Bioretention Assessment System (BAS)

Ted Hart, Chris Parker, Dominic Maze
Municipality Maintenance Cycle

Manager inspects each bioswale 2-4x/yr

Contractor services each bioswale 4x/yr

Paper Work Report

~1/3 of time

Manager

Municipalities building ~30 bioswales/yr

Asset Management Software
Municipality Maintenance Cycle

Manager inspects each bioswale 2-4x/yr

Contractor services each bioswale 4x/yr

PDX Hot summer 2015 $100k water trucks

Manager

~1/3 of time

Municipalities building ~30 bioswales/yr

Paper Work Report

Paper Work Report

Increasing Traffic

Asset Management Software
Municipality Maintenance Cycle

Manager inspects each bioswale 2-4x/yr

Contractor services each bioswale 4x/yr

Paper Work Report

Hot summer 2015
$100,000 water trucks

40% of time

Hot summer 2015
Municipalities building ~30 bioswales/yr

How to be more?

1. Efficient
2. Adaptive
3. Proactive

(Measure bioswale performance when needed)
Manager inspects each bioswale 1-2x/yr

Services 4x/yr
Collect Data 5min/facility

Pre Pic data
Post Pic data

Asset Management Software

~1/3 of time

Manager
• **Data:**
Ted collected most data, Crew leads some,

10 Parameters

1. Pre-pic
2. Collect data
3. Service
4. Collect data
5. Post-pic
# Beta Test: Parameters Collected

### Pre-Assessment
1. Inlet and Outlet Pic
2. Weed Cover %
3. Dead plants (number)
4. Water Cover %
5. Water level flush with outlet (yes/no)
6. Inlet clogged (yes/no)
7. Outlet clogged (yes/no)

### Post-Assessment
1. Inlet and Outlet Pic
2. Vegetation Removal (gal)
3. Sediment Removal (gal)
4. Liter Removal (gal)
5. Plants added (number)

### Potential Thresholds
- **Color Code**
  - Pink: > 1 hr/facility
  - Green: < 10 min/facility
  - Orange: > 50 gal Veg Removal
  - Beige: > 5 gal Sediment Removal
  - Light Blue: > 5 gal Liter Removal
  - Blue: Water level flush-outlet
  - Black: No indicators
  - purple: Multiple indicator thresholds exceeded

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[Image of a plant area]
Dashboard: Interactive map, Color = indicator, Circle size = value (threshold)
Inlet:

- Large weed cover difference
- 53 min service
Outlet:

- Large weed cover difference
- 53 min service

Pre

Post
Inlet:

• Little weed cover difference

• 6 min service
Outlet:

- Little weed cover difference
- 6 min service
Service Time

- 32 min/facility average, ~43.5 hr total

<table>
<thead>
<tr>
<th>Service Time</th>
<th>Value</th>
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<tbody>
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<td>8</td>
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<td>80</td>
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<td>0:32</td>
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Service Time

- Unavoidable weed removal time

Lots Vegetation removed
~14hr
~36% total time

**SOLUTION:**
REDUCE BARE GROUND COVER (=WEEDS)

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<tr>
<th>LITTER &amp; SEDIMENT</th>
<th>HYDROLOGY</th>
<th>VEGETATION</th>
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<tbody>
<tr>
<td>Litter Removal</td>
<td>152 gal</td>
<td>100%</td>
</tr>
<tr>
<td>Sediment Removal</td>
<td>171 gal</td>
<td>100%</td>
</tr>
<tr>
<td>Standing Water</td>
<td></td>
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<tr>
<td>Water Cover</td>
<td>14%</td>
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<tr>
<td>Inlet Clogged</td>
<td>1.3%</td>
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<tr>
<td>Dead plants Total</td>
<td>80 Plants</td>
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<td>Dead plants Avg</td>
<td>1 Plant/Facility</td>
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<td>Litter Removal</td>
<td>1.896 gal</td>
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<td>2.1 gal</td>
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<tr>
<td>Standing Water</td>
<td>7 Facilities</td>
<td></td>
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<td>14%</td>
<td>Of the facilities with water</td>
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- Adjust level of service, <10min just take photo?

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Number of Days: 8 Days
Number of Facilities: 80 Facilities
Facilities/Day: 10 Fac/Day
Total Maintenance Time: 43:35 Hrs:min
Minutes/Facility: 0:32 Min
People/Crew: 4.1 People

- LITTER & SEDIMENT
- HYDROLOGY
- VEGETATION

16 Facilities (~2hr)
Removal of Litter, Sediment, and Vegetation

375 and 500 gal not shown
**Vegetation**

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**VEGETATION**

- **Planted Cover Avg**: 56%
- **Weed Cover Avg**: 6.2%
- **Vegetation Removal Total**: 12 yd
- **Vegetation Removal Avg**: 26.3 gal (~200 gal = 1 yd)
- **Dead plants Total**: 80 Plants
- **Dead plants Avg**: 1 Plant/Facility

**LITTER & SEDIMENT**

**HYDROLOGY**

**Inlet Clogged**: 1.3%
**Outlet Clogged**: 1.3%
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Large facilities with lots of weeds increases time/facility

18 Facilities
**Vegetation**

- Plant 1 ft on center to lower bare ground cover (weed area)
- If estimated vegetation removal < 5 gal, then just take pre- and post-pictures?

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**LITTER & SEDIMENT**

**HYDROLOGY**
App ➔ efficient, adaptive, proactive

Manager inspects each bioswale 1-2x/yr

/crew day

Services 4x/yr
Collect Data 5min/facility

Pre Pic data
Post Pic data

~1/3 of time

Manager

Asset Management Software
Removal of Litter, Sediment, and Vegetation

- Vegetation (>90% weeds) removal largely determines time at facility
- No correlation of volume removed with time or planted cover % (omit large facilities, lots of weeds)
- Removal (veg, litter, sediment) varies greatly as ease of removal varies greatly (e.g. large easily extracted weeds vs. small difficult to remove weeds)
Basic Plan: Training + Data + Reports & Meetings

Manager will have:
1. 1st Yr comprehensive audit (future design)
2. Data-driven management service
3. More efficient maintenance
4. More time (less site visits)

BAS Advantages:
1. Efficient - Optimize data collection (appropriate accuracy) and maint.
2. Scalable - Robust and automated data management
3. Adaptive - Quantify any performance measure (soil moisture)
4. Proactive - Real time data (App)
5. Network Approach - Manage all facilities at once
6. Expertise - Facility design, soil, hydro, plants, data/stats, other munic. lessons
7. Better future design - Data drives maint. and facility design decisions
BAS Advantage vs. Competitors

1. BAS \( \sim \frac{1}{2} \) the cost

2. BAS app/software specifically built for bioretention application (competitors built for all city infrastructure)

3. BAS no hassle app and data = start creating efficiency today (competitors require months to learn how to use complex and clunky software/app)