



Engaging Middle Schoolers –
Future CASQA Members! –
in Green Infrastructure Planning
Using Flow Path Mapping and
Visualization Software



Focused Planning Solutions LLC



Context

Location: Feaster Charter

- Past attendance boom led to hasty construction of trailers and pavement
- Currently a DAC grant site to prepare stormwater design improvements

What we Brought: Tech for Design and Education on Stormwater

- iPads with flow path modeling and aerial for group design ideas
- CommunityViz software to calculate runoff net change

Middle School Media Design Lab

- ~20 students per class - 2 classes
- 30-40 minutes per class



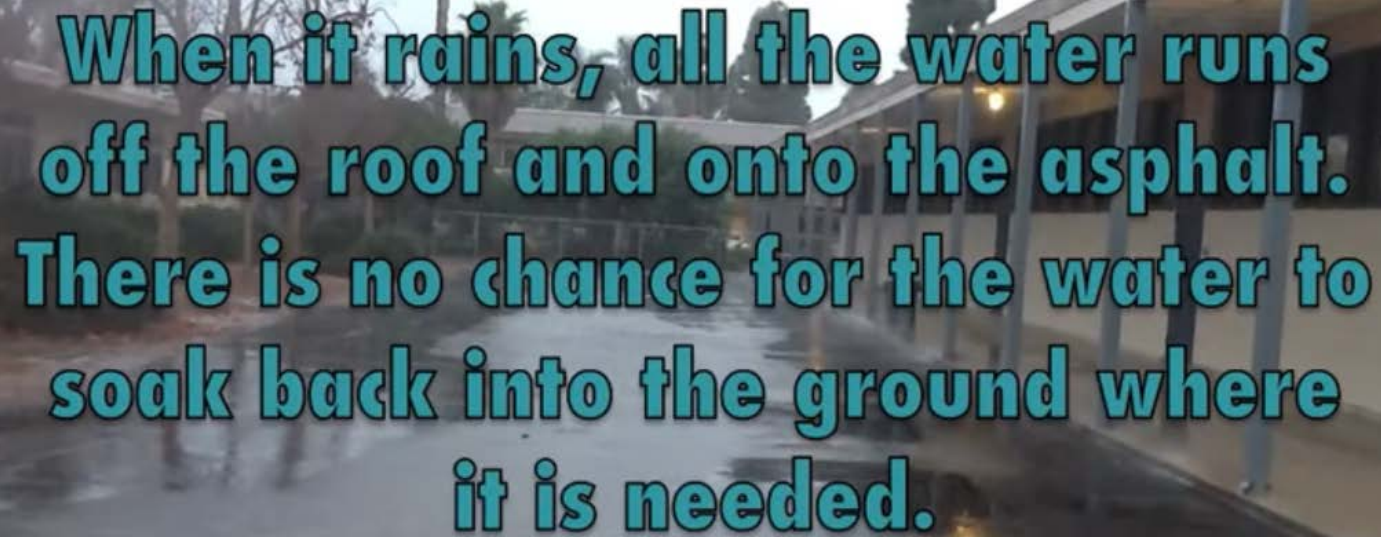
Feaster Charter School, Chula Vista

*The menace of
Lake Feaster
did not always exist.*


*It was created by us,
and only we can destroy it.*

*How did Lake Feaster come
into being?*

Feaster Charter School, Chula Vista



When it rains, all the water runs off the roof and onto the asphalt. There is no chance for the water to soak back into the ground where it is needed.



The water has to GO somewhere.



Several hours later all that water is down the **STORM DRAIN and off to the ocean. What a waste!**



Feaster Charter School, Chula Vista



Lesson Plan

Timeline:

- (10 min) – Introduction and presentation – what impacts stormwater flow and absorption on site?
- (10-15 min) – Group exercise on iPads – split into teams of 3-5 and draw ideas for groundcover changes
- (15 min) – Groups use the CommunityViz model (single laptop connected to projector) to input designs and see runoff results. Take turns sharing with group.



Essential Questions, Objectives and Standards

Essential Questions

- How is rain volume and flow measured?
- Do you understand the connection between materials and stormwater? What materials are better at absorbing water?

