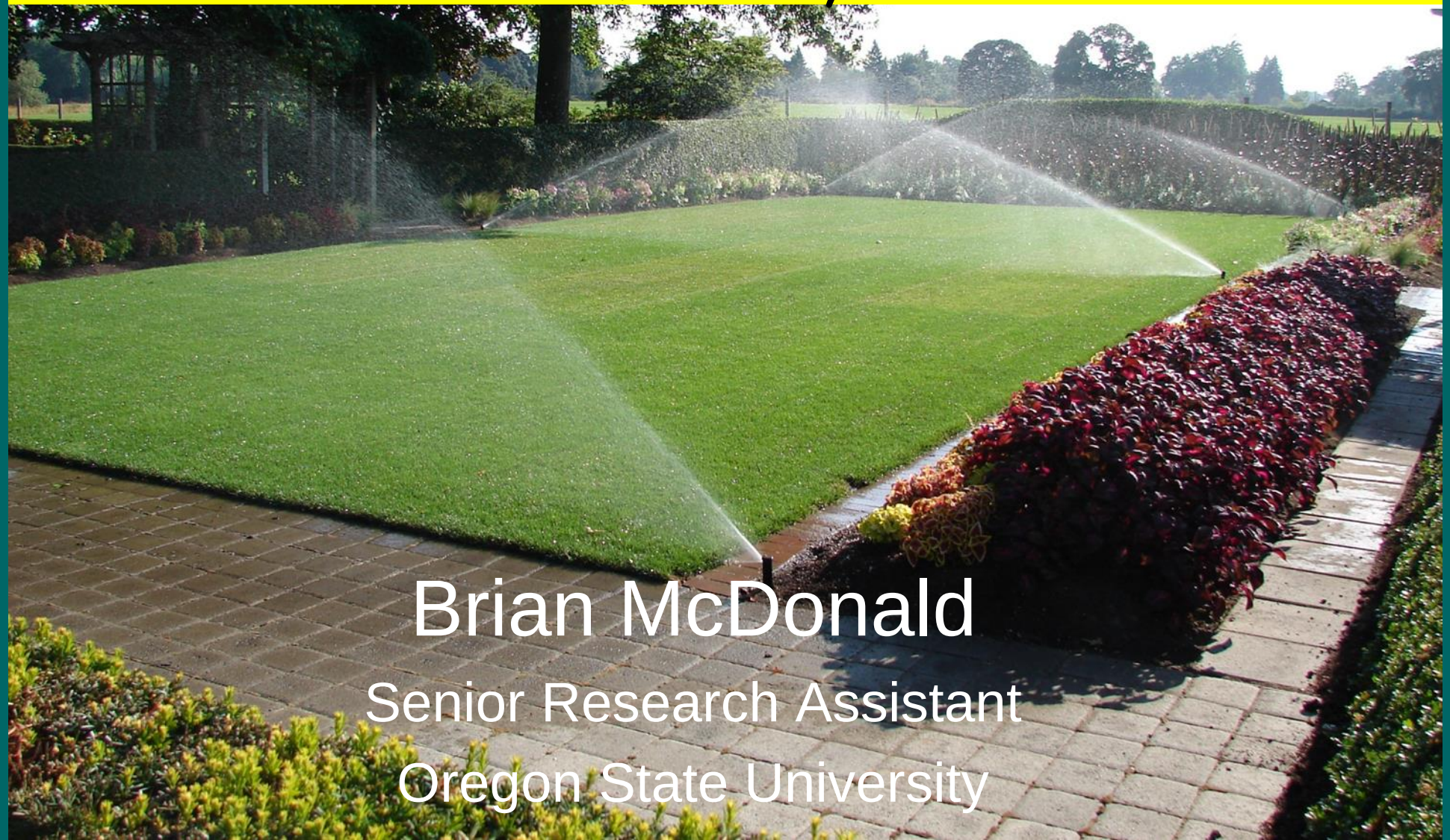
IPM and Turf Management
Boise, Idaho
December 1, 2017



Brian McDonald

Senior Research Assistant

Oregon State University

Overview

A. IPM & Cultural Practices

1. Mowing
2. Fertilization
3. Irrigation
4. Grass Selection

B. Managing Common Pests

1. Diseases – Necrotic Ring spot, Rust, Powdering Mildew, Leaf blight, etc.
2. Insects – Bill Bugs, Crane fly, European chafer, May & June Beatles.
3. Weeds – a long list

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.

Mowing

Effects of Mowing Height

1. Root length (impacts irrigation frequency)
2. Grass density
3. Grass texture
4. Grass resilience (ability to withstand pests)
5. Affects diseases and weeds.

