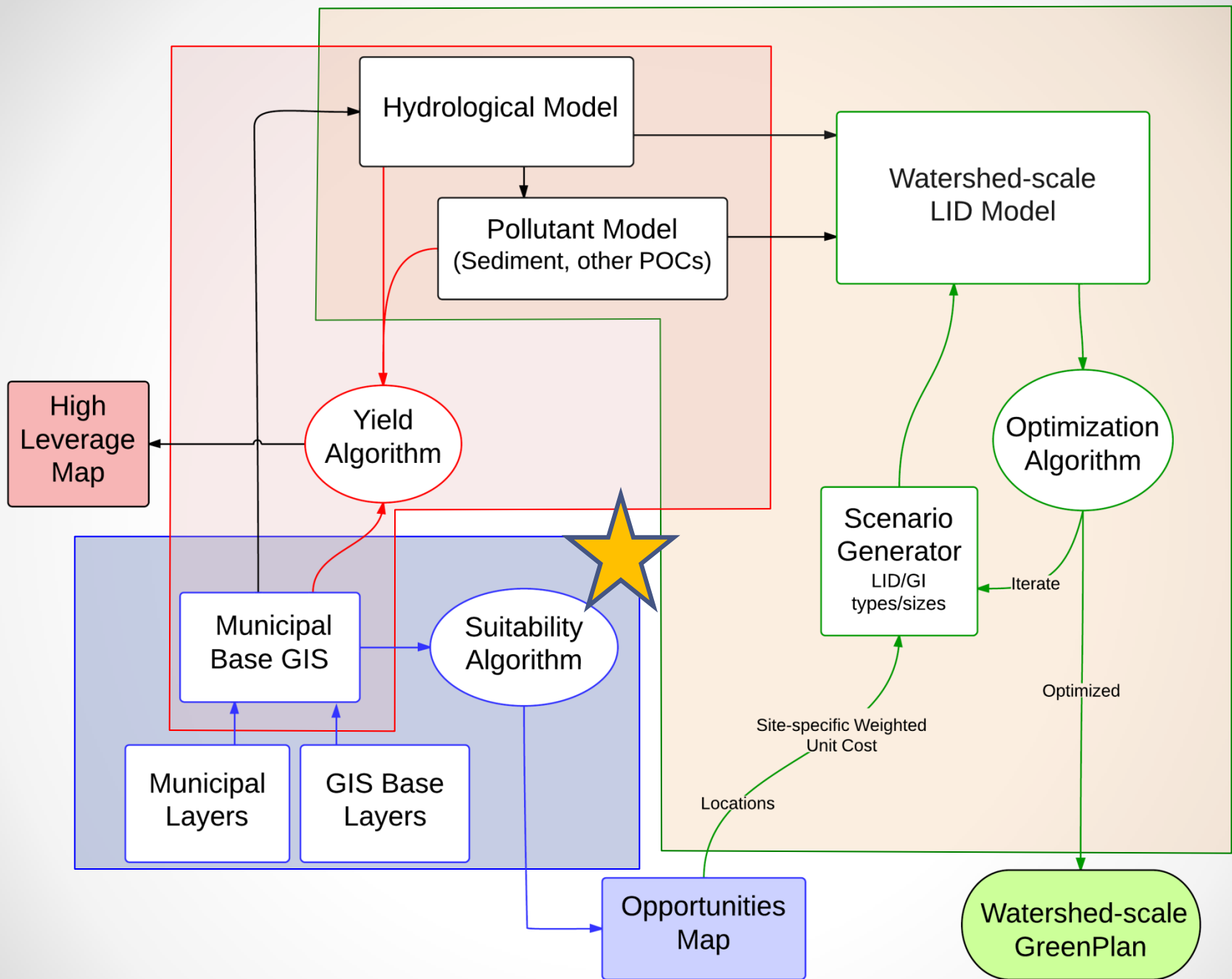


GreenPlanIT

LID Site Suitability Tool

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GreenPlanIT TAC Meeting, 06/17/2014



LID Site Suitability Tool

- Talk Outline
 - Our questions
 - Overview of the tool
 - Example of the tool with City of SJ data
 - Discussion of our questions

Our Questions for the TAC

- Add one more LID treatment type?
- What key data / analysis factors should be considered to identify and prioritize locations suitable for LID?
- Site Specific LID Refinements
 - We are developing two analysis modules to identify specific street and parking lot locations that will support certain LID types. Can you recommend other analysis modules that we should consider?
- Does the tool logic seem sound?
 - Will it produce useful results?

LID Site Suitability Tool

- Goal: identify potentially suitable sites for LID implementation
- Objectives: practical, flexible, broadly applicable, freely available, and useful
- Requires local data and knowledge, GIS software, staff
- The utility and limitations of the Siting Tool and analyses are driven by the underlying data as well as the tool logic

LID Site Suitability GIS Tool Components

- ArcGIS python scripts that will be accessible in the ArcGIS toolbox
- Configuration files defining suggested local layers and default parameters
- Data layers
 - Local + regional base analysis (Kass et al, 2011)
- Documentation on how to use and extend the tool

Building upon previous work

- 2011 regional GIS analysis for LID treatments – the base analysis
 - Kass et al. (2011). White Paper on Regional Landscape Characterization for Low Impact Development Site Suitability Analysis . SFEI.
- Regional Base Analysis Method