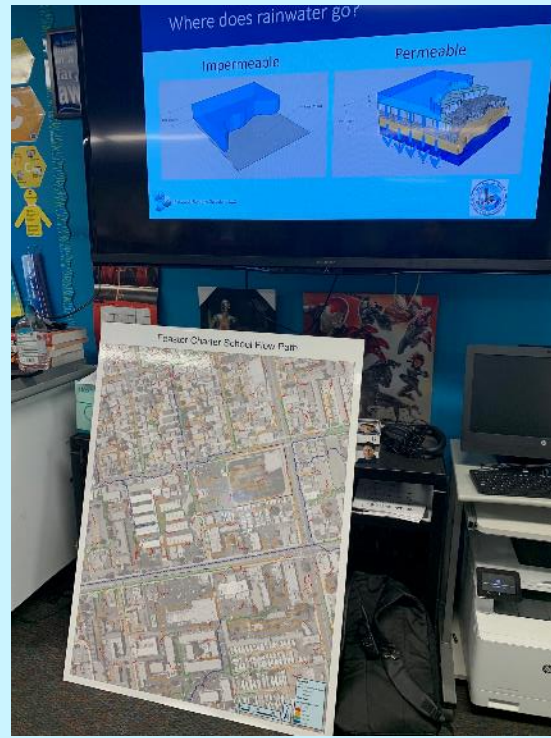
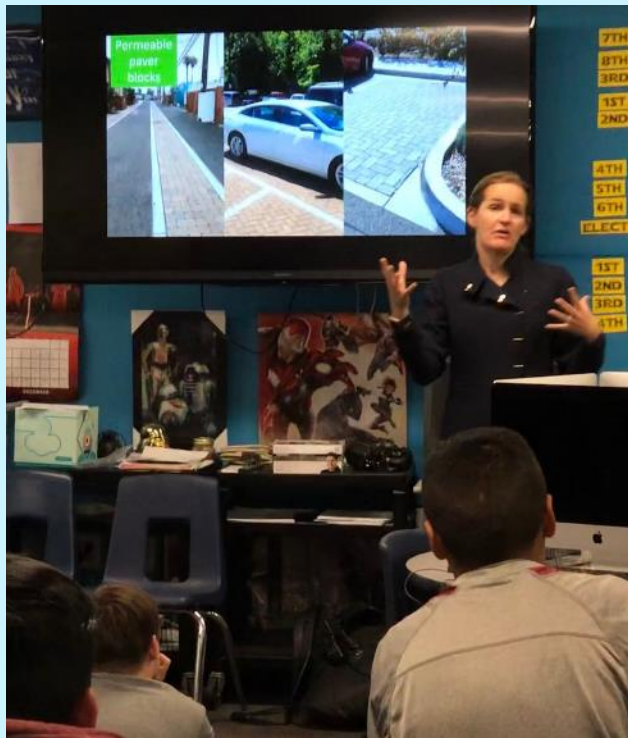
Objectives

- Use tools provided to create and evaluate design ideas for their campus

Standards

- Science – material properties, hydrology, hydrography
- Math – geometry, volume, measurements, estimation





