Low Impact Development in Western Oregon: A Practical Guide to Watershed Health

Free download from the Oregon DEQ website: bitly.com/WOLID

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The Western Oregon LID Template
Team Effort

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“Low Impact Development in Western Oregon: A Practical Guide to Watershed Health”

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- Kyle Shauer, City of Veneta
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Why we made the template

**Barriers to LID in Western Oregon**

- Codes don't provide a clear path for LID
- Lack of familiarity with LID design options
- No local design specifications for LID
- Uncertainty about adopting guidance from Portland or Washington State
- Questions about applicability to all sites (e.g., steep slopes, tight soils)
- No maintenance system in place for green infrastructure
- Need local demonstration projects
- Need active leadership and political will
- Extremely limited staff time and funding to invest in overcoming these barriers.
How we created More Pathways to LID in Western Oregon

- Meets state and multiple federal regulatory agencies requirements (EPA, NOAA, FEMA)
- Template approach saves at least $100k in making a stormwater management manual...
- That can be tailored to the stakeholders & natural conditions
- Lots of choices and guidance about pros & cons provided (e.g. not every jurisdiction needs to encourage ecoroofs!)
- Encourages implementation techniques that minimize maintenance
- Focus is on keeping stormwater “on-site” for watershed health not treat and discharge

The LID Template addresses air, water, soil & plants
A functioning, healthy watershed has...

- Lots of vegetation
- Which intercepts rainfall
- Which draws water up from the soil to the canopy
- Which have lots of roots
- Which move around to create voids
- Which have lots of soil animals
- Which hold water until it infiltrates
- Which breathes water back up into the air
- Which deliver water to our waterways slowly
- To evaporate it later
- To regulate our regional climate.
A “broken” watershed has...

- Hard surfaces & less vegetation
- Which prevent rain from evaporating or infiltrating
- Which creates runoff
- Causing flooding, landslides and stream bank erosion.

“Before” & “After” Runoff Compared

98% runoff
Runoff Volumes: A Watershed Perspective

Undisturbed Watershed

Developed Watershed

= HYDROMODIFICATION

Holistic Approach

PREPARE
Assemble knowledge and team [Chapter 1 and Chapter 2]

PLAN
[Chapter 3 "Siting" sections and Appendix A]

SIZE BMPs
[Chapter 4]
LID Implementation Form

DESIGN
[Chapter 3 and Appendix B "Design"]

BUILD
[Chapter 3 "Construction" sections and Appendix B "Construction"]

MAINTAIN
[Ch 5 and Appendix B "Maintenance"]
Stormwater Hierarchy

Choosing the Best “Best” Management Practices

1. Lay out the site to minimize impacts to natural resources and to minimize impervious areas (Runoff Prevention).

Courtesy of NEED Development

LID Guidance Template - EWRG Apr 26, 2017
2. Prevent runoff by intercepting, evaporating, and/or infiltrating rainfall. (Runoff Prevention)

3. Reduce runoff using BMPs with surface storage (i.e. ponding) that infiltrate and to a lesser extent, intercept and evaporate runoff and the rainfall they receive.
4. Reduce runoff using BMPs with that infiltrate runoff underground (UICs).

5. Reduce runoff using flow-based BMPs without storage (i.e. conveyance) that infiltrate lower volumes and to a lesser extent, intercept and evaporate runoff and the rainfall they receive.
6. *If the first five choices are not feasible, then the only remaining LID choice is to improve the water quality of runoff, without significantly reducing the volume, using a [lined BMP] [or proprietary device].

* Discouraged. Each jurisdiction should decide for themselves based on guidance and their own experience.

CHAPTER 3
Choosing & Implementing BMPs

VERY detailed guidance on
• Siting
• Design
• Construction
• Maintenance
• Cost Considerations
• Pitfalls & Common Mistakes
• & more when needed!
A Few Emerging BMPs in Oregon

Restored Soils BMP
- UW Stormwater Trials: till soil, no compost
- With Compost: less runoff, better turf

Depave BMP

Photo courtesy of Taylor White, Flickr

Minimal Foundations BMP

Photo courtesy of Taylor White, Flickr
LID Implementation Form

Area Managed Approach

• Includes all runoff-generating surfaces (just like TR-55)
• Includes sizing factors (like Portland and CWS) for:
  • runoff reduction facilities (e.g. rain gardens)
    AND
  • runoff prevention/rainfall management BMPs (e.g. vegetated roofs)

Hydrologic Excel Models

• Let’s take a look based on early (2002?) City of Portland work
  (Thank You Portland BES!)
Holistic Approach
Average Annual Water Balance

Conditions change, so we can’t look at just a handful of storms during the rainy season to restore watershed health.

The average annual water balance accounts for seasonal changes.

LID Implementation Form

• More like a tax form than a model, even though it steps you through the stormwater hierarchy in a methodical fashion and helps you size facilities.
Choosing the right design storm can mean big $$$ savings

EPA recommends:
95th percentile for new and re-development
90th percentile for retrofits

Table 1. Example 95th Percentile Storm Events for Select U.S. Cities (adapted from Hirschman and Kosco, 2008).

