



Let's Grow! 3D Analysis Focuses Community Outreach and Planting Plan

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July 16, 2014 | ESRI UC 2014

Presentation Overview

- Introduction
- Project Background
- Solution
- Results
- Challenges and Future Considerations
- Next Steps

Meet GeoEngineers

Earth Science and Technology Experts



Trusted advisors to clients who manage natural resources and the built environment.

Meet Hilltop Urban Gardens (HUG)

Hilltop Urban Gardens

- Founded in 2010
- 158 volunteers
 - +1,000 hours
- 98 homes within HUG Zone (18 acres)
- HUG Grub - Neighborhood Food Share Program (15 homes)



Mission: To develop systems for food sovereignty and create racial and economic justice

Meet Hilltop Urban Gardens (HUG)



Meet Hilltop Urban Gardens (HUG)

Hilltop Urban Gardens

- Food Charity
- Food Justice
- Food Sovereignty



What Work Has Been Completed to Date?

Volunteer Coordinator Maps

- Created maps of current growing areas
 - Garden beds
 - Hose Bibs
 - Tool Storage
- Empower and Coordinate Volunteers
 - Harvesting and Planting



“If a diagram is worth 1000 words, then it’s worth 1000 words of our attention.” – *Edward Tufte*

What Work Has Been Completed to Date? (cont.)

Growable Lands Inventory

- Identified open areas within yards and parking strips
- Assessed quantity of potential land
 - Open Area: 5.09 acres
 - Parking Strip: 1.44 acres
- Help predict how much food can be grown



1 acre CSA supports 30 households. HUG has over 1 acre in the parking strips alone.

Technology Helping Develop Food Systems

Neighborhood Based Food System (pilot)

- Predict HUG's food production potential
- Provide information to community
 - Help start conversations
 - Provide motivation and inspiration to participate
 - Gives the organization a face (people like pretty maps)



Technology Helping Develop Food Systems (cont.)

Neighborhood Based Food System (pilot)

- Gain support from potential funders
 - Grant applications
 - Measurable performance indicators
- 3D Analysis eventually will help define year around growing schedule



Project Background

Purpose: Understand which “growable” areas within HUG Zone get more than 6 hours of sunlight during the planting and growing seasons.

Challenges:

- Large area (18 acres), Lots of time to field survey.
- Limited GIS data available (buildings)

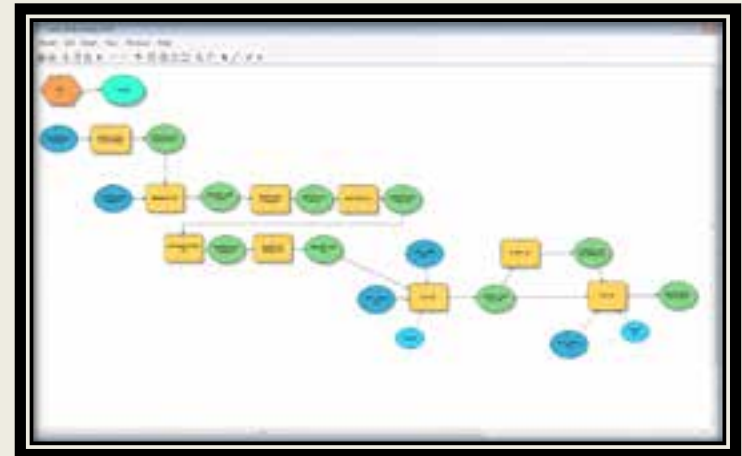
Method: 3D Volumetric Shadow Analysis

Benefits: Help focus community outreach efforts

Solution - Analysis

Volumetric Shadow Analysis Requirements

- ArcMap 10.0 or newer (we used 10.2)
- 3D Analyst
- Basic understanding of 3D Analysis and Model Builder