Introduction Presentation

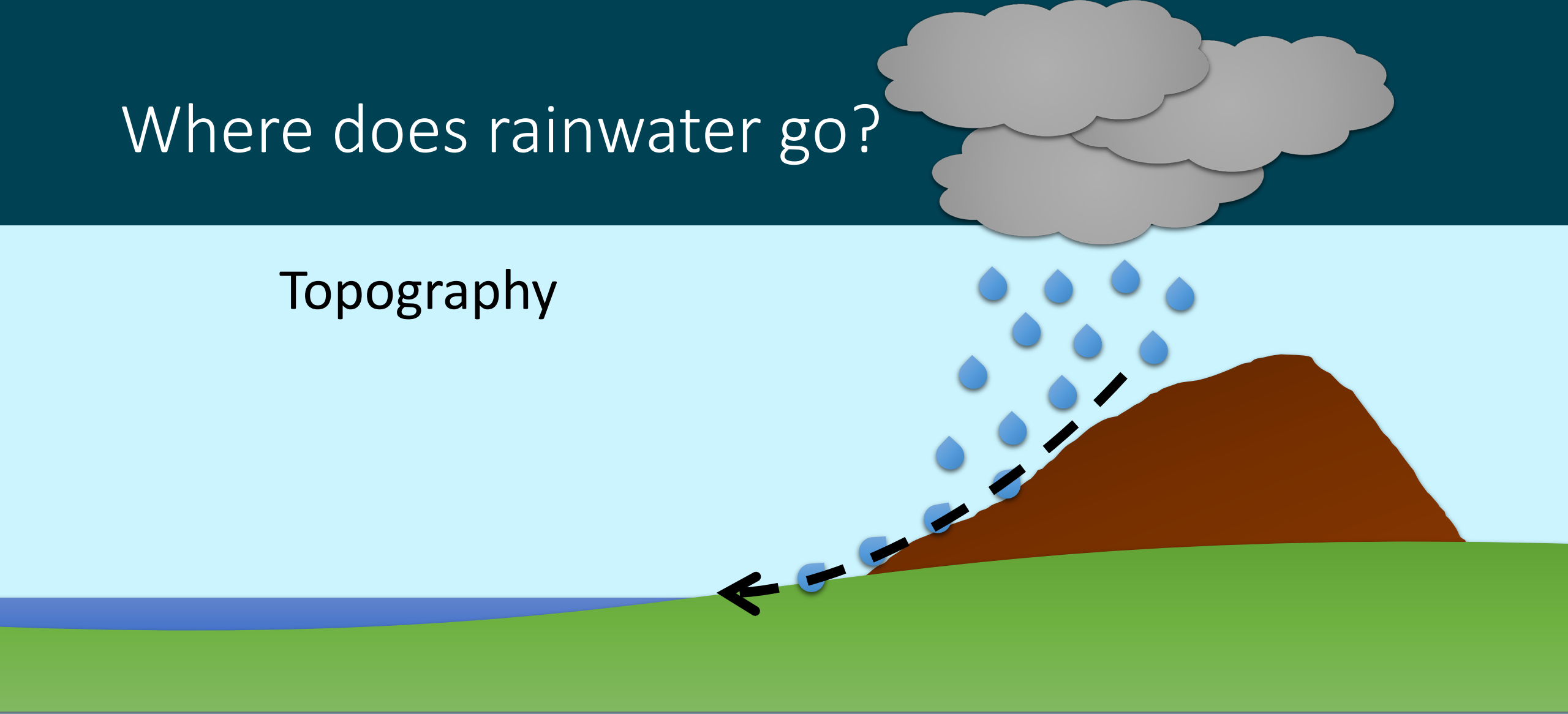


Focused Planning Solutions LLC

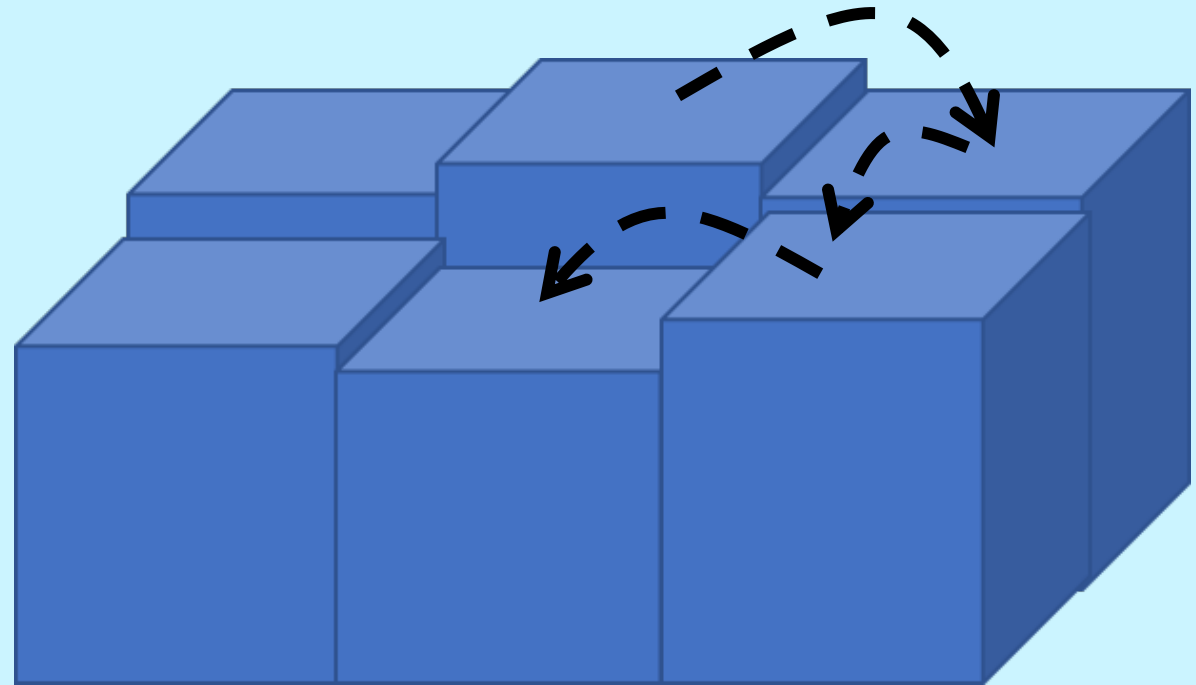
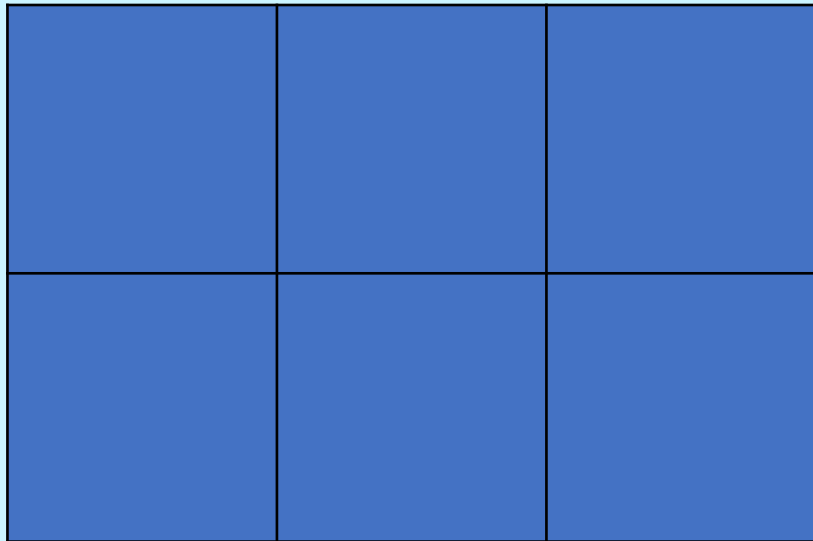


Where does rainwater go?