Effects of Mowing Frequency

1. Grass density (if you mow lower)
2. Grass texture
3. Weed flowering

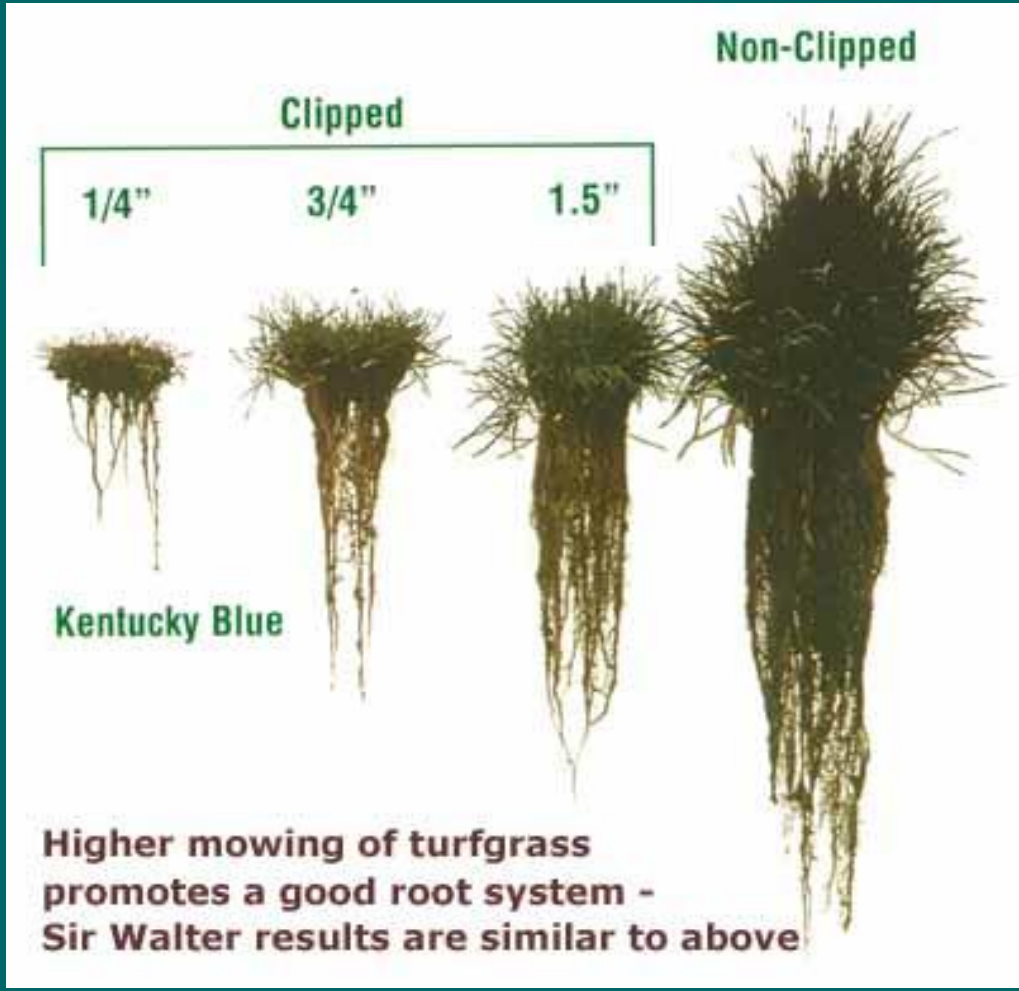
Effects of Mower Blade Sharpness

1. Grass aesthetics – ragged leaf tips.
2. Diseases – creates injuries that diseases use to enter the plants.

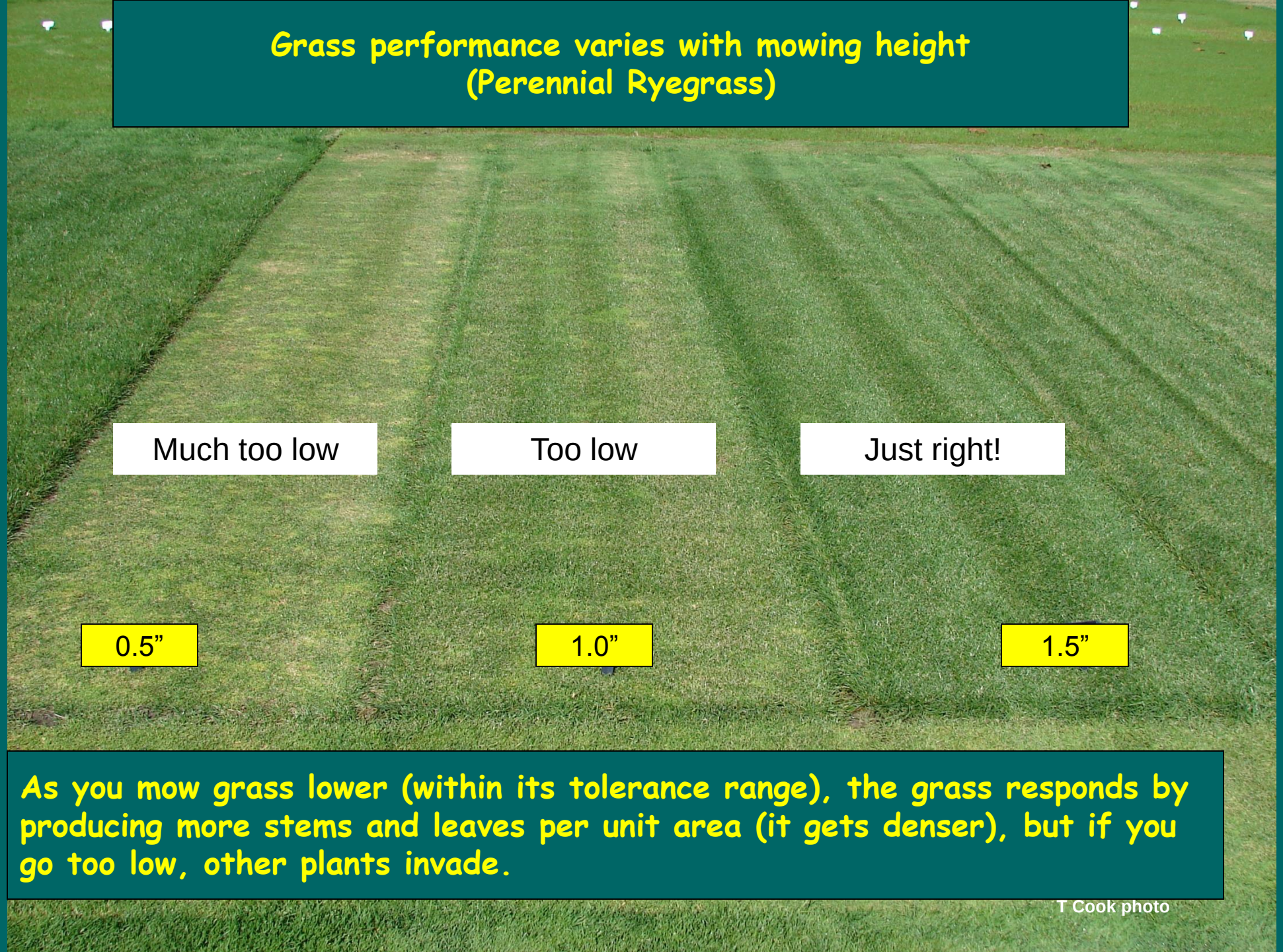
Mowing - Height

- Raise your mowing height
  - Deeper roots

(Assuming your soil is not compacted)



Grass performance varies with mowing height (Perennial Ryegrass)



As you mow grass lower (within its tolerance range), the grass responds by producing more stems and leaves per unit area (it gets denser), but if you go too low, other plants invade.

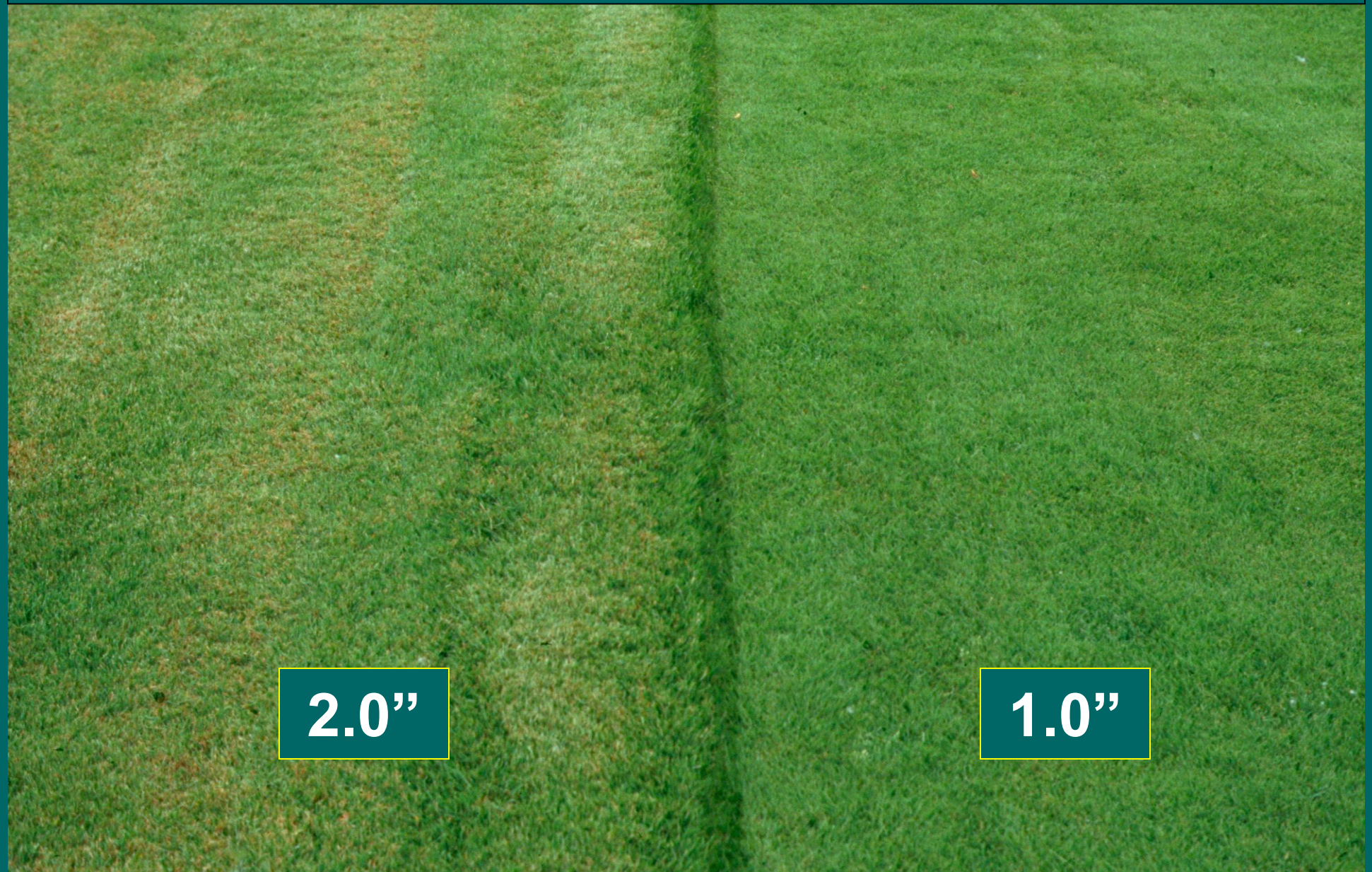
T Cook photo

Mowing height ranges

Ky. bluegrass	1.50″ – 2.50″
Per. ryegrass	1.50″ – 2.50″
Red & Hard fescue	1.50″ – 2.50″
Chewings fescue*	0.75″ – 2.50″
Tall fescue	2.00″ – 3.00″
Creeping bentgrass	0.10″ – 0.75″
Col. & Highland bent.	0.50″ – 1.50″
Annual bluegrass	0.10″ – 2.00″

* Chewings fescue gets mowed at 0.25” on putting greens.