Regional Base Analysis Method

Bioretention



Wet Pond



Permeable
Pavement



Vegetated Swale



Stormwater Wetland



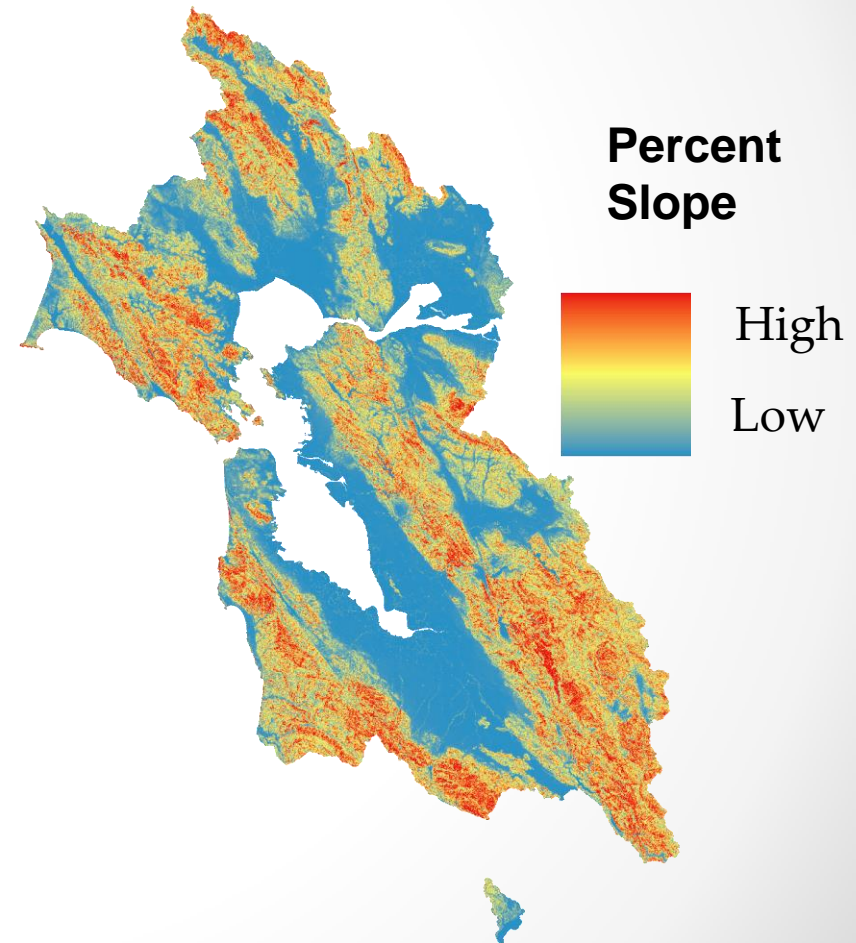
Identified
5 LID
Treatment
Types

Regional Base Analysis

Landscape factors that affect LID siting

1. Depth to groundwater
2. Slope
3. Soil type
4. Land use
5. Liquefaction

Study Area: SF Bay
Regional Water Board
boundary



Categorical Weighted Overlay

variables bins			OVERLAY VALUES (1-low -> 3-high)					← LID treatments	
			BIOR	SWWT	WTPD	VGSW	PRPV		
weights	27	depth to ground-water	0-2 ft	x	3	x	x	x	cell values
			2-3 ft	x	2	1	x	x	
			3-5 ft	1	2	1	1	2	
			> 5 ft	3	1	3	3	3	
	27	slope	0-2 %	3	3	3	3	3	
			2-3 %	3	2	3	3	2	
			3-5 %	2	2	2	3	1	
			5-7 %	2	1	2	2	x	
			7-8 %	1	1	1	2	x	
			8-10 %	1	x	1	2	x	
			10-12 %	1	x	x	1	x	
			12-15 %	x	x	x	1	x	
			> 15 %	x	x	x	x	x	
	20	soil hydrologic type	A	3	1	1	3	3	
			B	3	1	1	3	3	
			C	2	2	2	3	2	
			D	1	3	3	3	2	
	16	land use	residential	3	2	3	3	2	
			commercial	3	2	2	2	3	
			open space	2	3	3	3	x	
			agriculture	1	3	2	3	x	
			transportation	3	2	2	3	3	
			industry	1	1	1	1	1	
	10	risk of liquefaction	very low	3	3	3	3	3	
			low	3	3	3	3	3	
			medium	3	3	3	3	3	
			high/very high	1	1	1	1	1	

3

3

2

2

1

1

1

x

x

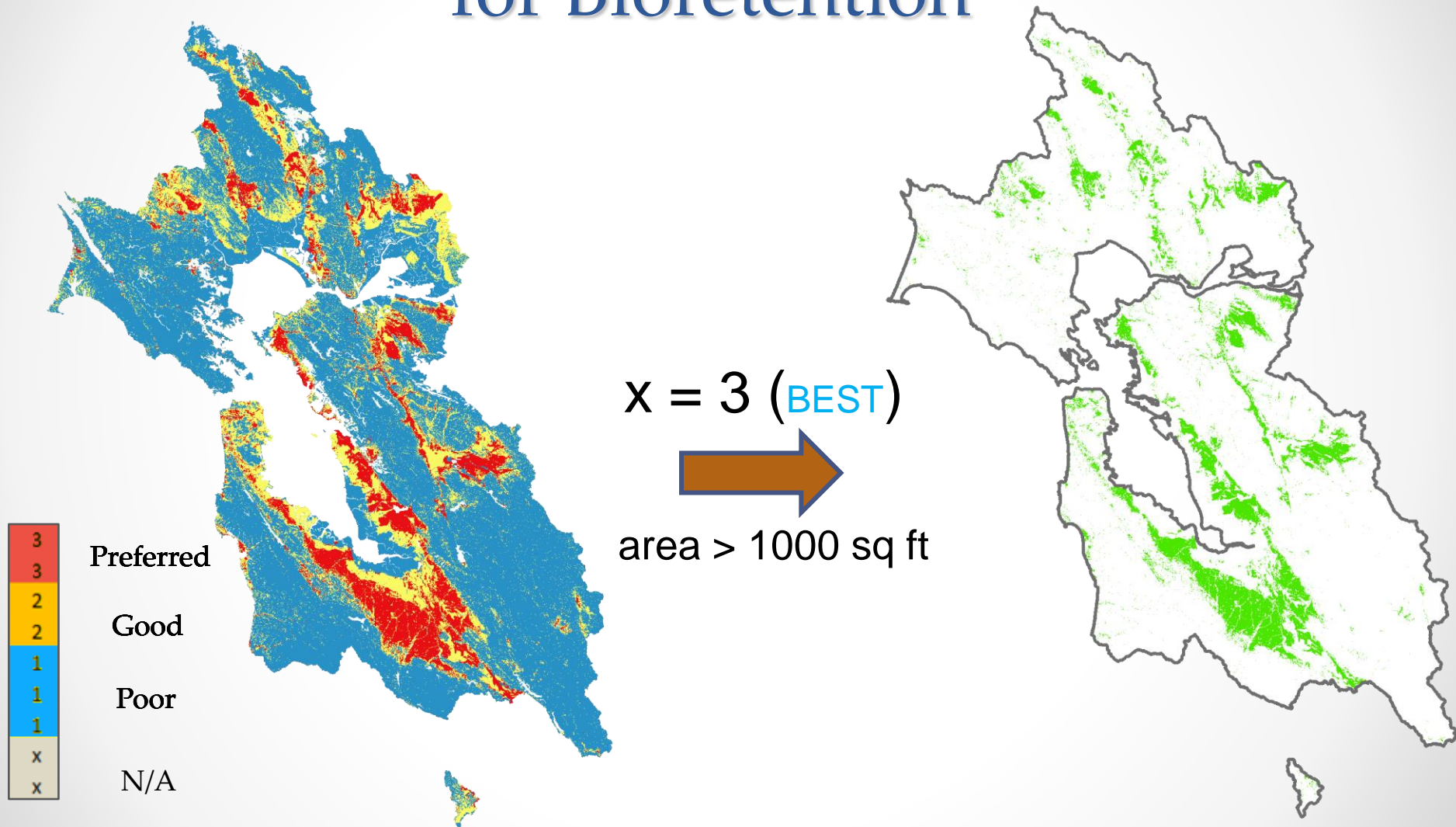
Preferred

Good

Poor

N/A

Regional Base Analysis Output for Bioretention




LID Site Suitability Tool

Enhancements

- Incorporate Regional Base Analysis
 - Add additional LID treatment type(S) to Base Analysis
- Allow users to add local-scale data
 - 2 partners – Cities of San Mateo and San Jose
- Allow user to customize parameters
 - But recommend defaults based on expert input
- Tool generated outputs:
 - GIS layer per LID type
 - Tabular report summarizing parameters
- Verification of Siting Results
 - Desktop Reconnaissance
 - Field Verification

Prep work:
Goals, Data, local expertise

LID Site Suitability Tool

Regional Base Analysis Module		
Extend Configure Use		
LID Best suitability polygons (1/0)		
X	LID1: BIOR	
X	LID2: SWWT	
	LID3: WTPD	
	LID4: PRPV	
X	LID5: VGSW	

Local Knock-out Constraints Exclusion Model + (config table2)	
Layers to remove from priority areas	buffer(ft)
Building Footprints	0
High Pressure Gas Lines	10
Existing LID	
Open Water	

Local Siting Refinements (Local data + Add-on Modules)			
Location Type (1/0)	LID 1	LID 2	LID 5
Wide Streets	0	1	1
Wide Sidewalks	0	1	1
Pedestrian Streets	1	1	1
Uncovered Parking Lots	1	0	1
Publicly owned open space			

INTERSECT

ERASE

INTERSECT

Site Visit

Model
Refinement

Iteration

Tool Outputs

- One layer per selected LID type
- Summary report

Local Opportunities and Constraints:
Additive Model + (config table1)

weight	Factor	weight	Priority Layer	LID 1	LID 2	LID 5
1:nf	local development	1:nl	Priority Development Areas	1	1	1
		1:nl	Capital Improvement Projects	1	1	1
		1:nl	Recently retrofitted streets	0	-1	0
		1:nl	Proximity to storm drains	1	1	1
1:nf	Water Quality	1:nl	Pollutant loading			
		1:nl	Proximity to wetlands, streams			
		1:nl	Areas of known flooding			
1:nf	Community Needs	1:nl	Park and open space deficits			
		1:nl	Population density			
		1:nl	High crime areas			
		1:nl	priority Habitat/biodiversity areas			
1:nf	Conservation	1:nl	Connectivity / linkages			

Key Municipal Data Layers

- **Streets**, transportation
- **Parcels with ownership**
- **Building footprints**
- **Parking lots**
- **High pressure gas lines**
- Storm drains and sizes
- **Land use**
- Open space
- Slope, elevation
- **Aerial Imagery**
- Soils / geology
- **Priority development areas**
- Impervious surfaces
- **Capital improvement projects**
- Habitat conservation areas, biological diversity
- Floodways
- Liquefaction zones
- City Tree Inventory
- Existing LID

Tool Add-on Analysis Modules

- Streets Analysis Module
- Parking Lot Analysis Module

Given required input layers, these tools can generate new outputs that can be used to refine the suitability analysis.