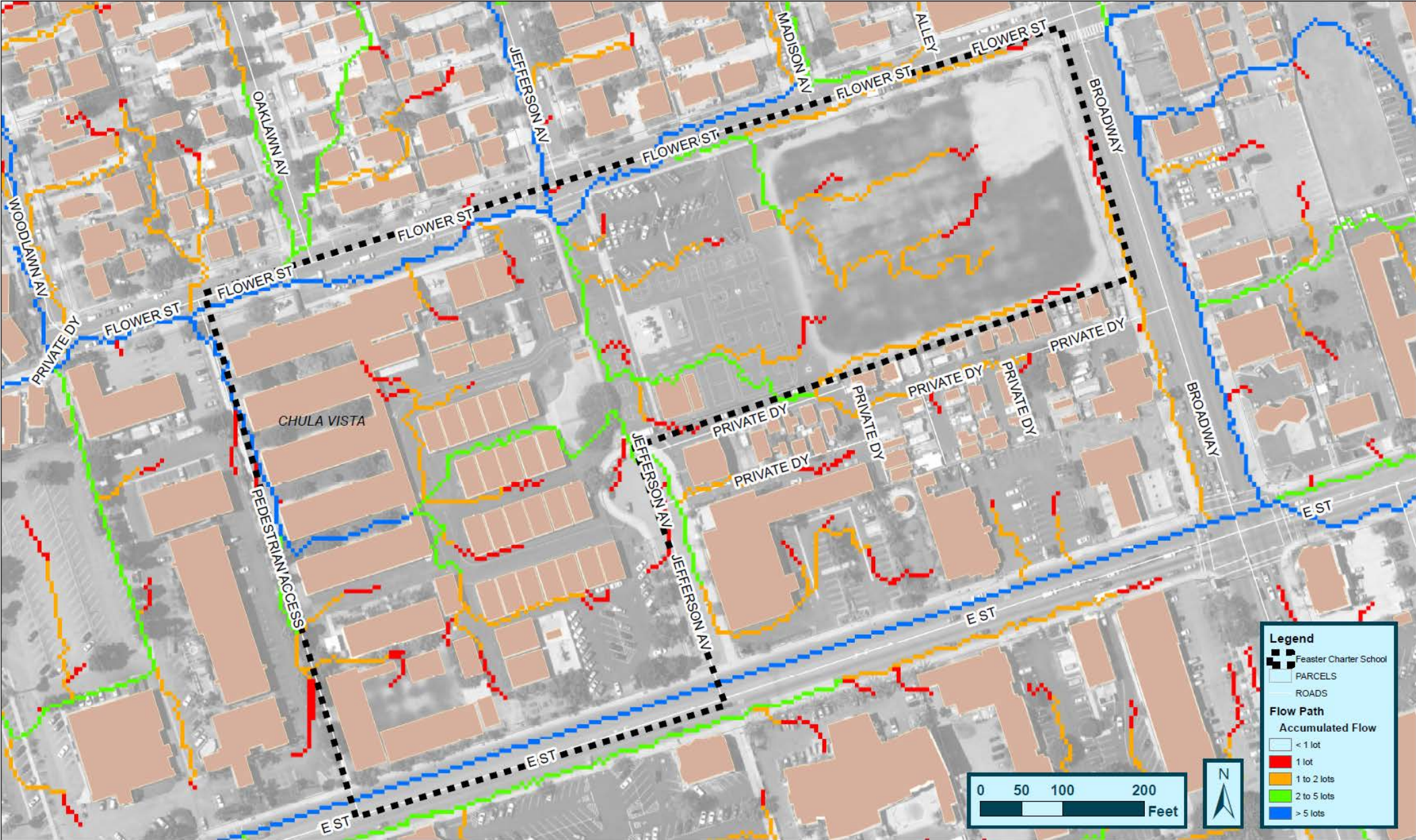
Topography



Flow Path Model

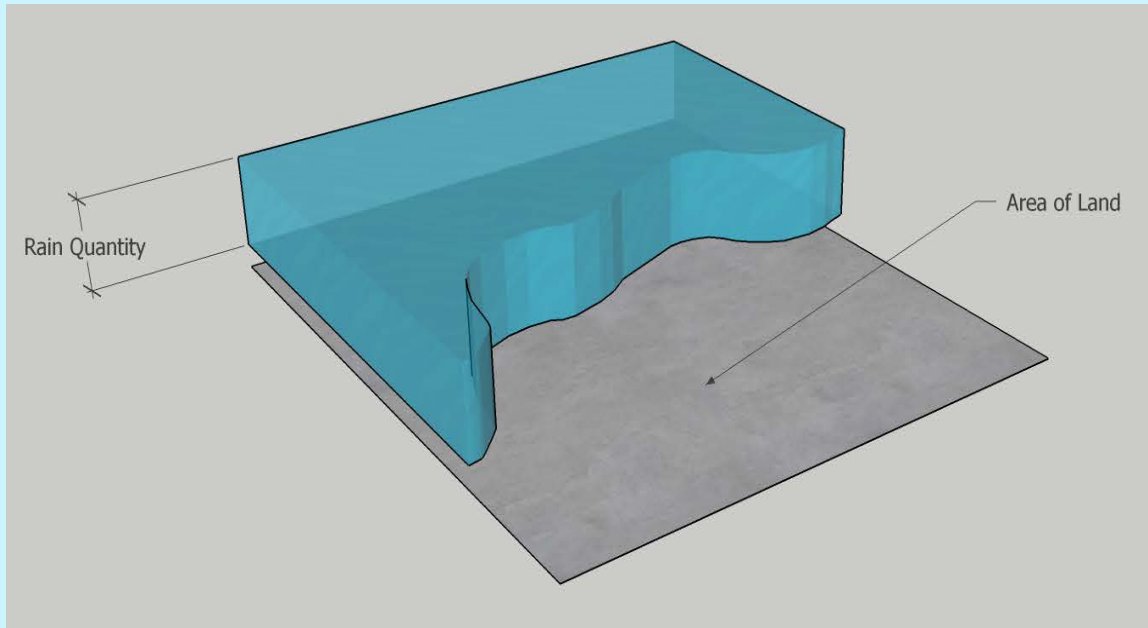