Sun
Positions

Create
Building
Shadows

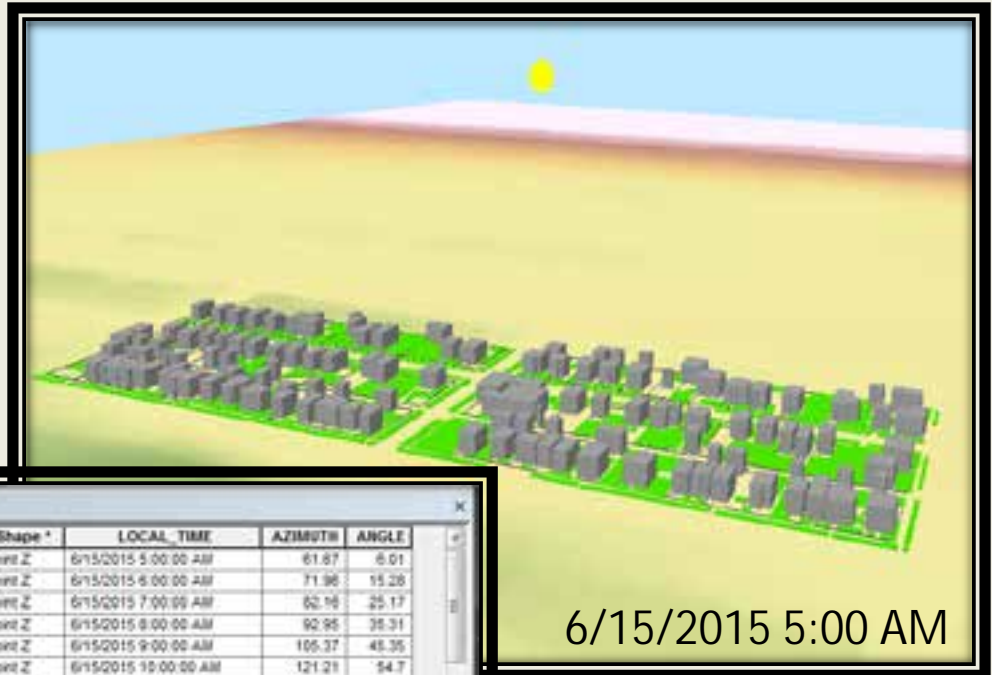
Intersect
with Open
Areas

Summarize
Results

Define Sun Positions

Create Sun SkyMap

- 1 day per month for the 2015 growing season
 - June 15th
 - July 15th
 - August 15th
- Calculated one sun position every hour



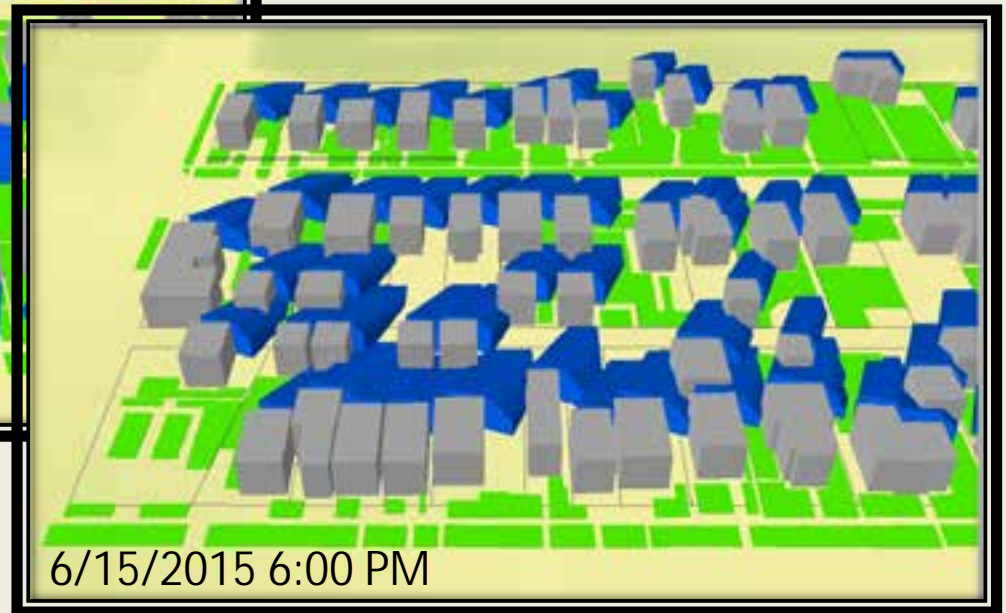
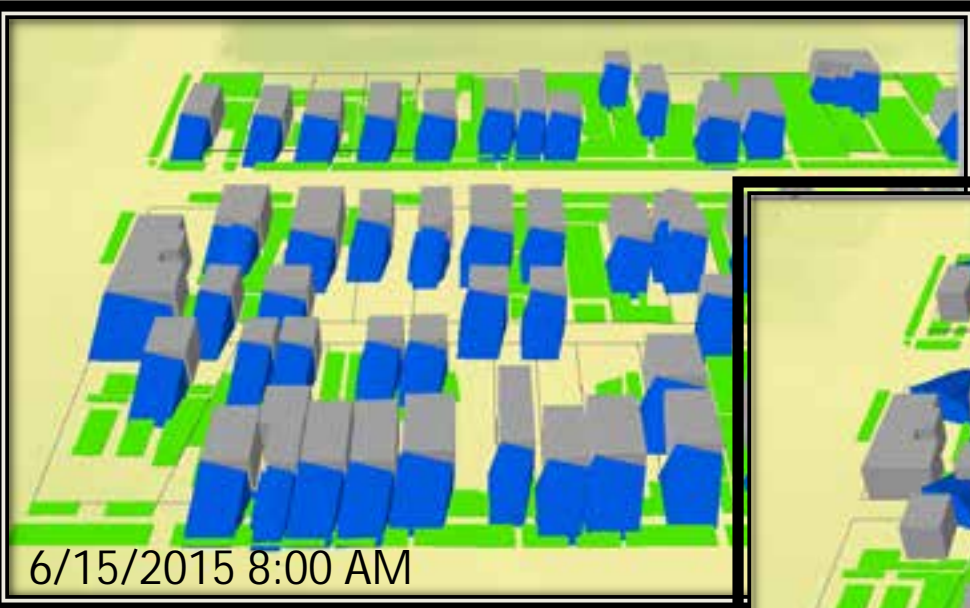
6/15/2015 5:00 AM

