IPM in Turf
“The Real Story”

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Non Crop Vegetation Management
Pesticide Recertification Course
January 19, 2016
IPM vs. Sustainability

• Goals are basically the same.

• IPM is more detailed as to the approach.

• “Sustainability” has more of a long term focus.
IPM

• Focuses on maintaining plant health and using cultural practices to minimize pest pressure.

• Encourages using pest resistant varieties.

• Uses thresholds and monitoring to make pesticide application decisions.
IPM Overview

- 9 Common Lawn Myths
- Making common sense choices.
- 3 Keys to IPM
9 Common Lawn Myths
Myth # 1

Lawns REQUIRE a lot of fertilizer.
Why Apply Fertilizer?

Improves the vigor of the lawn

A healthy lawn will:
- Resist weed encroachment.
- Reduces disease pressure.
- Resist insect pests.
- Be more drought resistant.

Overall, intelligent fertilizer applications will reduce the need for herbicides, insecticides, and water.
Fertilization

"The goal is to use the least amount of fertilizer nitrogen needed to achieve your goals"
Prioritize your lawn areas

The lawn behind the warehouse doesn’t need to be as well maintained as the entrance to the Corporate Head Quarters.
When to Fertilize? (1 lb. N/1,000 ft$^2$)

**Figure 1. Fertilizer calendar for irrigated lawns in western Oregon.**

<table>
<thead>
<tr>
<th>Visual turf quality</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>J</th>
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<tbody>
<tr>
<td>High</td>
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<td>Utility</td>
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</tbody>
</table>

= Planned application  ■ ■ ■ ■ = Optional application

Horizontal bars indicate time for each application. Adjust timing based on your goals and personal experience with your lawn. Each application is assumed to be at 1 lb N per 1,000 sq ft. On hungry lawns, 1.5 to 2 lb N per 1,000 sq ft can be used to stimulate density and color. Unless lawns are very weak, avoid early-spring applications since grass normally grows vigorously by itself at that time.
What to consider:

- Type of grass
- Age of lawn
- Clipping removal
- Soil type/ fertility
- Expectations
Perennial ryegrass:

- Mowed weekly
- Clippings removed
- Irrigated
- 4+ fertilizer apps/year
Mature perennial ryegrass lawn, clippings removed, fertilized regularly.

Young perennial ryegrass lawn, imported soil, clippings removed, not fertilized regularly.
Bentgrass climax:

- Mowed weekly
- Clippings returned
- Irrigated
- 0 -1 fertilizer application
Climax lawn fertilized once in past 24 yrs. Mowed weekly, clippings returned, clay soil.
What to apply:

- Nitrogen is the key
- Phosphorus only if deficient
- Potassium is rarely needed
- Synthetic fertilizers work fine
- Organic fertilizers work fine
Myth # 2

Lawns REQUIRE a lot of pesticides.
Possibilities?

- Insect problems?
- Disease problems?
- Weed problems?
Insects: European crane fly
A few crane fly larvae in an otherwise healthy lawn do not require treatment.
High larval populations (50+/sq. ft.) results in turf thinning. Do not spray after April 1st as they are done feeding and the damage is done.
Curative control in mature lawns

Treatment threshold for 3\textsuperscript{rd} instar larvae:

25-50 larvae/sq ft

plus

visible turf thinning
Monitoring Schedule

No History: Start in January

Prior History: Start in December

SAMPLE EVERY TWO WEEKS
Practical monitoring for 3rd instar larvae

Count the larvae and multiply by 4
1. Crane fly damage is worse when they first invade a new area.

2. Damage is usually sporadic in a given area.

3. Monitoring can reduce insecticide use up to 80% (vs. Preventative sprays)

Fall plantings can have bad crane fly infestations
Cultural Crane Fly Control

- Keep your lawn healthy.
- Stop watering on Labor Day.
What about diseases?

• Most are foliar and cause little damage.
• Will recover in spring.
• Fall applications of fertilizer will go a long way in reducing severity of fall and winter diseases.
• Mulch or remove leaves promptly from turf.
Low N Diseases to Ryegrass in Winter

Brown Blight

Low N diseases cause turf thinning.

Rust

Red thread

T Cook photos
Also, Microdochium patch - especially under leaves.
What about weeds?

- First, ask yourself whether the “weeds” are a problem.

- If they are, make 2 spray applications (ideally in the fall) and kill ALL your weeds.

- Do not use weed and feed products – they are only about 50% effective.
Broadleaf weed control options

Two Scenarios

Heavy infestation: use herbicides
- Two apps about three weeks apart in spring or fall
- Follow up with spot treatments or hand weeding
- Continue to hand weed regularly

Light infestation: hand weed (spot spray) or ignore
- Mow frequently during flowering period
- Continue to hand weed regularly
Can hand weeding work after herbicide treatments?

