Using LiDAR to Quantify Vegetation Growth and Stream Shade Change

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Background

Water Resources Management Utility

• Focus on watershed health, water reuse and resource recovery
• Received first watershed based permit in the United States
  • Sanitary water treatment for 550,000 customers in urban Washington County, OR
  • Stormwater management and development standards for 712 mi² Tualatin River Watershed
• Temperature Management Plan for permit compliance and mitigation of treated sanitary water effluent (kcal/day)
  • Provides regulatory framework for decreasing solar energy (kcal/day) by flow augmentation and creating stream shade
Estimating Shade Credit

• Zones and cells are created radiating from stream banks
• Stream parameters attributed to each zone
• LiDAR is used to determine baseline vegetation in each cell
• Baseline shade calculated in each cell and subtracted from projected canopy cover
Communication Needs

• Telling the story of enhancement to different audiences
  • Regulators, elected officials, rate payers, other agencies

• Show enhancement progress over time with attractive, easily digestible reporting

• Track and document stream shade creation accurately, at regular intervals
2008 to 2013 Growth
Precision Tree Height

Treetop Point Location

Average Tree Top Height (feet)

- 5 - 10
- 11 - 16
- 17 - 23
- 24 - 32
- 33 - 42
- 43 - 52
- 53 - 64
- 65 - 79
- 80 - 105
- 106 - 163
Vegetation Height Change Summary

- Minimum: -16.93 ft
- Maximum: 19.88 ft
- Mean: 5.18 ft
- Std Dev: 4.53 ft
Calculating Shade Creation

- **Step 1:** Stream Center Nodes
- **Step 2:** Elevation and Gradient
- **Step 3:** Shade From Features
- **Step 4:** Radial Shade Model
Effective Shade
Effective shade for both 2008 and 2013 as well as the percent change in effective shade are shown below. Solar Loading for 2008 and 2013 as well as percent change in solar load are shown below.

- Simulated Effective Shade
- Effective Shade Change
- % Solar Load Change