<table>
<thead>
<tr>
<th>City</th>
<th>95th Percentile Event Rainfall Total (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>1.8</td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>1.6</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>1.5</td>
</tr>
<tr>
<td>Buffalo, NY</td>
<td>1.1</td>
</tr>
<tr>
<td>Burlington, VT</td>
<td>1.1</td>
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<tr>
<td>Charleston, WV</td>
<td>1.2</td>
</tr>
<tr>
<td>Chicago, IL</td>
<td>1.0</td>
</tr>
<tr>
<td>Cincinnati, OH</td>
<td>1.6</td>
</tr>
<tr>
<td>Cleveland, OH</td>
<td>1.3</td>
</tr>
<tr>
<td>Columbus, OH</td>
<td>1.3</td>
</tr>
<tr>
<td>Denver, CO</td>
<td>1.1</td>
</tr>
<tr>
<td>Kansas City, MO</td>
<td>1.7</td>
</tr>
<tr>
<td>Minneapolis, MN</td>
<td>1.4</td>
</tr>
<tr>
<td>New York, NY</td>
<td>1.7</td>
</tr>
<tr>
<td>Salt Lake City, UT</td>
<td>0.8</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>1.0</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>1.0</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>1.6</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>1.7</td>
</tr>
</tbody>
</table>


Retaining small storms on-site solves REGIONAL flooding problems
20 of the fastest urbanizing watersheds were analyzed for the medium scenario

<table>
<thead>
<tr>
<th>Percentile storm retained</th>
<th>Scenario</th>
<th>New development</th>
<th>Redevelopment</th>
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<tbody>
<tr>
<td>High</td>
<td>90th</td>
<td>90th</td>
<td>90th</td>
</tr>
<tr>
<td>Medium</td>
<td>90th</td>
<td>90th</td>
<td>90th</td>
</tr>
<tr>
<td>Low</td>
<td>90th</td>
<td>90th</td>
<td>90th</td>
</tr>
</tbody>
</table>

Figures 3–2. Sample 26 HUCs selected for modeling.

Conclusion

No retrofits needed and small storms are great!

Even retaining only the 90th and 85th percentile storms on-site for new and redevelopment projects respectively, SHRUNK THE 100-YR FLOODPLAIN from 2-year to the 100-year storm events. Over a 20 year period.
## Percentile storms in Oregon

<table>
<thead>
<tr>
<th>Station Name</th>
<th>County</th>
<th>State</th>
<th>99%</th>
<th>95%</th>
<th>90%</th>
<th>85%</th>
<th>80%</th>
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</thead>
<tbody>
<tr>
<td>ASTORIA/CLATSOP, OR</td>
<td>Clatsop</td>
<td>OR</td>
<td>2.36</td>
<td>1.42</td>
<td>1.08</td>
<td>0.88</td>
<td>0.76</td>
</tr>
<tr>
<td>ESTACADA 24 SE</td>
<td>Clackamas</td>
<td>OR</td>
<td>2.30</td>
<td>1.40</td>
<td>1.00</td>
<td>0.88</td>
<td>0.70</td>
</tr>
<tr>
<td>GERBER DAM</td>
<td>Klamath</td>
<td>OR</td>
<td>3.11</td>
<td>1.20</td>
<td>0.80</td>
<td>0.60</td>
<td>0.50</td>
</tr>
<tr>
<td>JORDAN VALLEY</td>
<td>Malheur</td>
<td>OR</td>
<td>1.37</td>
<td>0.71</td>
<td>0.51</td>
<td>0.45</td>
<td>0.40</td>
</tr>
<tr>
<td>LAKEVIEW 2 NW</td>
<td>Lake</td>
<td>OR</td>
<td>1.26</td>
<td>0.79</td>
<td>0.60</td>
<td>0.50</td>
<td>0.43</td>
</tr>
<tr>
<td>MEDFORD/MEDFORD- JACSON COU</td>
<td>Josephine</td>
<td>OR</td>
<td>1.63</td>
<td>0.97</td>
<td>0.72</td>
<td>0.60</td>
<td>0.50</td>
</tr>
<tr>
<td>PENDLETON, OR.</td>
<td>Umatilla</td>
<td>OR</td>
<td>0.97</td>
<td>0.62</td>
<td>0.48</td>
<td>0.41</td>
<td>0.36</td>
</tr>
<tr>
<td>PORTLAND/INT., OR.</td>
<td>Multnomah</td>
<td>OR</td>
<td>1.61</td>
<td>0.98</td>
<td>0.76</td>
<td>0.63</td>
<td>0.53</td>
</tr>
<tr>
<td>PRAIRIE CITY</td>
<td>Grant</td>
<td>OR</td>
<td>1.20</td>
<td>0.79</td>
<td>0.53</td>
<td>0.47</td>
<td>0.40</td>
</tr>
</tbody>
</table>