Colonial bentgrass false crowns at higher heights



Bentgrass appearance mowed at 2.5”

Bentgrass mowed vs. unmowed

Mulching reduces the need for fertilizer inputs by as much as 25%

Reason to bag clippings – infrequent mowing

Scalping

Don’t do this!

Overview

A. IPM

1. Mowing
2. Fertilization
3. Irrigation
4. Grass Selection

B. Managing Common Pests

1. Diseases – Necrotic Ring spot, Rust, Powdering Mildew, Leaf blight, etc
2. Insects – Bill Bugs, Crane fly, European chafer, May & June Beattles.
3. Weeds – a long list

Why Apply Fertilizer?

Improves the vigor of the lawn

A healthy lawn will:

- Resist weed encroachment.
- Reduces disease pressure.
- Resist insect pests.
- More drought resistant.

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

What to consider:

- Type of grass
- Age of lawn
- Clipping removal
- Soil type/ fertility level
- Expectations

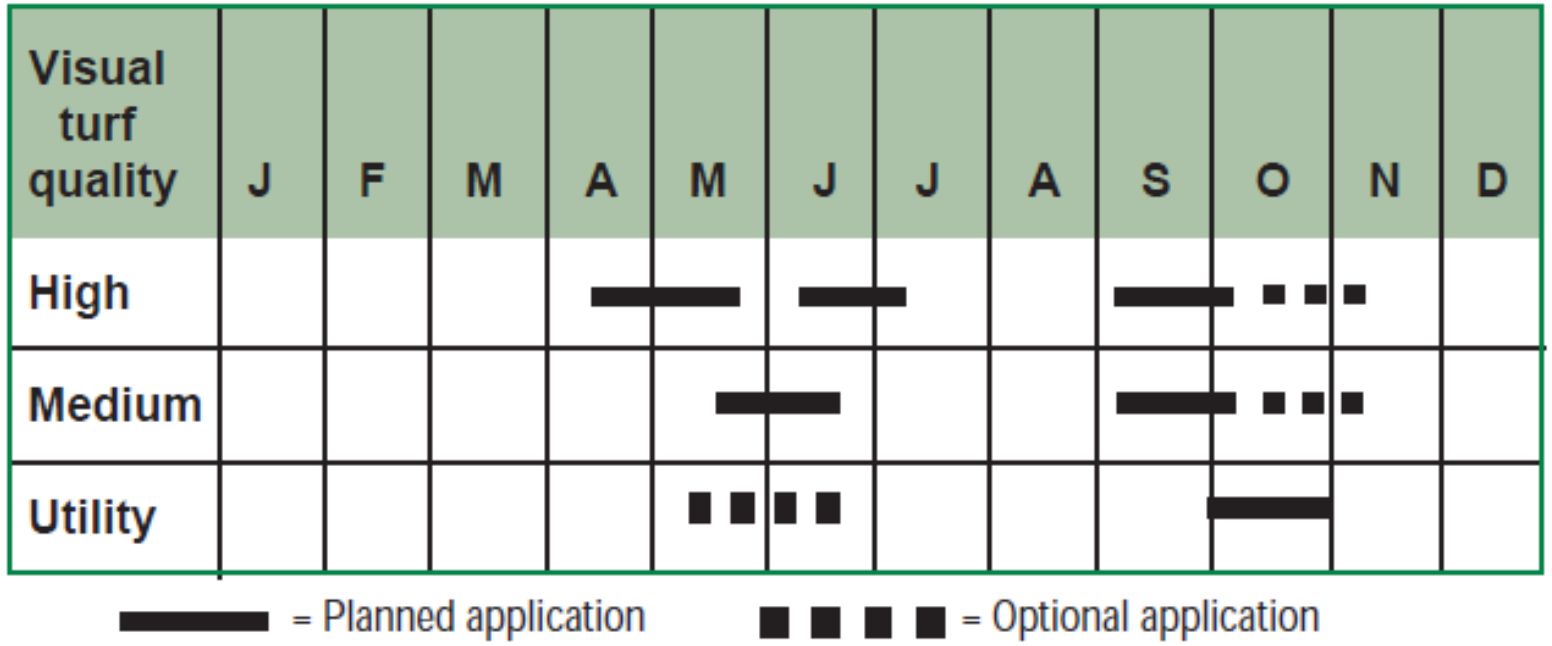
What to apply:

- Nitrogen is the key
- Phosphorus only if deficient
- Potassium is rarely needed

- Synthetic fertilizers work fine
- Organic fertilizers work fine

When to Fertilize? (1 lb. N/1,000 ft^2)

Figure 2. Fertilizer calendar for irrigated lawns in central and eastern Oregon.



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.