1984: Before herbicide treatments

2013: Thirty years of hand weeding after initial herbicide treatments
Myth # 3 - Lawns REQUIRE a lot of maintenance.
Lawns are the lowest maintenance areas of a yard!

FALSE!

20 hours per week total
Lawns - 1 hour per week
Other landscape - 19 hours/week
Myth # 4

Lawns are bad for the environment so you should remove them.
FALSE!

- Prevents nutrient runoff.
- Lawns filter nutrients from storm water.
- Improve air quality.
- Prevent soil erosion.
- Cool the area around your house.
- Store carbon.
- Greatly reduce dust.

But, if you want to remove your lawn and grow food or plant perennials, GREAT!
What about environmental impact of lawn and garden fertilizers?

Possible problems:

1. N & P runoff into storm sewers
2. N leaching into groundwater
3. Direct application into streets
Nitrogen Pollution Sources

- Atmospheric Deposition: 48.7%
- Agriculture: 39.2%
- Urban Storm Water Runoff: 8.4%
- Septic Systems: 3.4%
- Golf Courses and Lawns: 0.3%

From: Penn State Agriculture, summer 1999
www.aginfo.psu.edu/PSA/s99/contents.html

Nutrients in Atmosphere: Nitrogen 78%, Oxygen 21%, Argon 1%, CO² 0.0039%
Phosphorus Pollution Sources

- **Agriculture** 68.8%
- **Septic Systems** 13.1%
- **Urban Storm Water Runoff** 10.8%
- **Atmospheric Deposition** 7.1%
- **Golf Courses and Lawns** 0.2%

From: Penn State Agriculture, summer 1999
www.aginfo.psu.edu/PSA/s99/contents.html
0.6 lb/A/yr = 0.22 ounces/1,000 ft²/yr

Figure 3

Runoff - in/yr
Synthetic Organic None

Runoff P - lb/A/yr

Runoff
Runoff P

Fertilizer Applied
Where is Phosphorus Runoff coming from?

Dr. Wayne Kusow
University of Wisconsin-Madison
In: Turfgrass Producers Int'l “Turf News”, March–April 2003 pg. 48-56

Quote:

“Phosphorus coming from vegetation in the landscape represents a level below which further reductions are not practical”
Other pollution sources

Garden debris
Fruit tree debris
Soil erosion
<table>
<thead>
<tr>
<th>OM %</th>
<th>P&lt;sub&gt;4&lt;/sub&gt;</th>
<th>K</th>
<th>Mg</th>
<th>Ca</th>
<th>pH</th>
<th>CEC</th>
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</thead>
<tbody>
<tr>
<td>1.6</td>
<td>12</td>
<td>99</td>
<td>570</td>
<td>1788</td>
<td>5.9</td>
<td>17.2</td>
</tr>
</tbody>
</table>

Corvallis, OR
Climax Lawn
Bentgrass
Gray Clay
Comparing un-amended lawn soil vs. imported amended shrub bed soil in Corvallis, OR

<table>
<thead>
<tr>
<th>Corvallis</th>
<th>OM %</th>
<th>P&lt;sub&gt;1&lt;/sub&gt;</th>
<th>K</th>
<th>Mg</th>
<th>Ca</th>
<th>pH</th>
<th>CEC</th>
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</thead>
<tbody>
<tr>
<td>Lawn</td>
<td>1.6</td>
<td>12</td>
<td>99</td>
<td>570</td>
<td>1788</td>
<td>5.9</td>
<td>17.2</td>
</tr>
<tr>
<td>Shrub Bed</td>
<td>20.0</td>
<td>102</td>
<td>802</td>
<td>430</td>
<td>2392</td>
<td>6.5</td>
<td>19.1</td>
</tr>
</tbody>
</table>
Are nutrients leaching from this vegetation and soil?

What is more likely to leach nutrients - bare landscape soil amended with mulch every spring or a lawn?
To Minimize Pollution from Landscapes:

1. Keep fertilizer out of the street
2. Keep clippings out of the street
3. Keep mulch out of the street
4. Keep soil out of the street
5. Keep tree leaves out of the street
Myth # 5

• If I can’t find a plant that works in that spot, plant a lawn.
Why were lawns planted here?
Why were lawns planted here?
Why were lawns planted here?
Lawn design principle # 1:

“Lawns should be part of the overall design”
Design principle # 2

“Place lawns inside bed areas when feasible”

Lawns bordering sidewalks lead to maximum runoff and overthrow into streets
Intelligent design avoids non-target fertilizer pollution
This lawn makes sense
“Don’t use lawns as space fillers”
Parking strips don’t have to be grass

Mowed *Euonymous fortunei*
Mowable Groundcovers

- Cotoneaster dammeri
- Euonymous fortunei
- Juniperus conferta
- Juniperus horizontalis
- Vinca minor
Worst use of grass?