Streets Analysis Module

Street centerlines
with FOC and ROW

FOC \geq 36' Buffer by $\frac{1}{2}$ FOC
(residential and commercial)
*customizable

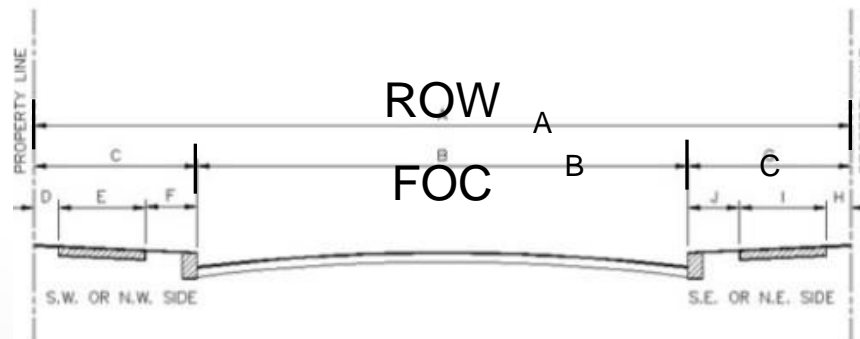
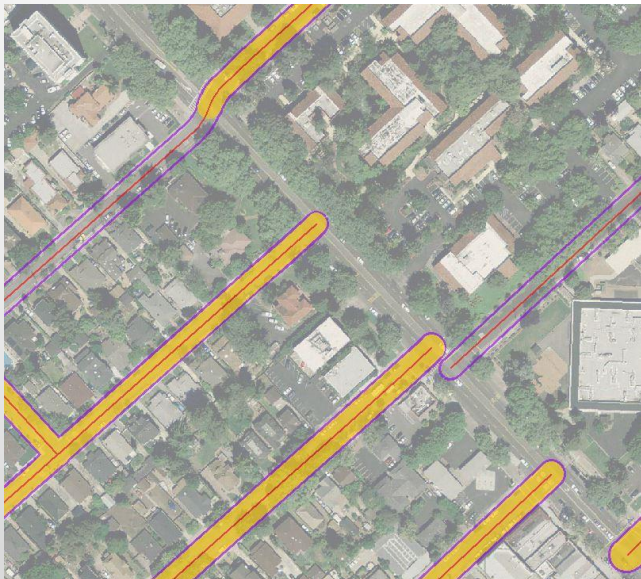
Wide Streets

ROW-FOC \geq 26' Buffer by
 $\frac{1}{2}$ ROW and erase buffer
of $\frac{1}{2}$ FOC
(residential and commercial)
*customizable

Wide Sidewalks

Class = PA with buffer

Pedestrian Streets

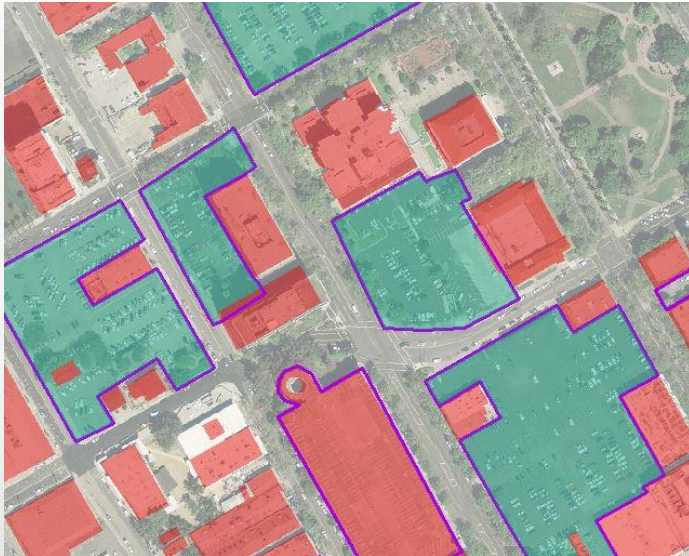


Parking Lot Analysis Module

Parking lots (or OSM)
Building footprints

Parking where $>50\%$ of area
is not-building; and size of
polygon (parking with
building footprint is erased)
 $\geq 7000\text{sqft}$
*customizable

