Source Area and Outfall Controls

	Infiltration Device	Wet Detention	Grass Swale	Street Cleaning	Catchbasin Cleaning	Porous Pavement	Other
Paved Parking/Storage	X	X				X	X
Unpaved Parking/Stor.	X	X					X
Playgrounds	X	X				X	X
Driveways						X	X
Sidewalks/Walks						X	X
Streets/Alleys				X			X
Undeveloped Areas	X	X					X
Small Landscaped Areas	X						X
Other Pervious Areas	X	X					X
F. way Lanes/Shoulders	X	X					X
Large Turf Areas	X	X					X
Large Landscaped Areas	X	X					X
Drainage System			X		X		X
Outfall	X	X					X
Roof	X	X					X
Other Impervious Areas	X	X					X

## SLAMM Model Output

### Output source areas by land use & outfall for each rain - complete printout.

Output consists of runoff, concentration, and loading values, by rain event, for all source areas in each land use, and outfall totals for each rain event.

### Output source area totals and outfall summaries.

Output consists of runoff, concentration, and loading value totals for all rain events, for all source areas in each land use, and outfall value totals for entire model run.

### Output outfall data only for each rain.

Output consists of outfall runoff, concentration, and loading values, by rain event.

### Default option - Output outfall summaries only.

Output consists of outfall runoff, concentration, and loading value totals for entire model run.

### Runoff & Flow Summary

One line data summary per event.

### Outfall Hydrograph Data

Three time increment options - 6, 15, or 60 minute.  
Output a component of SLAMM integration with SWMM