How do you maintain it?
Myth # 6

Lawns use a lot of water
Recent irrigation research

Sydney, Australia: May 2006
Case studies of 50 landscapes
Lawn & garden areas

Two thirds of irrigation water was applied to gardens, one third to lawns
Corvallis irrigation habits
Unirrigated Lawns - Loss of Benefits?

- Prevents nutrient runoff
- Lawns filter nutrients from storm water
- Improves air quality
- Cool the area around your house
- Prevents soil erosion
- Stores carbon
- Greatly reduces dust
Recent irrigation research

North Carolina:
In ground systems used twice as much water as hose and sprinkler irrigation.
Irrigating lawns

"Automated in ground systems may be the worst thing that ever happened to lawn irrigation"

Tom Cook, Professor Emeritus
OSU Horticulture
Basic Irrigation Questions

1. How much water is needed?

2. How often should it be applied?
   > Daily or weekly?
<table>
<thead>
<tr>
<th>Month</th>
<th>ET/mo.</th>
<th>ET/wk.</th>
<th>Ave Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>3.04”</td>
<td>0.76”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0”</td>
<td></td>
<td></td>
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<tr>
<td>June</td>
<td>3.91”</td>
<td>0.98”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>5.46”</td>
<td>1.37”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.4”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>20.49”</td>
<td>1.03”</td>
<td>1.19”</td>
</tr>
<tr>
<td>Aug</td>
<td>4.77”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5”</td>
<td></td>
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</tr>
</tbody>
</table>

*Based on evaporation correlations*
How often?

• **Hose and sprinkler:**
  – Once or twice per week

• **In ground system:**
  – More than once per week
  – Less than seven times per week
2 Basic Concepts

• Turf will take as much water as you give it.

• Declining soil moisture levels will progressively lower the water use rate by up to 80% (Beard 2004)
Practical Ideas to Reduce Water Use

• Increase the number of days between watering

• Wait as long as you can before turning on the system in the spring

• Quit irrigating on Labor Day
Practical Ideas to Reduce Water Use

• Core in April to increase rooting.

• Manage organic layer by dethatching.

• Adequate Nitrogen – healthy turf is more drought resistant.
Myth # 7

Planting Tall Fescue (or fine fescue) will save water
FALSE!

People turn the water on!
Tall Fescue - 1 year after planting
Myth # 8

“Mow your lawn at 3 – 4”.
FALSE - not in the PNW!
Bentgrass appearance mowed at 2.5”
Bentgrass mowed vs. unmowed
False Crowns

Note stem elongation
<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Mowing Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryland bentgrass</td>
<td>.75” – 1.5”</td>
</tr>
<tr>
<td>Colonial bentgrass</td>
<td>1.0” – 1.5”</td>
</tr>
<tr>
<td>Rough bluegrass</td>
<td>1.0” – 2.0”</td>
</tr>
<tr>
<td>Annual bluegrass</td>
<td>1.0” – 2.0”</td>
</tr>
<tr>
<td>Climax lawns</td>
<td>.75” – 1.5”</td>
</tr>
</tbody>
</table>

Prostrate growing grasses
Functional mowing heights

Erect growing grasses

Fine fescues 1.5” – 2.5”
Per. ryegrass 1.5” – 2.5”
Ky. bluegrass 1.5” – 2.5”
Tall fescue 2.0” – 3.0”
The Limit to Low Mowing Depends on Species

Perennial Ryegrass

½ Inch  1 Inch  1.5 Inch
The Big Contradiction – Mow High or Low?

Longer roots give you a bigger gas tank – go more days between waterings.
2009/2010 Combined Difference in Percent Reference ET

Total ET = 8.8 inches for 45 days
(Avg. Per Day = 0.20 inches)

SE = 3.9923

Percent of Reference ET

<table>
<thead>
<tr>
<th></th>
<th>Low Mow</th>
<th>High Mow</th>
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<tbody>
<tr>
<td>Annual Bluegrass</td>
<td>94.04</td>
<td>86.05</td>
</tr>
<tr>
<td>Strong CRF</td>
<td>93.74</td>
<td>68.02</td>
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<tr>
<td>Slender CRF</td>
<td>89.16</td>
<td>64.29</td>
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<tr>
<td>Chewings Fescue</td>
<td>80.52</td>
<td>66.27</td>
</tr>
<tr>
<td>Colonial Bentgrass</td>
<td>65.45</td>
<td>49.45</td>
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<tr>
<td>Velvet Bentgrass</td>
<td>45.19</td>
<td>49.21</td>
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<tr>
<td>Kentucky Bluegrass</td>
<td>49.17</td>
<td>47.24</td>
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<tr>
<td>Creeping Bentgrass</td>
<td>55.13</td>
<td>40.32</td>
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<tr>
<td>Perennial Ryegrass</td>
<td>40.05</td>
<td>36.04</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>36.91</td>
<td>31.48</td>
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</table>