Uncovered
Parking



Example: City of San Jose

- Vegetated Swale
- Bioretention

VEGETATED SWALE

San Jose Vegetated Swale Suitability Analysis Output



Vegetated Swale Suitable Areas



0 0.75 1.5 3 4.5
Miles

BIORETENTION

San Jose Bioretention Suitability Analysis Output



Bioretention Suitable Areas

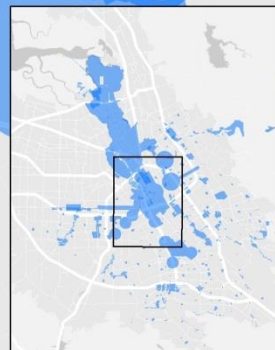


0 0.75 1.5 3 4.5
Miles

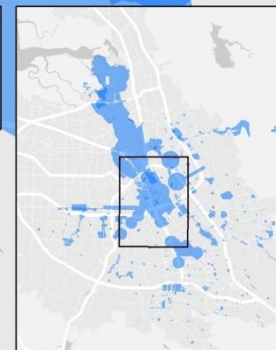
VEGETATED SWALE

BIORETENTION

San Jose Local Opportunities
and Constraints Additive Model

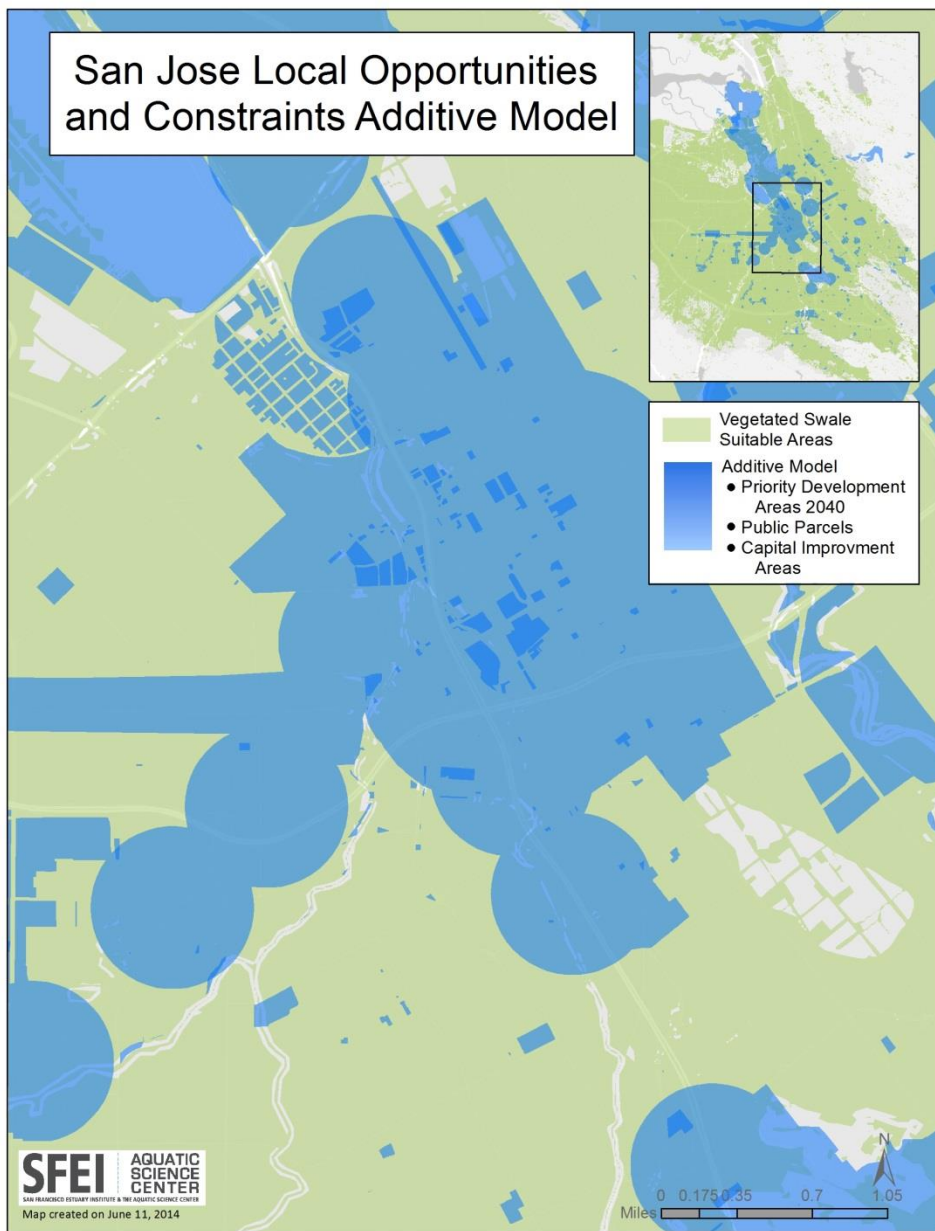


San Jose Local Opportunities
and Constraints Additive Model



VEGETATED SWALE

San Jose Local Opportunities and Constraints Additive Model



BIORETENTION

San Jose Local Opportunities and Constraints Additive Model



VEGETATED SWALE

BIORETENTION

San Jose Vegetated Swale
Intersected with Additive Model

San Jose Bioretention
Intersected with Additive Model

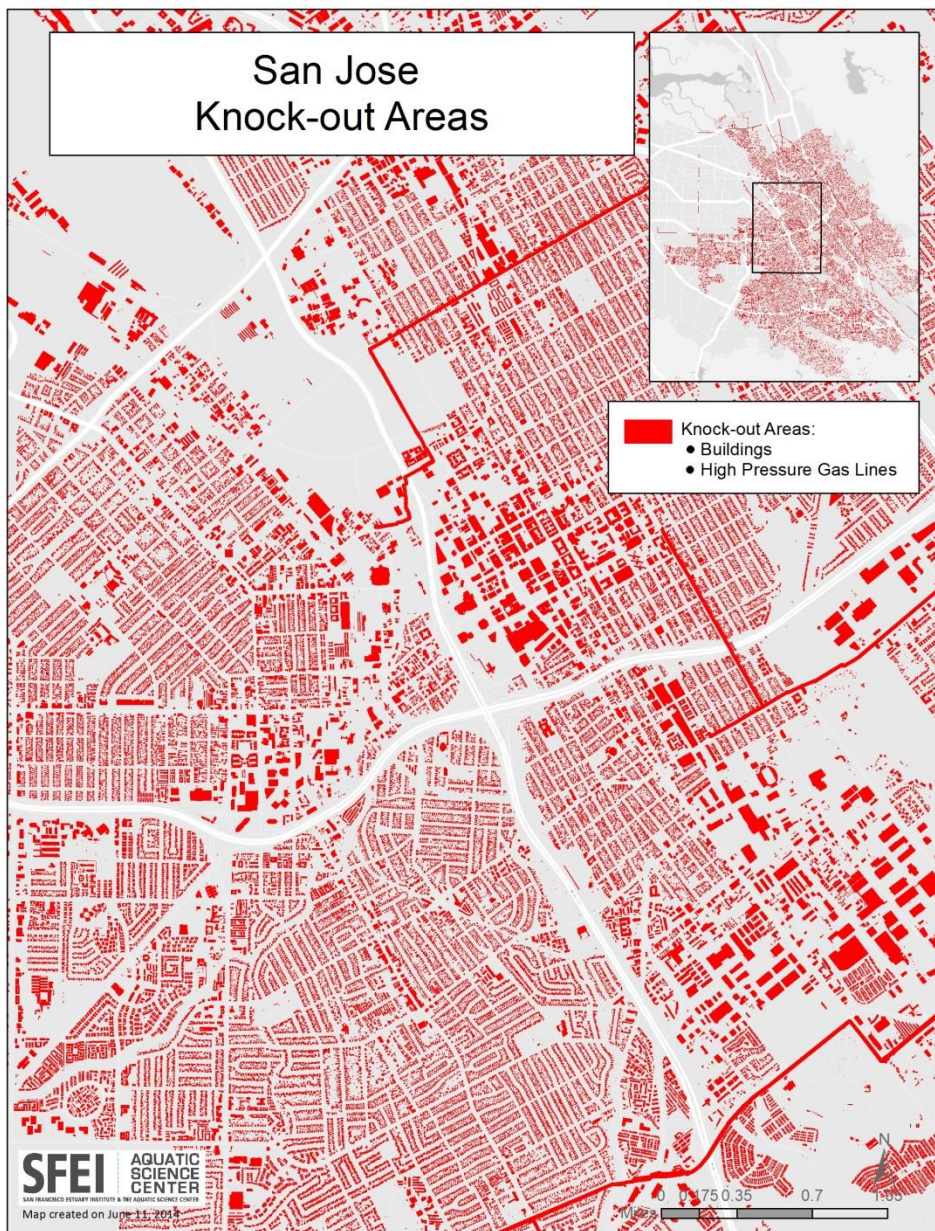
Vegetated Swale Intersected
with Additive Model