Feaster Charter School Flow Path

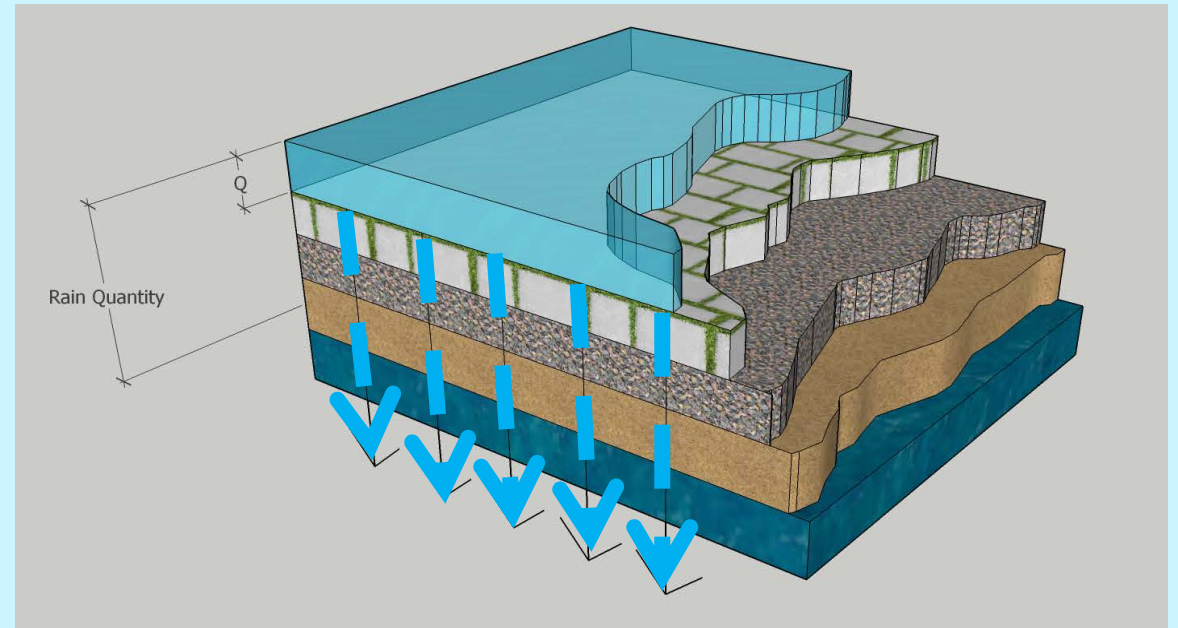


Where does rainwater go?