Overview

A. IPM & Cultural Practices

1. Mowing
2. Fertilization
3. Irrigation
4. Grass Selection

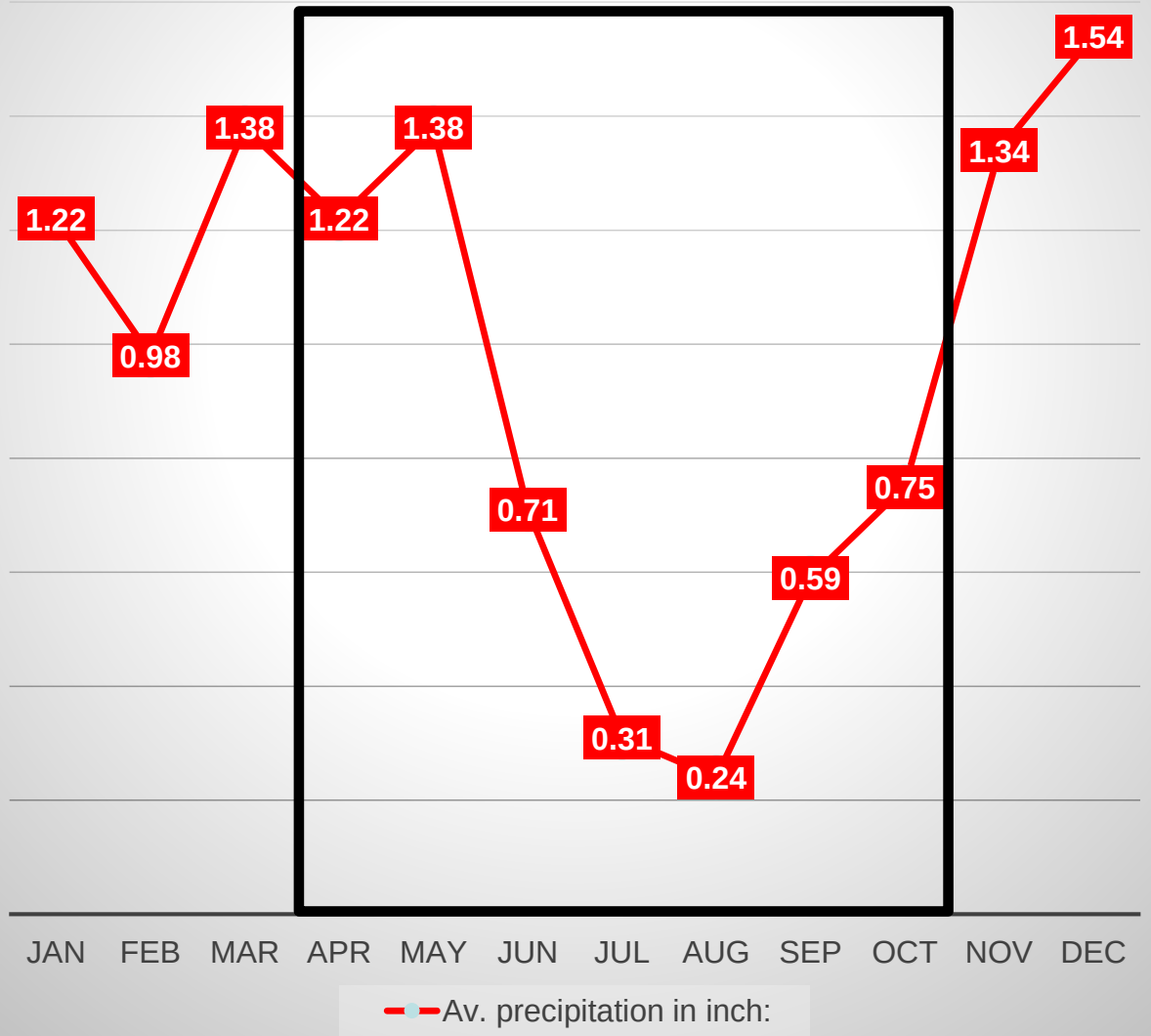
B. Managing Common Pests

1. Diseases – Necrotic Ring spot, Rust, Powdering Mildew, Leaf blight, etc
2. Insects – Bill Bugs, Crane fly, European chafer, May & June Beattles.
3. Weeds – a long list