Bioretention Intersected
with Additive Model

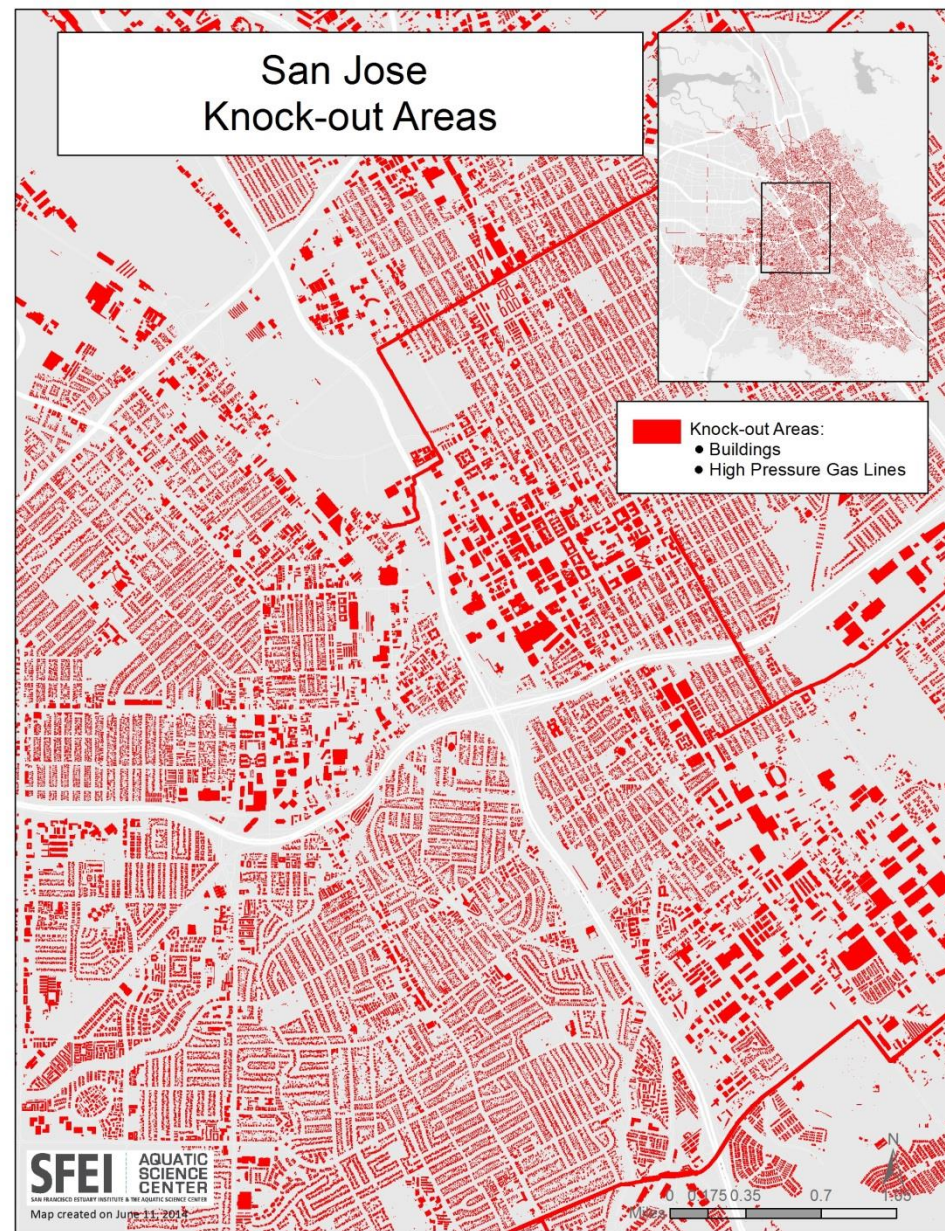
0 0.175 0.35 0.7 1.05
Miles

0 0.175 0.35 0.7 1.05
Miles

VEGETATED SWALE



BIORETENTION



VEGETATED SWALE



BIORETENTION



VEGETATED SWALE

BIORETENTION

San Jose Knock-out Analysis

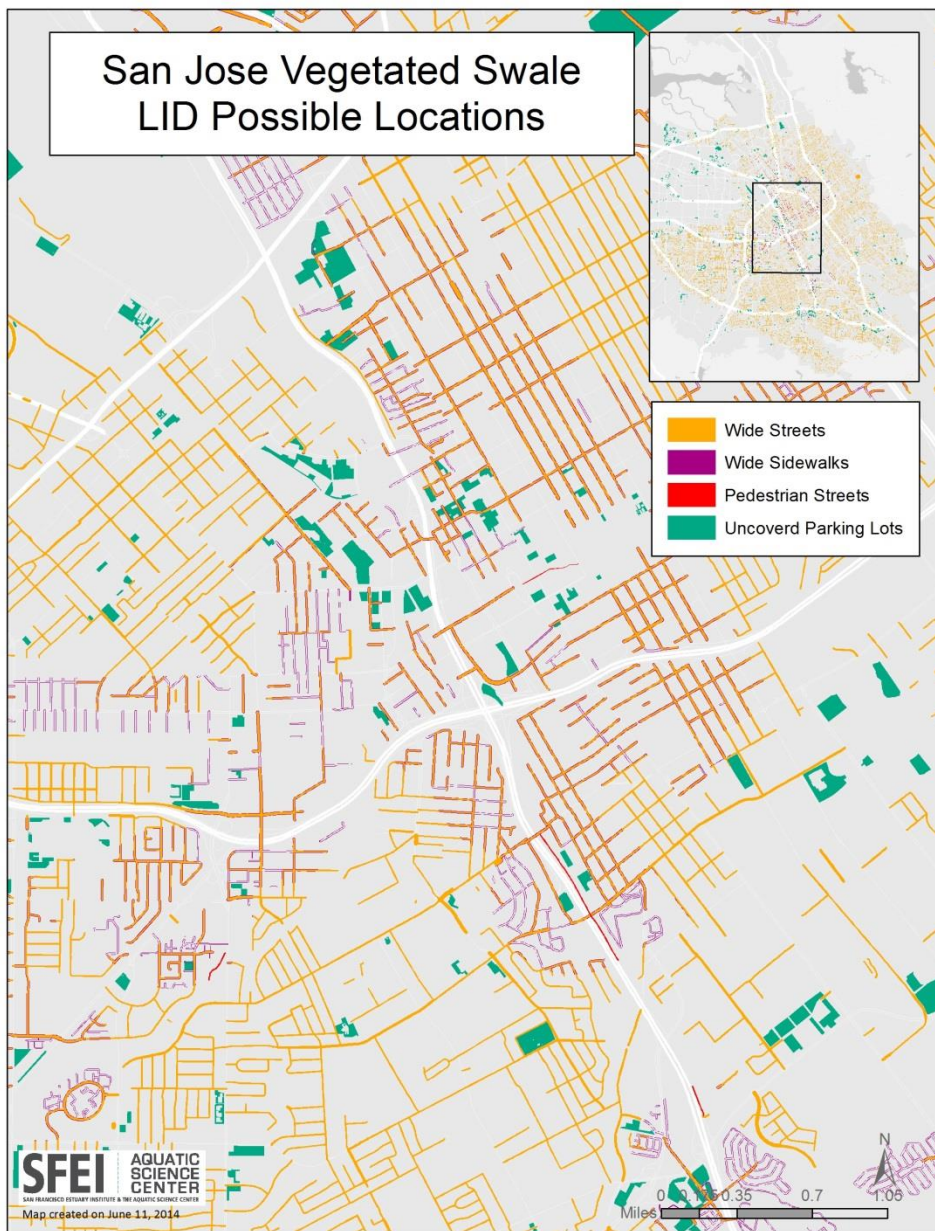


San Jose Knock-out Analysis



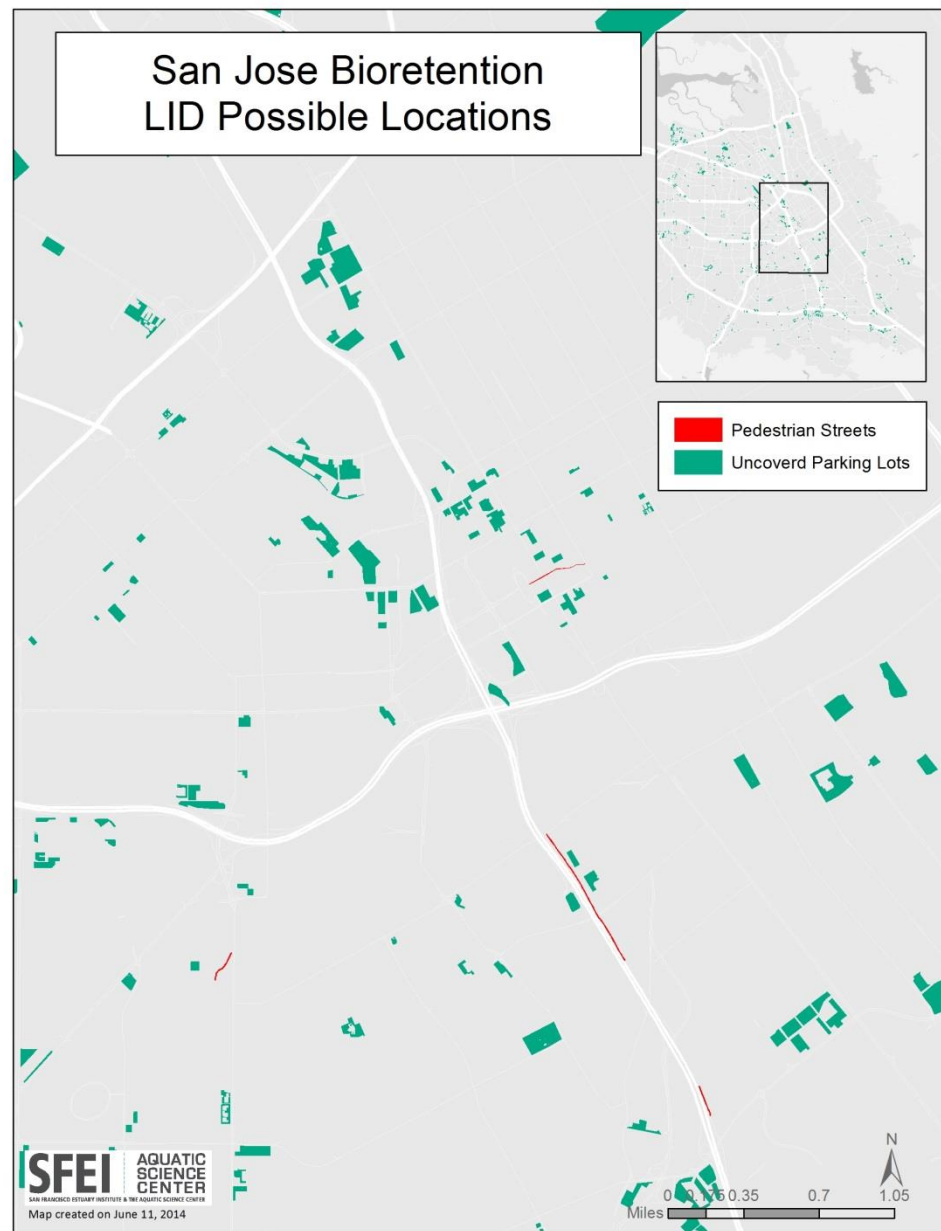