Impermeable

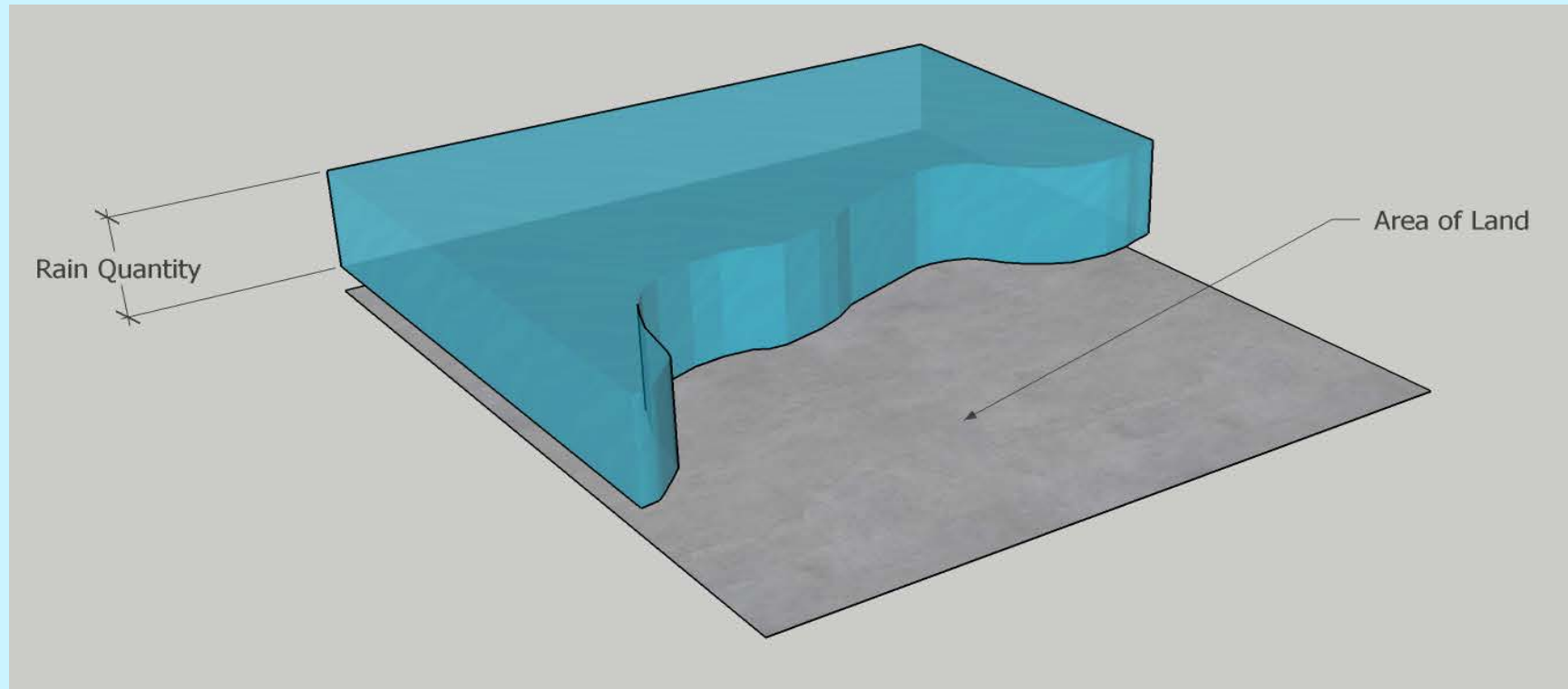


Permeable

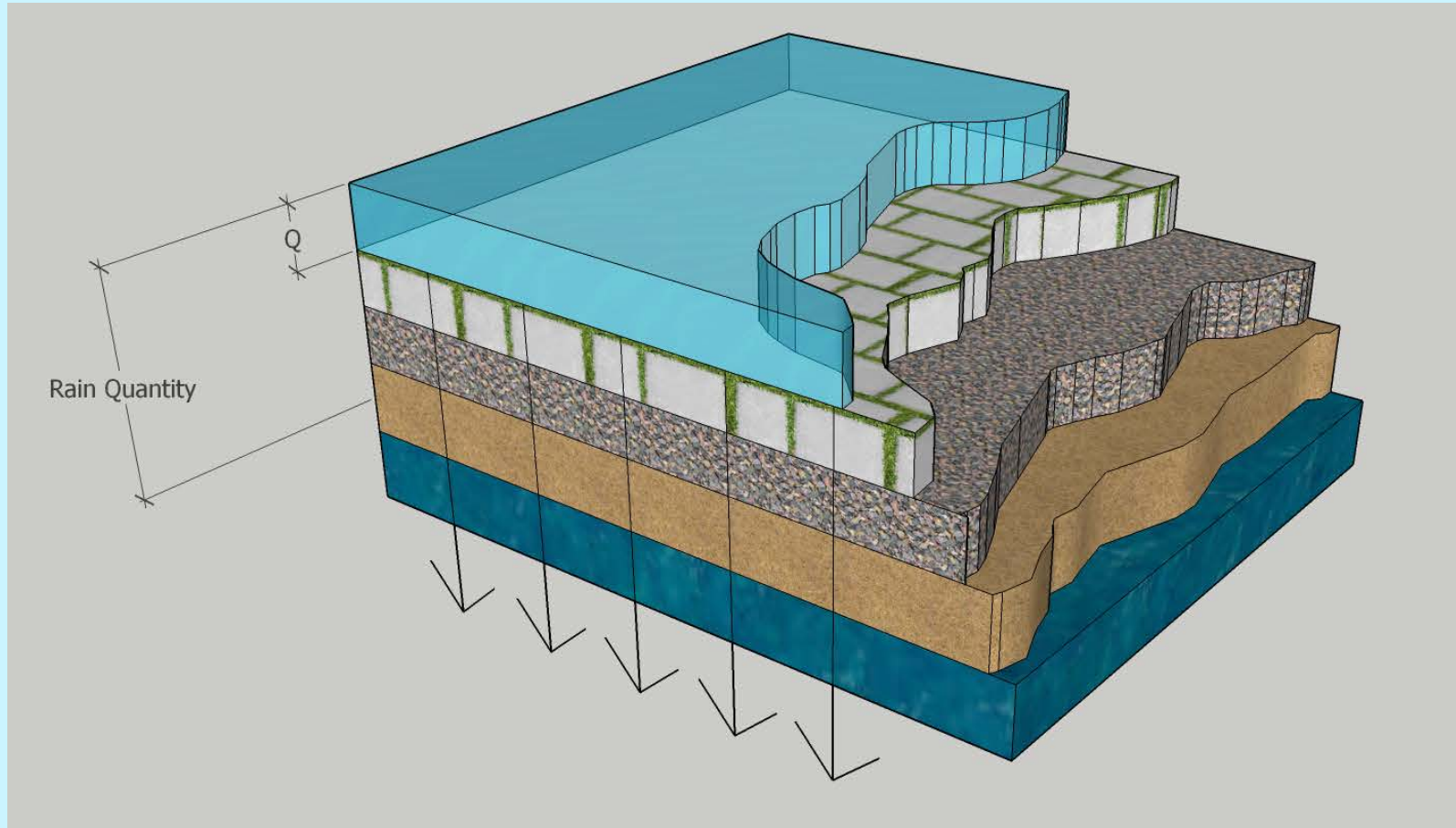


Rainwater Estimated Volume

$$\text{Volume} = \text{Rainwater Quantity} \times \text{Surface Area}$$



Rainwater Estimated Volume





Rain Gardens



2011 Beach Park Improvements Featuring Permeable Concrete Pavers

Since 2007, improvements were made to Beach Park to offer many amenities to visitors including a playground, changing room buildings, walking paths and expanded parking. In addition to increased usage of the beach by visitors, geese and seagulls flocked to the sandy shoreline and the sensitive bay was threatened by E. coli contamination.

In 2009, utilizing a grant from the Wisconsin Coastal Management Commission, the Village of Egg Harbor undertook a major improvement project at Beach Park and a remote boat trailer parking lot.

An engineered Biofilter, with shore grasses and other plants, was added - a technique that is used to remove stormwater pollutants by filtering runoff before it reaches the bay. This solution worked to clean up the beach and increase beach visitors. To accommodate the need for additional parking in a space-restricted area that would not produce an increase in stormwater runoff, the Village decided to install **PERMEABLE PAVERS**.

Beach Erosion
caused by
Stormwater
Runoff →



Permeable Pavers

The **Permeable Concrete Pavers** were placed over a sub-base 6-inch layer of 2"-3" aggregate followed by a 4-inch layer of 3/4"-1" aggregate and a 2-inch bedding course of 3/8" aggregate.