OBJECTID*	Shape*	LOCAL TIME	AZIMUTH	ANGLE
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7	Point Z	6/15/2015 6:00:00 AM	71.96	15.28
8	Point Z	6/15/2015 7:00:00 AM	82.16	25.17
9	Point Z	6/15/2015 8:00:00 AM	92.95	35.31
10	Point Z	6/15/2015 9:00:00 AM	105.37	45.35
11	Point Z	6/15/2015 10:00:00 AM	121.21	54.7
12	Point Z	6/15/2015 11:00:00 AM	143.45	62.25
13	Point Z	6/15/2015 12:00:00 PM	174.18	65.99
14	Point Z	6/15/2015 1:00:00 PM	206.88	64.1
15	Point Z	6/15/2015 2:00:00 PM	232.95	57.58
16	Point Z	6/15/2015 3:00:00 PM	249.71	48.68
2	Point Z	6/15/2015 4:00:00 PM	263.95	38.81
3	Point Z	6/15/2015 5:00:00 PM	274.25	28.65
4	Point Z	6/15/2015 6:00:00 PM	284.57	18.64
5	Point Z	6/15/2015 7:00:00 PM	294.76	8.11
1	Point Z	6/15/2015 8:00:00 PM	305.39	0.66
18	Shape F	7/15/2015 8:00:00 PM	31.88	1.88

Create Building Shadows

Building Shadows

- Shadow created for every sun position time interval



Intersect Shadows with Open Areas

Intersect Shadow/Open Area for each Sun Position

- 46 time intervals (over 3 days analyzed)
 - June: 16 hours of Sun
 - July: 16 hours of Sun
 - August: 14 hours of Sun