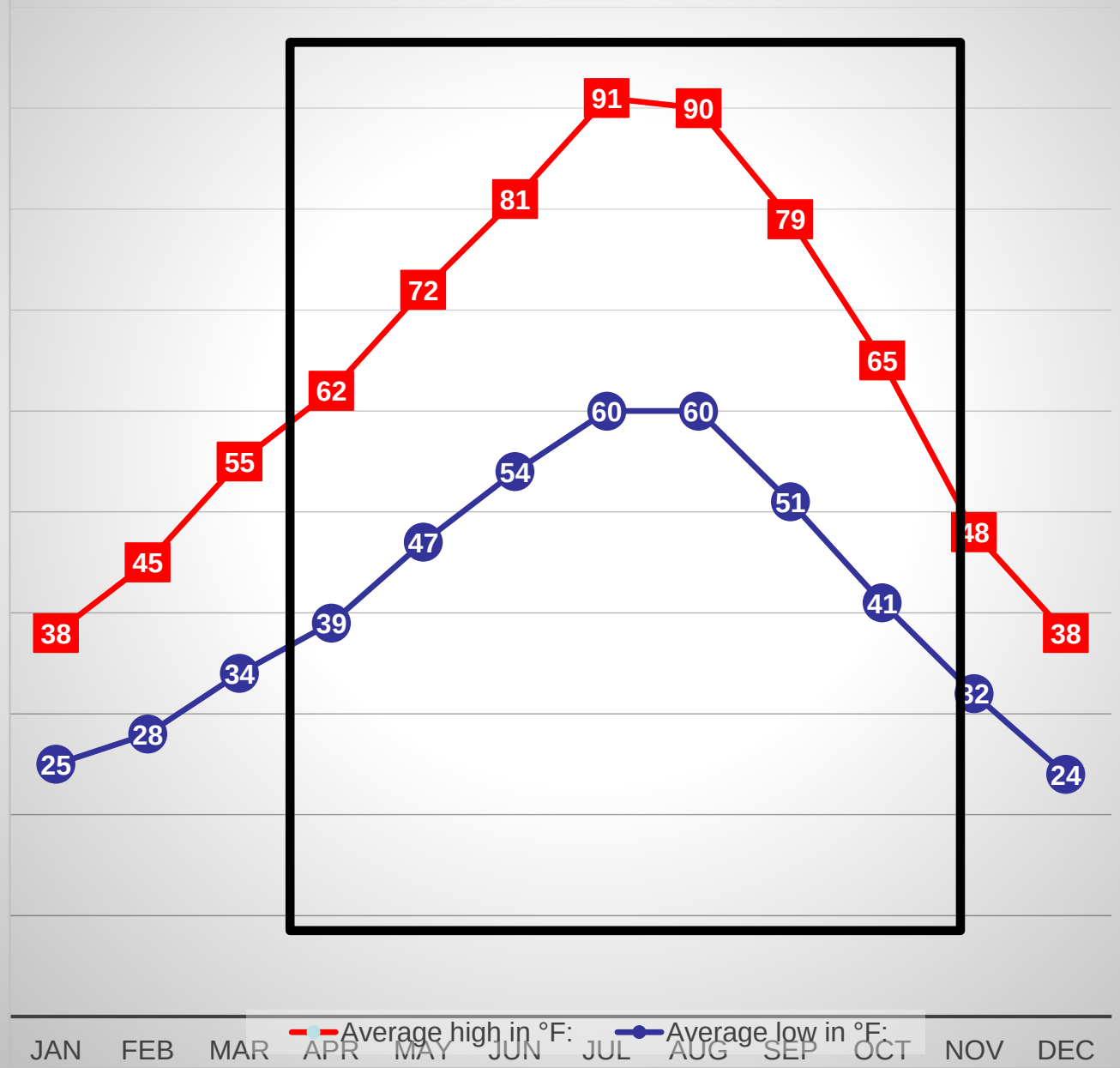
Irrigation

Average Rainfall (inches) - Boise, ID

Average per year = 12 inches



Average Temps - Boise, ID

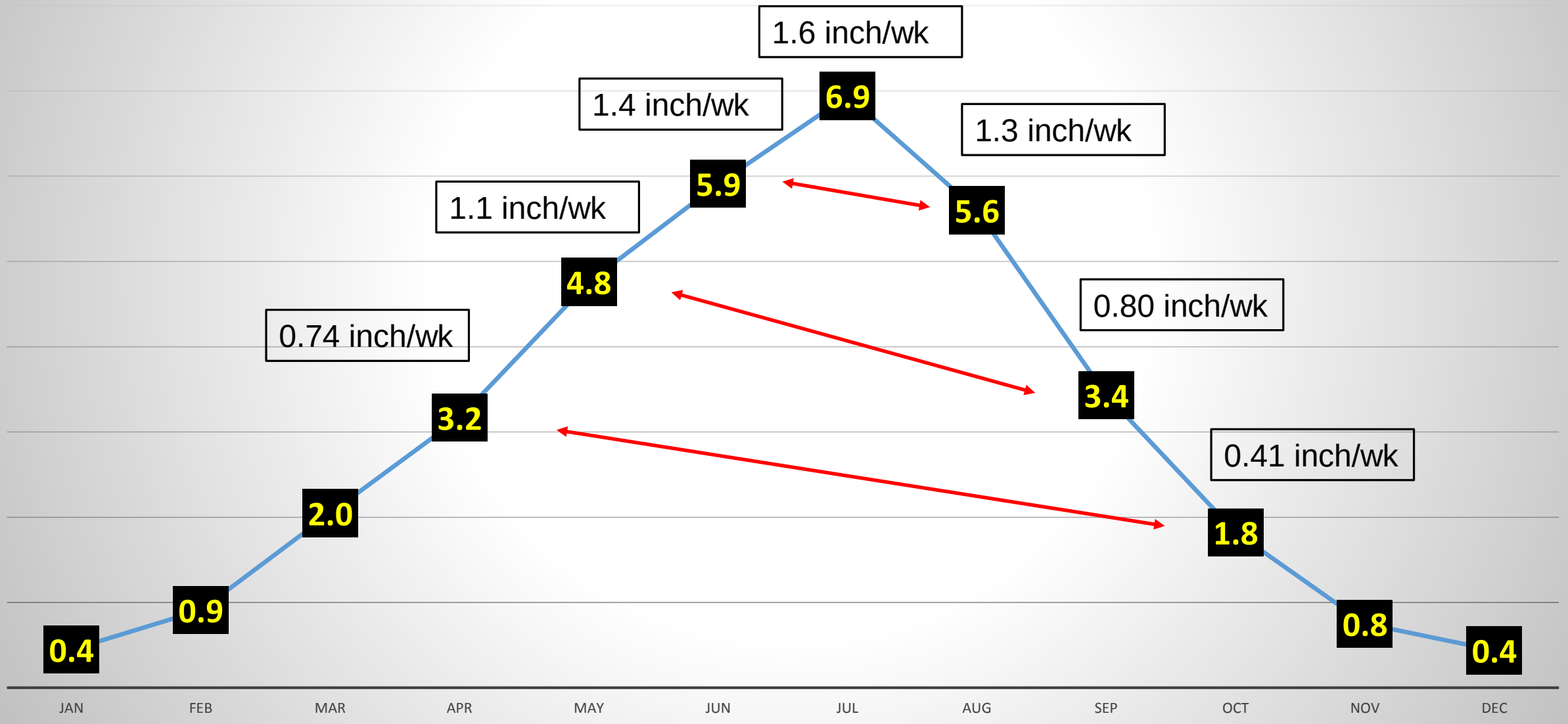


Evapotranspiration - Boise, ID

ETr x 80%

Source: Agrimet

https://www.usbr.gov/pn/agrimet/monthlyet.html



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)*

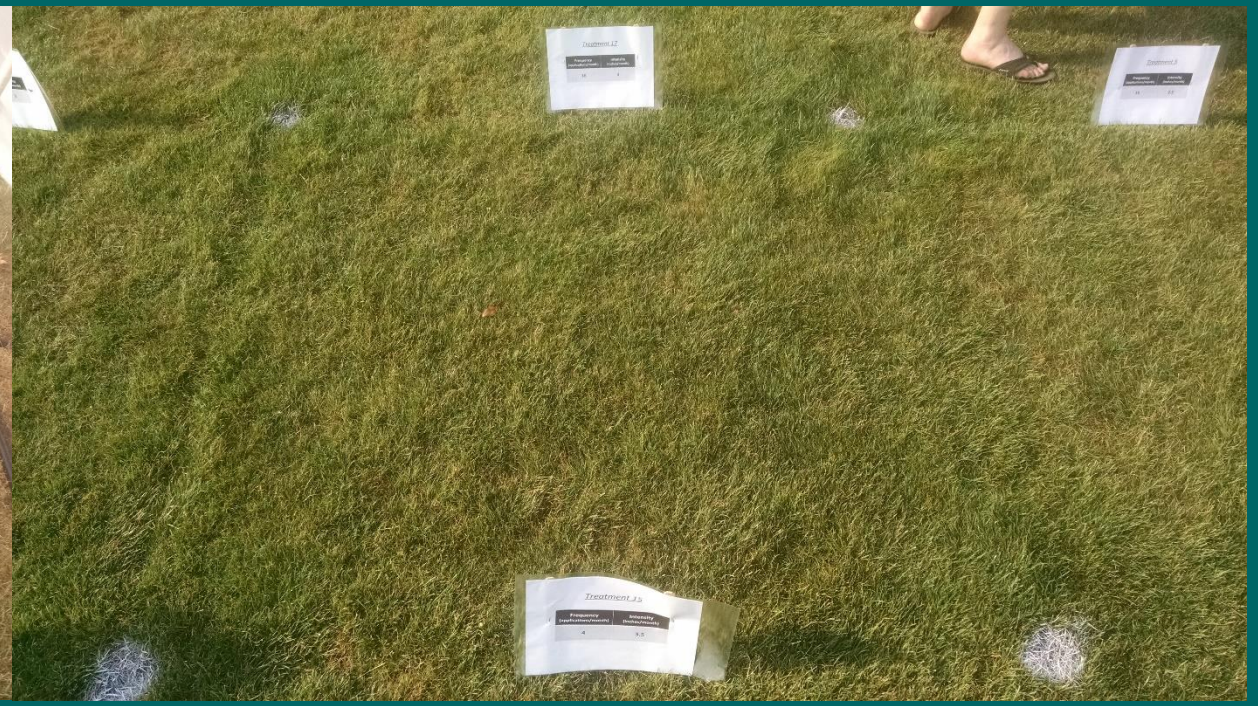
How often?

- Hose and sprinkler:
  - Once or twice per week
- In ground system:
  - More than once per week
  - Less than seven times per week

Irrigation Frequency

Photos Taken – Mid August

1 inch applied weekly



1 inch per week applied 4x/wk at 0.25 inches/app

Irrigation Timing & Disease Control

- Many disease are made worse by poor irrigation timing.
- Time your irrigation to run in the morning to minimize leaf wetness time.
- Ideally, if you customers can see the irrigation heads running they can spot problems with the system.

Practical Ideas to Reduce Water Use

- Adjust your run times monthly
- Increase the number of days between watering
- Wait as long as you can before turning on the system in the spring
- Turn off the system as early as you can in fall.

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.

Grass Species Options

- Kentucky bluegrass
- Perennial ryegrass
- Tall Fescue
- Fine Fescues
- Bentgrass

Change Species?

“When you change species, you simply trade one set of problems for another. Pick the species with the problems you can manage”

Tom Cook, Professor Emeritus, Oregon State University

Kentucky Bluegrass

Strengths

- Best looking grass
- Rhizomatous (lateral growth)
- Recovers from drought
- Good wear tolerance

Weaknesses

- Very slow to establish.
- Poor in wet or shady conditions (diseases!)
- Extremely heavy thatch producer.
- High water use with heavy thatch layer.
- Necrotic ringspot, leaf blight, rust & Bill Bugs


GRASS
THATCH
SOIL
METRIC
1
2
3
4
5

Dethatching will have little effect on the amount of thatch in these lawns.
Coring may help if tines go deep enough.

Necrotic Ringspot on Kentucky bluegrass

Ophiosphaerella korrae

Tall Fescue

Strengths

- Low thatch producer
- Endophytic enhanced varieties – Bill bug resistance
- Resistant to necrotic ringspot
- Deep rooted: drought tolerant
- Wear tolerant

Weaknesses

- Coarse textured but getting better
- Susceptible to snow mold disease under longer term snow cover
- Will go dormant earlier in cold weather.
- Brown patch in high humidity, high temperature climates.


New Tall Fescue Lawn

Perennial Ryegrass

Strengths

- Low thatch producer
- Blends well with Ky. Bluegrass
- Resistant to necrotic ringspot
- Endophytic enhanced varieties – Bill bug resistance

Weaknesses

- Poor cold tolerance
- Highest nitrogen requirement to look good.
- Subject to red thread, rust, M. Patch, and leaf spots.
- Not good in shade

Fine Fescue

Strengths

- Low nitrogen requirement
- Fine textured
- Good shade tolerance
- Resistant to necrotic ringspot
- Recovers from long term drought
- Endophytic enhanced varieties – Bill bug resistance

Weaknesses

- High thatch producer
- High water user to look good
- Often has a brown color
- Brown tips after mowing
- Poor traffic tolerance.
- Heavy thatch layer which tears out when dethatching

Bentgrasses

Strengths

- Can tolerate low maintenance
- Low nitrogen needs
- Can recover from long term drought

Weaknesses

- Poor wear tolerance
- Low mowing height requirement to look good.
- Medium high thatch, but can manage.
- Needs consistent irrigation to look good.