Permeable pavers offer an aesthetically pleasing alternative to traditional pavements in low volume areas accommodating seasonal park traffic and pedestrians.

They effectively slow stormwater runoff from the bluff and provide the opportunity to infiltrate the runoff into the underlying sandy soils before it reaches the Bay.

20 additional parking stalls were created, nearly doubling parking capacity. The project has been well received by the community. The permeable pavers are performing as expected and will continue to be monitored.

Because of this successful project and the positive comments by visitors, the Village plans to use the pavers in other applications throughout the Village. Nearly 81% of the cost of the project was covered by a grant received from the Great Lakes Restoration Initiative.

As a result of the stewardship and efforts to promote water quality The Village was awarded the Water Star Community designation by the UW-Extension in 2011, recognizing efforts to improve surface, ground and recreational waters.



PROJECT PARTICIPANTS:

- Village of Egg Harbor
- Door County
- McMAHON
- EPA's Great Lakes Restoration Initiative
- Harbor Construction of Door County, Inc.
- Edgewater Landscaping & Decks, Inc.
- Northeast Asphalt, Inc.
- Choice Construction, Inc.
- County Materials Corporation

Permeable
paver
blocks



“Grass-Crete”










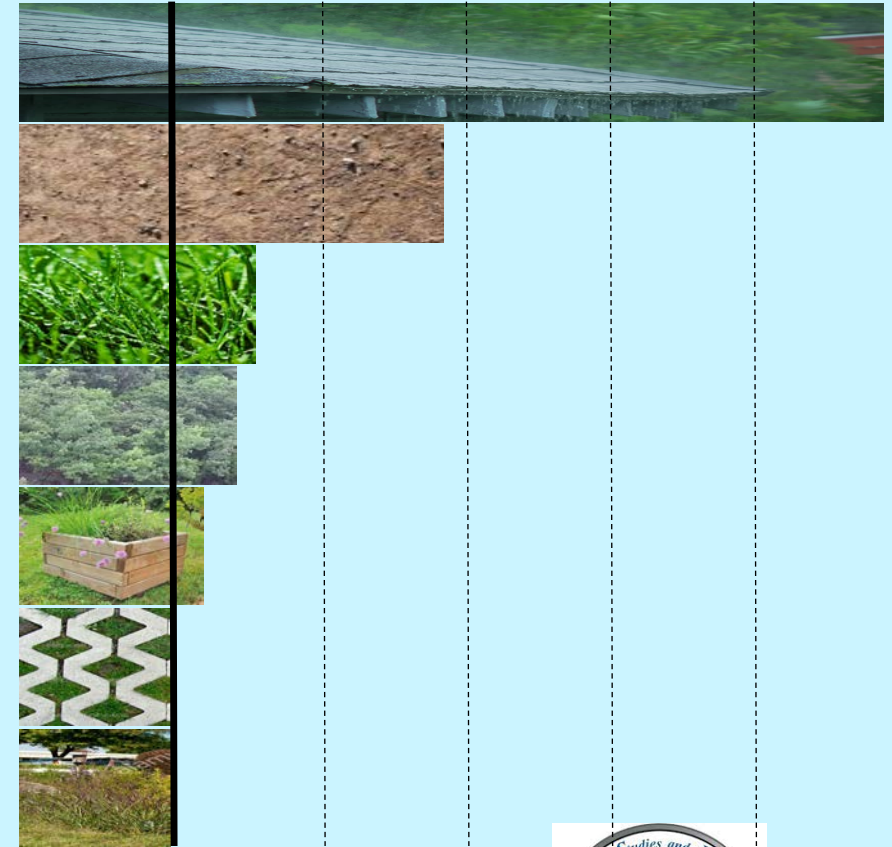


Permeable
Concrete

What's the impact of a square?