VEGETATED SWALE

San Jose Vegetated Swale LID Possible Locations



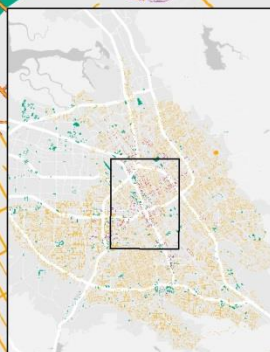
BIORETENTION

San Jose Bioretention LID Possible Locations

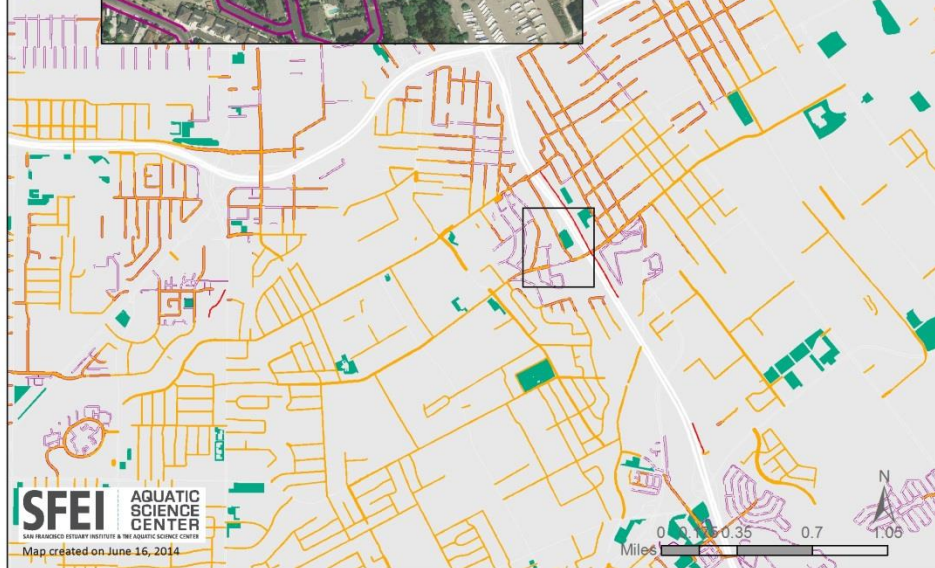


VEGETATED SWALE

San Jose Vegetated Swale LID Possible Locations

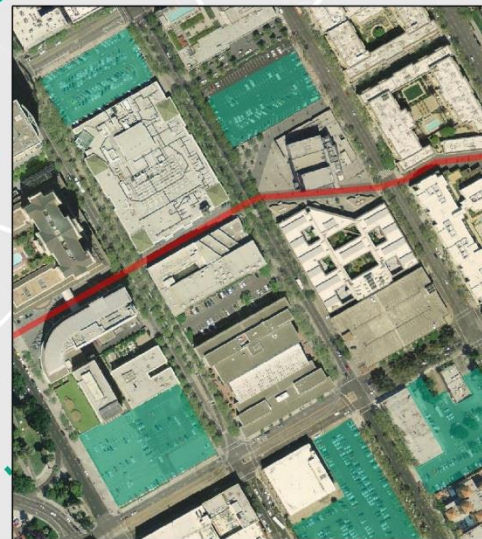


- Wide Streets
- Wide Sidewalks
- Pedestrian Streets