Overview

A. IPM & Cultural Practices

1. Mowing
2. Fertilization
3. Irrigation
4. Grass Selection

B. Managing Common Pests

1. Diseases – Necrotic Ring spot, Rust, Powdering Mildew, Leaf blight, etc.
2. Insects – Bill Bugs, Crane fly, European chafer, May & June Beatles.
3. Weeds – a long list

Billbugs in Turf

Common Billbug species:

- Sphenophorus apicalis
- Sphenophorus cicatristriatus* (Rocky Mtn)
- Sphenophorus coesifrons
- Sphenophorus inaequalis
- Sphenophorus minimus
- Sphenophorus parvulus* (Bluegrass)
- Sphenophorus phoeniciensis* (Phoenician)
- Sphenophorus venatus* (Hunting)

* Billbugs common to Oregon, Washington, and Idaho

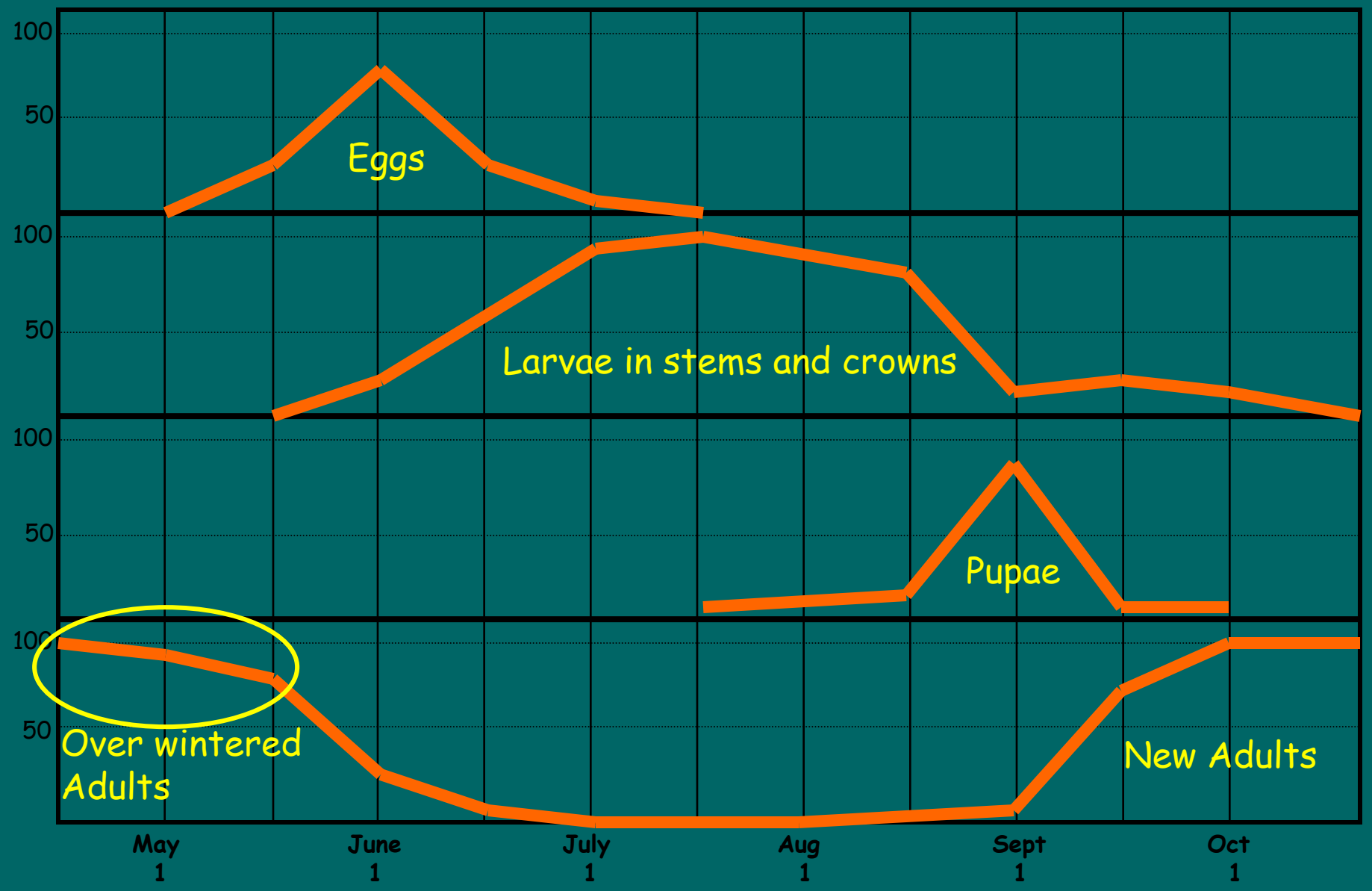
Johnson-Cicalese et. al. Environmental Entomology. 1990:19:4 pg. 1037-1046

Billbugs in Turf

- Rocky Mountain Billbug - Corvallis, Oregon
- Phoenician Billbug – Eugene and Cresswell, Oregon
- Bluegrass Billbug – Portland, Oregon