Estimated stormwater runoff by landcover type for a 1 inch rainfall event on 100 square feet of land (1 grid square)

Impervious (buildings, pavement, road, water)		49 gallons
Bare earth		18 gallons
Grass/shrub		5 gallons
Trees		4 gallons
Green Roof		2 gallons
Porous Pavement		0 gallons
Swale/rain garden		0 gallons





Design Exercise



Focused Planning Solutions LLC



Group Activity

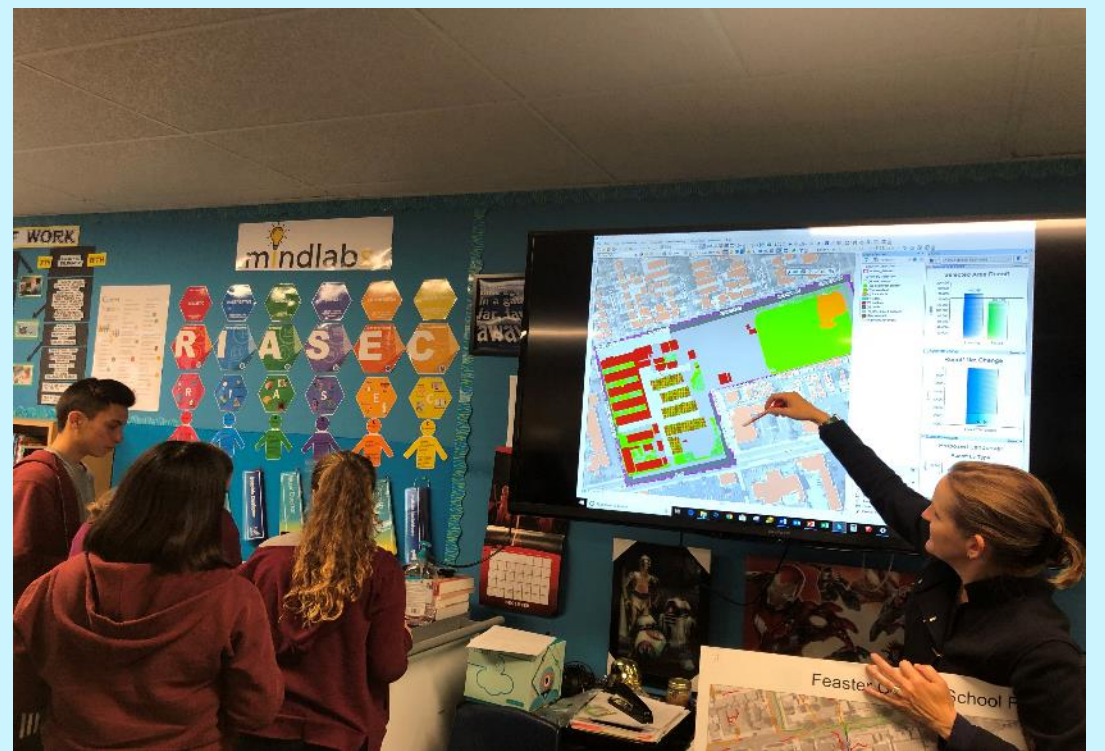
- Teams of 3-5 students
- Provided iPad with maps
 - Aerial photograph of campus
 - Flow path map of campus
- Used drawing tools to sketch and color code design ideas
- Consultants roamed to assist and answer questions
- Large format print board of site flow path aided in talking about design ideas for problem areas



Group Activity – what did we learn?

- Students are the experts in their environment
- Something for everyone –
 - Participation/interest from all
- Quick grasp of introduction
 - No need to be overly detailed
 - Spend more time on exercise and results





Design Results and Sharing



Focused Planning Solutions LLC



Paint the Map

- Students brought their sketches to the CommunityViz model
- Design ideas were “painted” onto a vector grid
- Model estimates runoff and compares existing landcover versus painted landcover
- Overall runoff volume for before and after calculated
- Charts provide results for comparison
- Students earned badges for 10-30% reductions in runoff volume



Overall Lessons Learned

- More time on the group exercise is needed
- Kids loved the payoff – need to make sure all of the teams have a chance to get to the model
 - If possible, have two stations with the model running
- It was helpful that the students had some pre-cursor with the stormwater problems on site



Other Future Considerations

- Vocabulary in other languages
 - Non-native English speakers, ESL
- If possible, another approach would be to have multiple lessons over time
 - Part 1: Explore and observe
 - Part 2: Help in mapping existing conditions. Introduce runoff topics.
 - Part 3: Share the runoff model results. Create designs for changes.



Q & A



Focused Planning Solutions LLC