- Uncoverd Parking Lots



BIORETENTION

San Jose Vegetated Swale LID Possible Locations

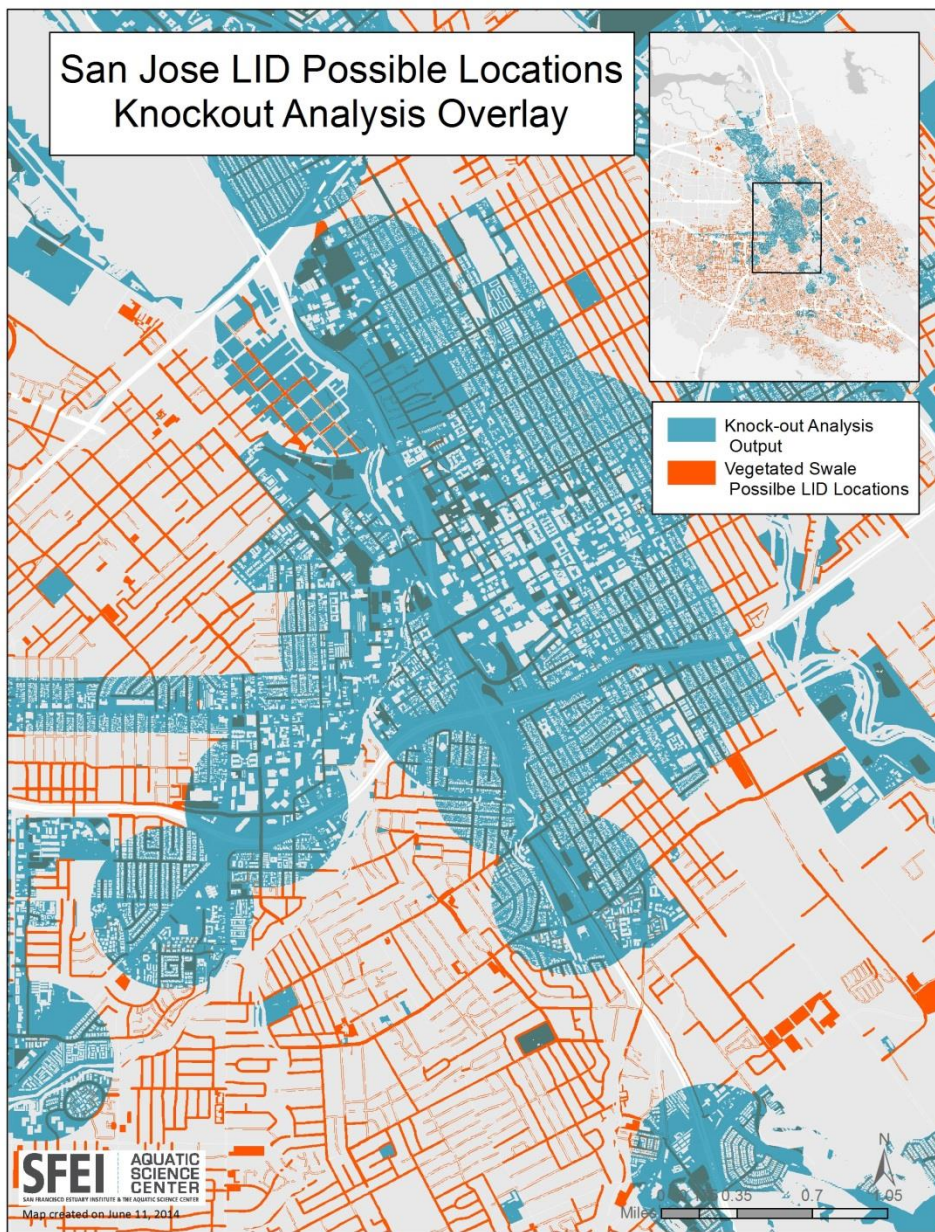


- Pedestrian Streets
- Uncoverd Parking Lots



VEGETATED SWALE

San Jose LID Possible Locations
Knockout Analysis Overlay



BIORETENTION

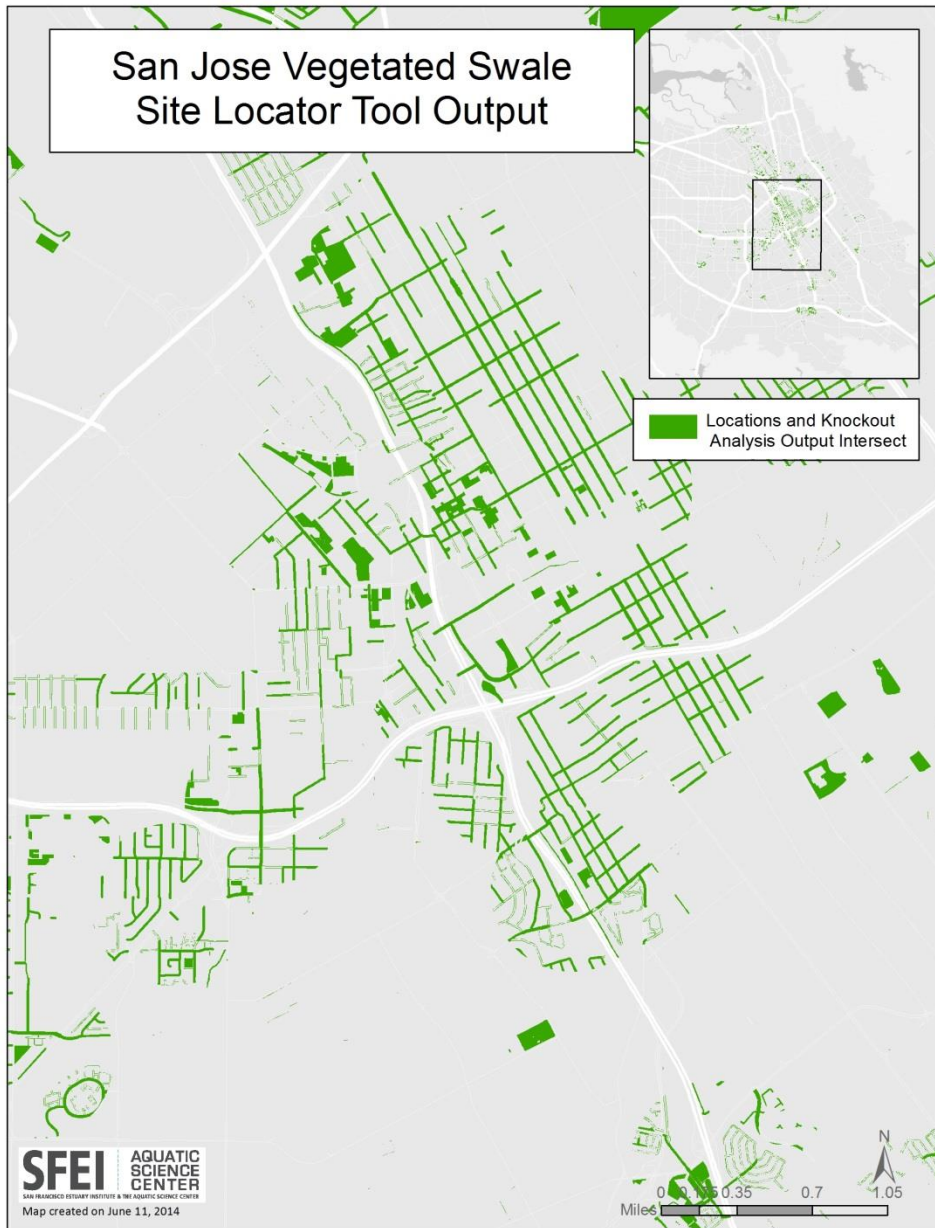
San Jose LID Possible Locations
Knockout Analysis Overlay