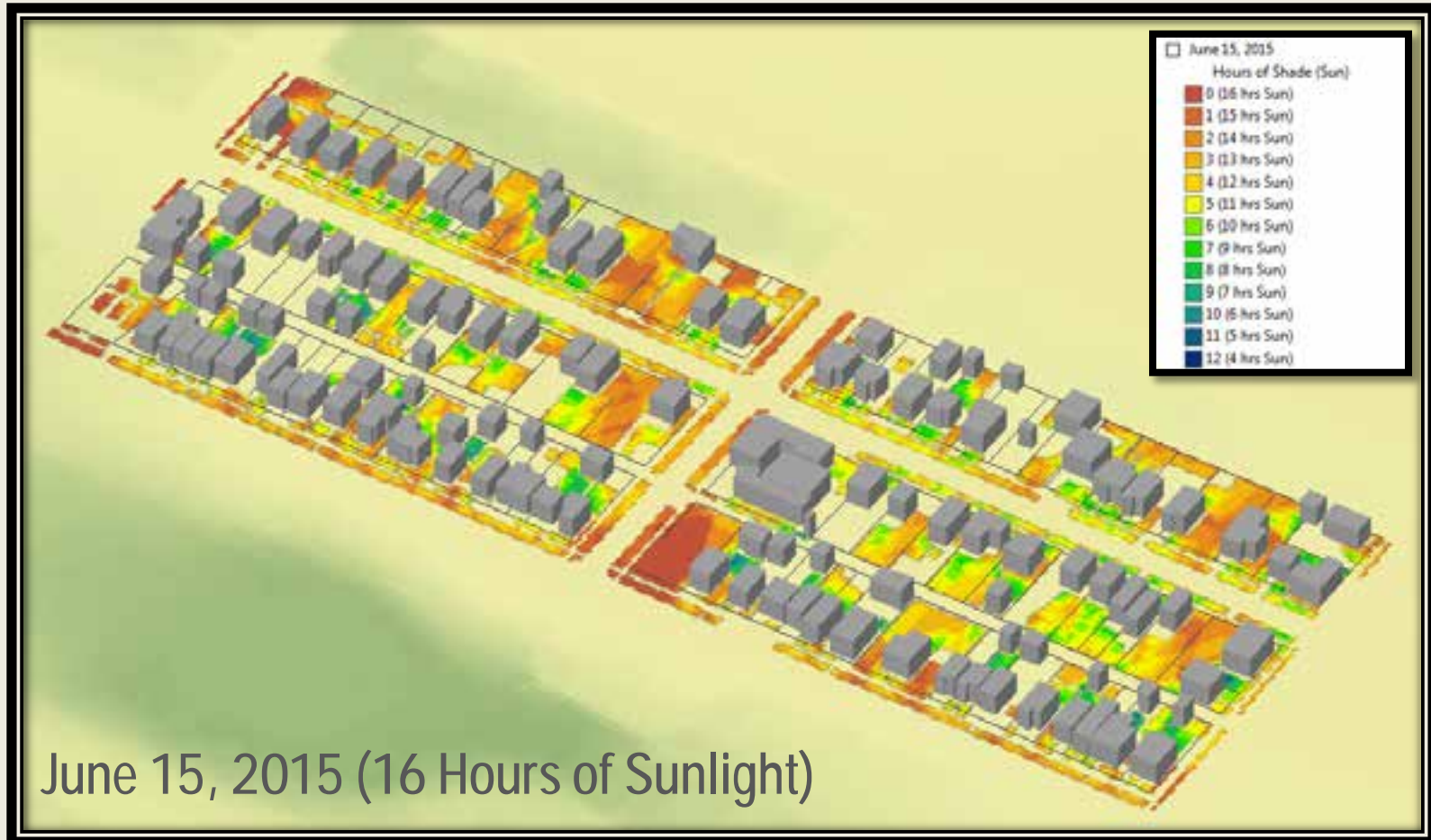
Intersect Shadows with Open Areas/Summarize Results