Life Stages of *Sphenophorus venatus confluens* in Corvallis Oregon

J. A. Kamm 1969 J. of Economic Entomology Vol. 62, No. 4



General Damage Symptoms

Injured turf separates easily from soil

Phoenician Billbug

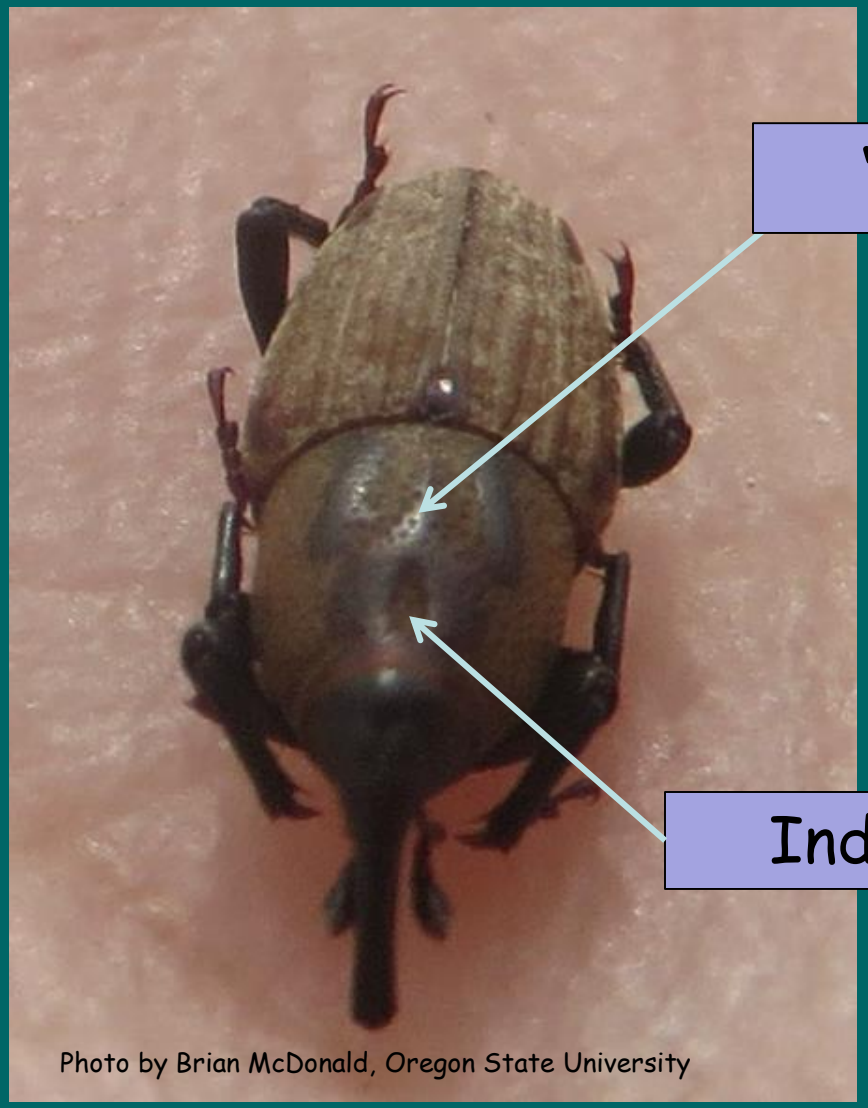
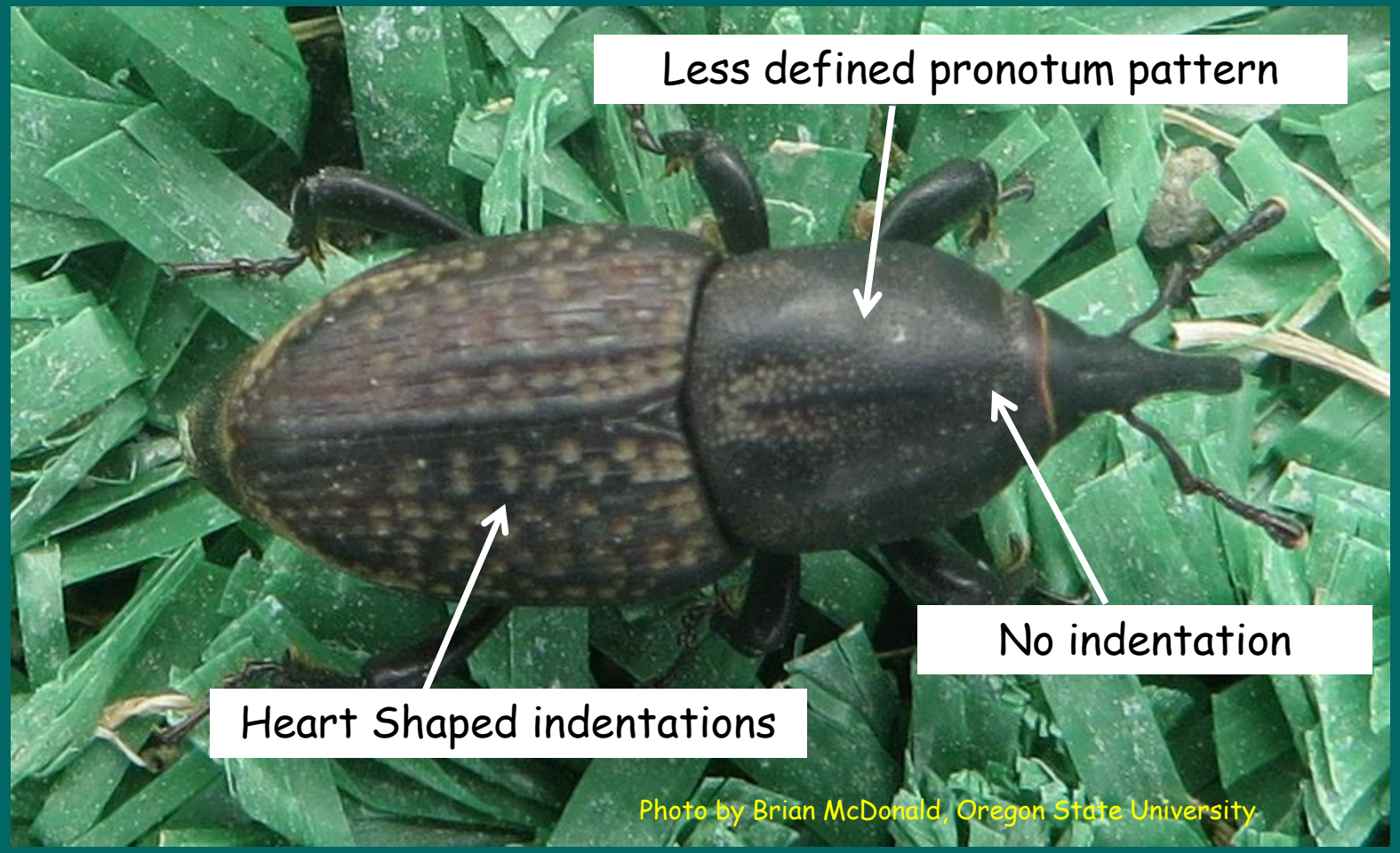


Photo by Brian McDonald, Oregon State University

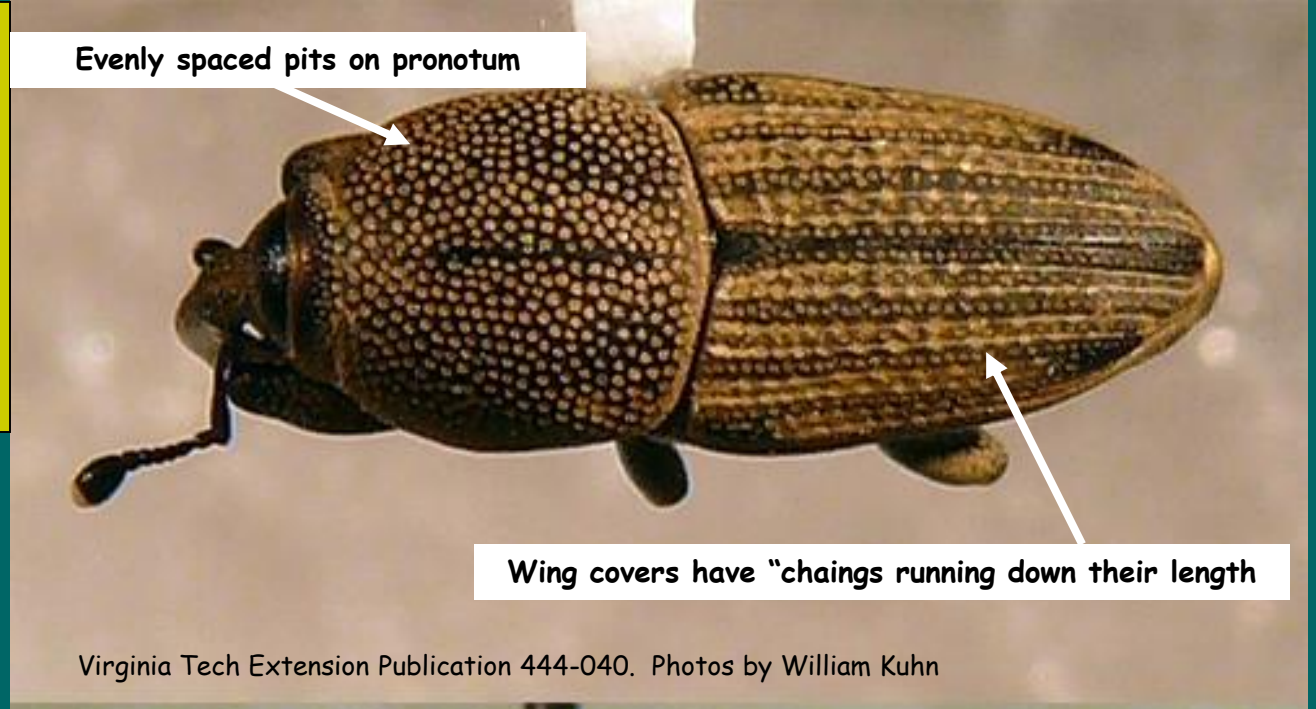
Pronotum "Raised Ridges" Pattern:

- "M" Shape.
- Indentation

Denver or (Rocky Mountain) Billbug



Bluegrass Billbug *Sphenophorus parvulus*



Virginia Tech Extension Publication 444-040. Photos by William Kuhn

Can be black in color

Photo by Jeff Hahn, University of Minnesota

Hunting Billbugs look very similar to Phoenician Billbugs but are larger

Figure 2. Hunting billbug adult, showing top and side views. (Photos: William Kuhn.)

Photo by Tom Cook, Oregon State University

Billbug Larvae

Grasses affected by Billbugs:

Kentucky Bluegrass
Perennial Ryegrass*
Fine Fescues*
Tall Fescue*
Bentgrasses
Annual Bluegrass

* Some varieties have endophytic fungi and are more resistant to damage.