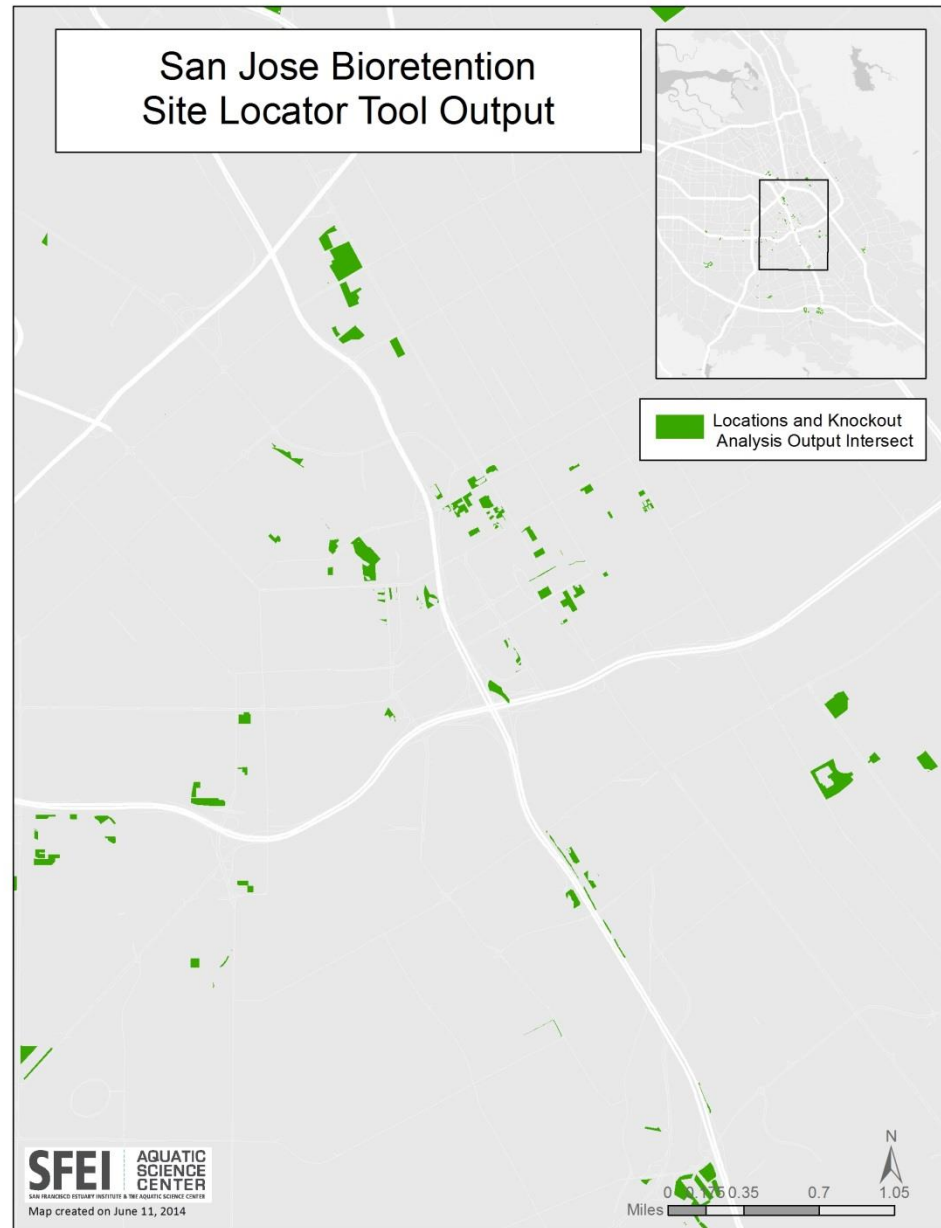
VEGETATED SWALE

BIORETENTION

San Jose Vegetated Swale Site Locator Tool Output



San Jose Bioretention Site Locator Tool Output



SITE LOCATOR TOOL OUTPUT

VEGETATED SWALE

BIORETENTION

San Jose Vegetated Swale
Site Locator Tool Output

San Jose Bioretention
Site Locator Tool Output

Locations and Knockout
Analysis Output Intersect

Locations and Knockout
Analysis Output Intersect

Vegetated Swale

Bioretention

Returned Acreage

1969.13 acres

372.254 acres

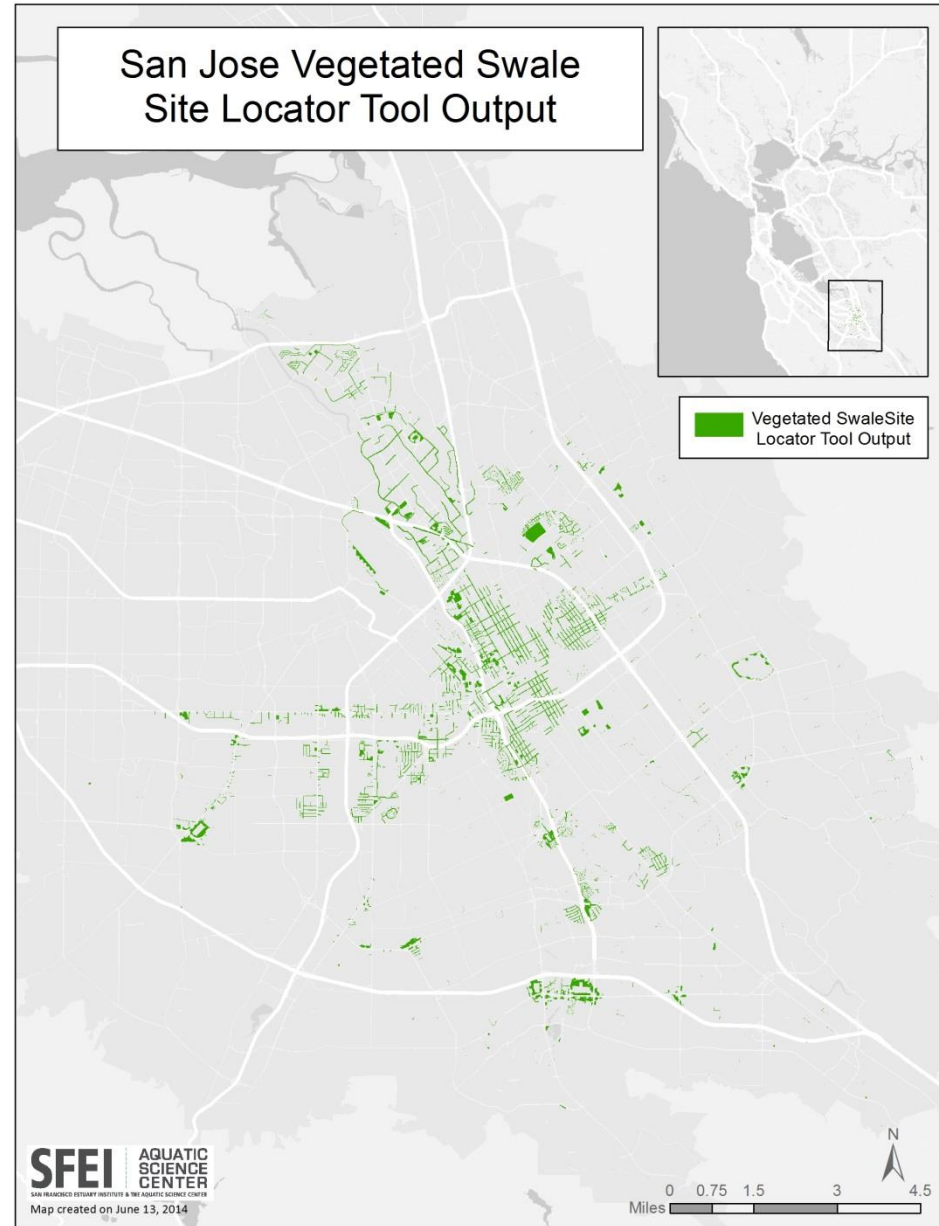
SITE LOCATOR TOOL OUTPUT

VEGETATED SWALE SITE LOCATOR REFINEMENT

San Jose Vegetated Swale
Suitability Analysis Output



San Jose Vegetated Swale
Site Locator Tool Output



BASE ANALYSIS OUTPUT

SITE LOCATOR TOOL REFINEMENT

Our Questions for the TAC

- Add one more LID treatment type to the base analysis: Infiltration trench. Other?

bioretention



wet pond



permeable
pavement



vegetated swale



stormwater wetland



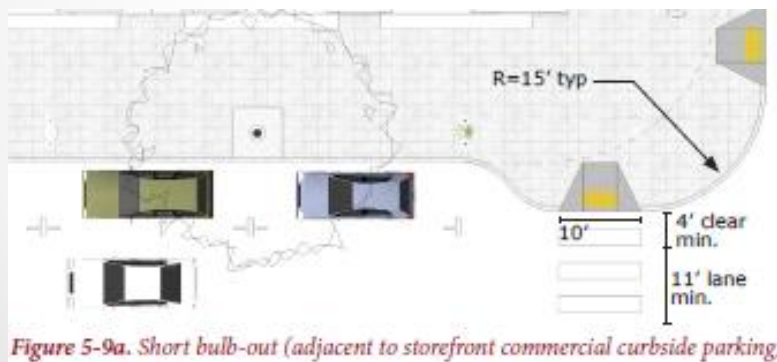
What Key Data / Analysis Factors should be considered to identify and prioritize locations suitable for LID?

Opportunities	Constraints	Knockout Constraints
Public schools & facilities	Gas lines	Gas Lines
Demographics: Income, Age	Sewers	Power lines
Land use: High density residential, industrial	Underground power lines	Existing LID
Transportation	Open water	
Parks & Open space	Emergency services (fire hydrants...)	
Areas of known flooding	Contaminated areas	
Impervious surfaces	Red curbs?	
Near streams, wetlands	High crime areas	
High visibility areas		
Land surface temperature		
Conservation & Biodiversity		

Note: CCS Green Solution Project Alameda County, Phase 1 report, 2011 has recommendations

Our Questions for the TAC

- We are developing two analysis modules to identify specific street and parking lot locations that will support certain LID types. Can you recommend other analysis modules that we should consider?
 - Vacant parcels
 - Roundabouts?
 - Intersection Bulb-outs? – how to identify?



Our Questions for the TAC

- Does the tool logic seem sound?
- Will it produce useful results?
- What's missing?
 - Site size consideration?

	Vegetated Swale
Returned Acreage	1,969.13 acres



Thank You!

- Please email or call us with additional feedback