Total ET = 8.8 inches for 45 days
(Avg. Per Day = 0.20 inches)
## Water Use – % ET (2009 & 2010)

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>2.0” Height</th>
<th>5/8” Height</th>
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<tbody>
<tr>
<td>Tall Fescue</td>
<td>32 %</td>
<td>37 %</td>
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<tr>
<td>Perennial Ryegrass</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Creeping Bentgrass</td>
<td>40</td>
<td>55</td>
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<tr>
<td>Kentucky Bluegrass</td>
<td>47</td>
<td>49</td>
</tr>
<tr>
<td>Velvet Bentgrass</td>
<td>49</td>
<td>45</td>
</tr>
<tr>
<td>Colonial Bentgrass</td>
<td>49</td>
<td>65</td>
</tr>
<tr>
<td>Fine Fescues</td>
<td>64 – 68</td>
<td>81-93</td>
</tr>
<tr>
<td>Annual Bluegrass</td>
<td>86</td>
<td>94</td>
</tr>
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</table>
Trial Considerations

• Newly seeded in spring may have given species which establish quicker an edge (i.e. larger root system)?

• Choosing 0.3 inches per irrigation may have over estimated annual bluegrass water use.

• Does not address stand changes over time (e.g. climax lawns & fine fescues)
Myth # 9

All lawns have to be weed free show lawns.
FALSE! - Choose the lawn you want.

Alternative lawns:
aren't always green
aren't always pure
aren't always grass
are site appropriate
Ecolawns

Per. Rye + White Clover + Yarrow
Conventional grass lawn

Ecolawn

Three weeks without irrigation
3 Keys to IPM

• Mow consistently
• A little fertilizer can do wonders
• Irrigate based on your goals

• But keep in mind -
  “No water in the summer will result in weeds”
Myth # 10

The most important thing is to plant the correct grass.
“All lawns transition from planted grasses to situation specific climax vegetation”

Tom Cook, Professor Emeritus, Oregon State University
The Pacific Coastal Region:

Hot dry summers/Mild wet winters/Moderate-low humidity
Lawn are brown in summer without irrigation and have a long growing season with irrigation.

Planted grasses: Perennial ryegrass (bunch grass)
Fine fescue (rhizomatous)
Tall fescue (bunch grass)

Insects: Crane fly, Billbugs, Cutworms

Lawn Diseases: Red thread, Net blotch
Microdochium patch
Rust & leaf spot

Weeds: False dandelion, Common dandelion, Clovers,
Mousear chickweed, Blackmedic, moss, others.
Pacific Coastal Region
Climax Species

- *Agrostis* sp. (Bentgrasses)
- *Poa trivialis* (Rough Bluegrass)
- *Poa annua* (Annual Bluegrass)
- *Holcus lanatus* (Velvetgrass)
- *Vulpia myuros* (Rat’s-tail Fescue)
- Planted grasses
- Various moss species
- Numerous dicot species (i.e. weeds)
Pacific Coastal Lawn Ecology Rule # 1

- Plants that grow well fall through spring (or at least maintain density) will eventually dominate the stand.

“Competition occurs in the 9 cool months”
“Maintenance intensity determines the succession endpoint”

Primary factors include:
1. Nitrogen fertility,
2. Irrigation intensity, and
3. Herbicides.
Effects of Nitrogen on Grass Species

Perennial Ryegrass

High N
- N responsive grasses dominate
- Annual Bluegrass
- Climax

Low N
- Low N responsive plants dominate
- Bentgrass, moss, clover
- Climax
Effects of Drought on Grass Species

**Perennial Ryegrass**

- **Stand thins as ryegrass goes dormant. Some plants die.**
  - Ryegrass stand thins to clumps.
  - Invading grasses: Dryland bent, Velvetgrass, Rat’s Tail fescue

- **Drought tolerant dicots invade.**
  - Weeds germinate in fall.
  - Invading dicots: Clover, False dandelion, Common yarrow, Mousear chickweed
Qualities of Climax Lawns in the Pacific Coastal Region

- Looks better at lower mowing heights
- Color is generally lighter green
- Generally require less fertilizer
- Most have limited drought resistance
- All form long lived soil seed bank
- Generally strong winter competitors
Climax lawn in Portland, OR
Bentgrass/ *Poa annua*/*Poa trivialis*/ *Veronica* climax

T Cook photo
Potential Climax end points

Perennial Ryegrass

High N responsive grasses dominate

Annual Bluegrass

Low N responsive plants dominate Bentgrass, moss, clover

Typical Poa annua golf course in Portland, OR Seattle, WA

Long term consistent care will inevitably result in golf courses dominated by annual bluegrass.
A lawn provides many benefits, but the key is how you maintain it.