Intersect Shadow/Open Area for each Sun Position

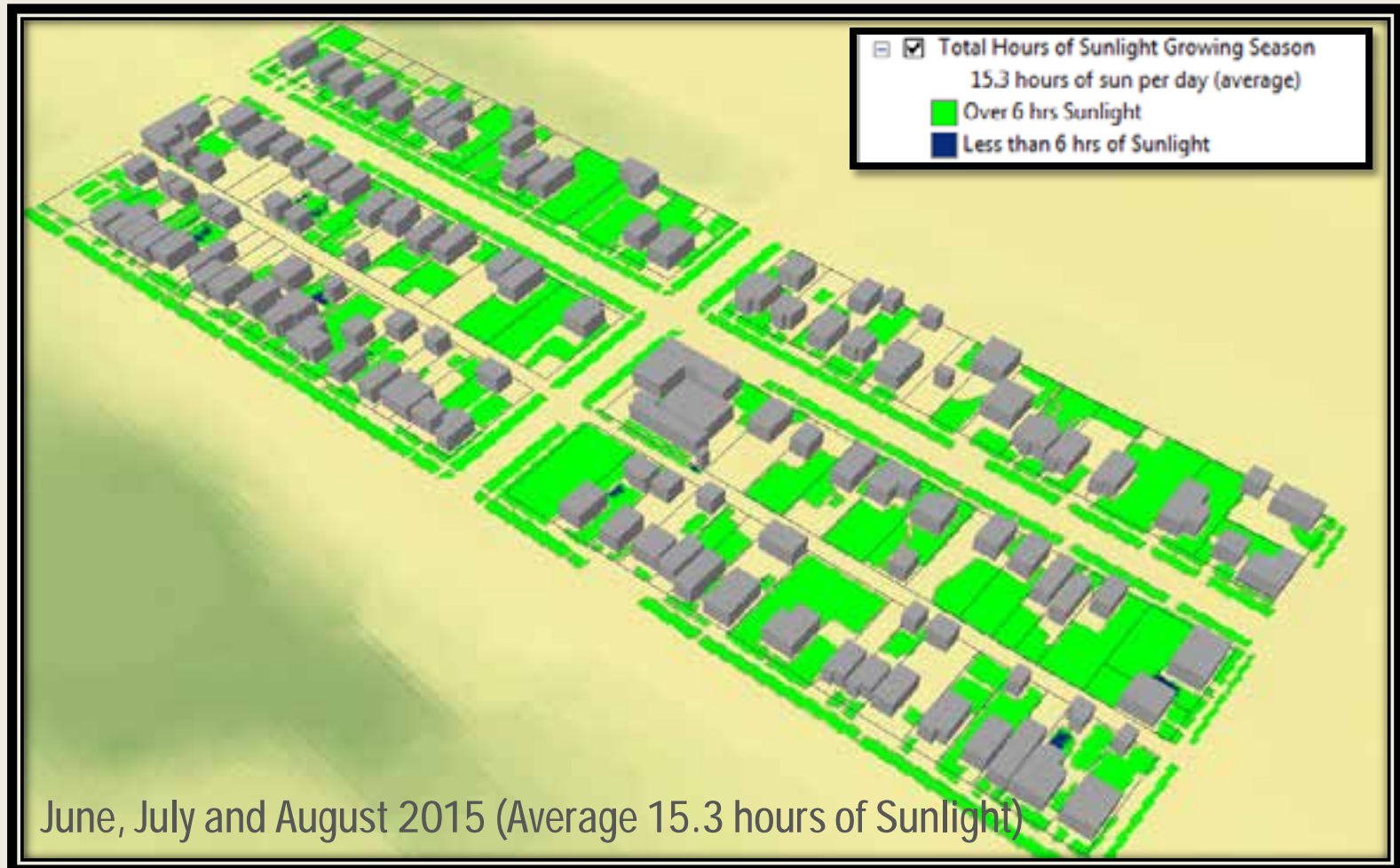
- Creates an output grid with a 1 (Shadow) and 0 (No Shadow) for each sun position
- Add the grids together to summarize the total number of hours the open areas exposed to Shade and, thereby Sun



Results – Total Hours of Shade/Sun (June)



Results – Total Hours of Shade/Sun (Growing Season)



Challenges and Future Considerations

- Limited GIS data available
 - Building heights were estimated
 - Open areas were estimated from aerial
 - Aerial photo low resolution and outdated (2012)
- Time was calculated in Greenwich Mean Time
- Complete the analysis for the entire year

Next Steps

GeoEngineers - GIS Data and Model

- Field verify and refine Open Areas and Parking Strips
 - Obtain newer/better resolution aerial photo
- Refine Building layer (accurate heights)
- Add Trees, Fences

HUG – Neighborhood Based Food System

- Present data and maps - Community Based Participatory Research Project
- Continue building out the HUG Zone as a Community Food Sovereignty Pilot project (animals, edible alleys, hoop house)

Next Steps

YOU - Call to Action

- Get Involved,
- Share your knowledge and
- Help your community

You are the expert!



Thank You for Attending!

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References and Resources

- “3D Virtual City: Shadows over time” template
 - <http://www.arcgis.com/home/item.html?id=30786012683041bfbc9a58647ee7b986>
- “Shadow Analysis: Shadow maps” template
 - <http://www.arcgis.com/home/item.html?id=941cc4bc7b56459c95599197d61f0203>
- “Volumetric Shadow Analysis Over Time” video
 - <http://video.arcgis.com/watch/279/volumetric-shadow-analysis-over-time>
- “Shadow Maps” video
 - <http://video.arcgis.com/watch/272/shadow-maps>