From: Managing Bill Bugs in Turfgrass.
Douglas Richmond, Purdue University

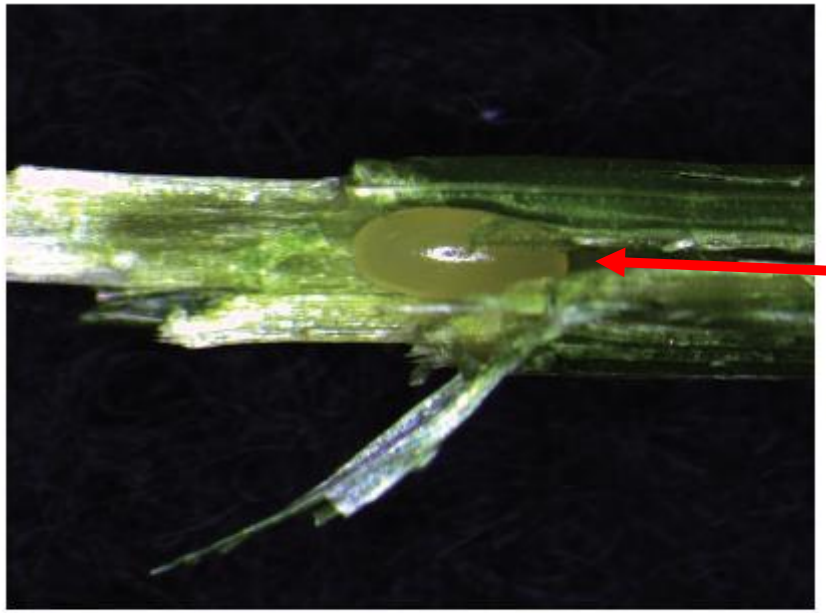


Figure 4. Bluegrass billbug egg inside the stem of a Kentucky bluegrass plant.

Egg Gets Laid in the Stem

Egg hatches and larvae begins feeding

Figure 5. Bluegrass billbug larvae inside stem of a Kentucky bluegrass plant.

1. Larvae hollow out sheathes
2. Destroy crown meristems
3. Move to other tillers
4. Drop to soil and eat roots

Young exposed larvae on way to soil

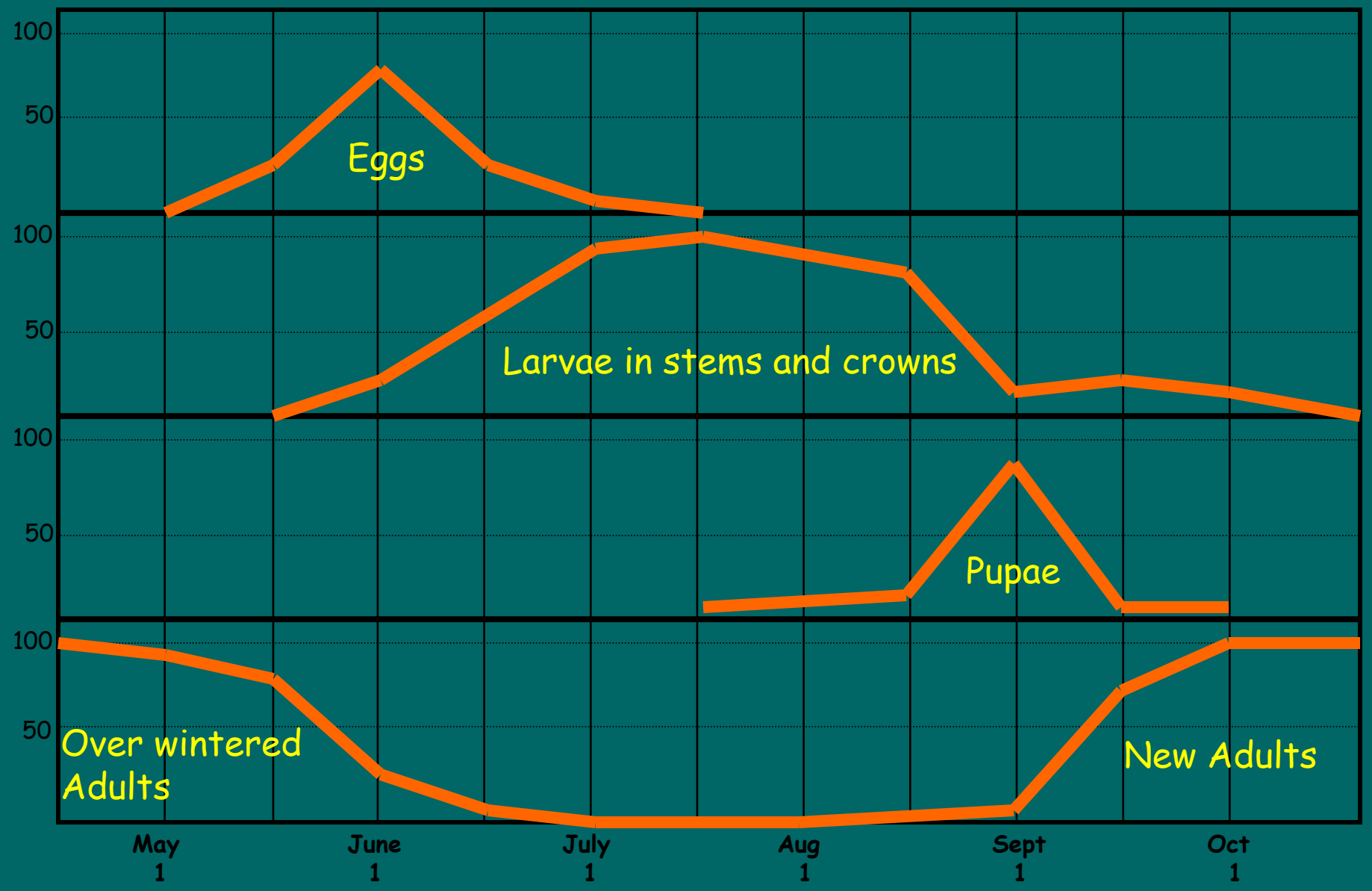

Mature Larvae
feed mostly on roots

General Control Strategies

1. Target over wintered adults
2. Target young exposed larvae
3. Target mature larvae in soil
4. Preventive chemical control
5. Resistant grasses

Life Stages of *Sphenophorus venatus confluens* in Corvallis Oregon

J. A. Kamm 1969 J. of Economic Entomology Vol. 62, No. 4



1. Controlling Over Wintered Adults

Treatment Timing:

Pitfall traps:

Visual Observations:

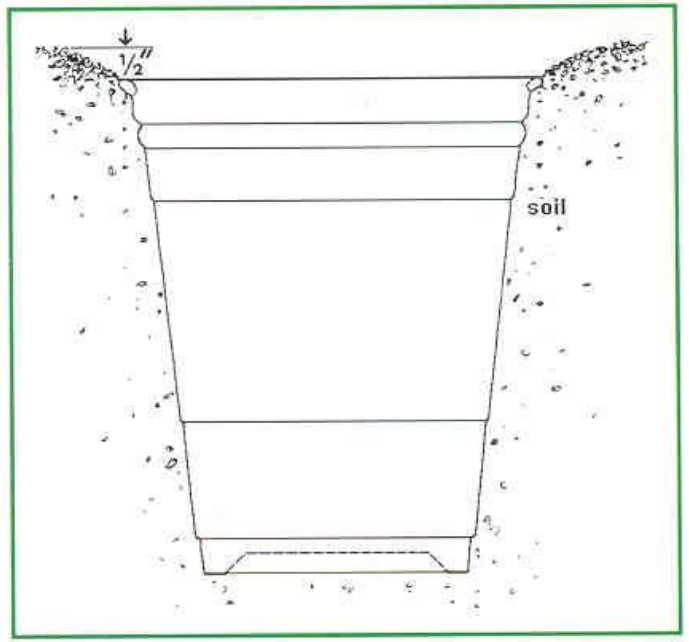
Empirical models:

> April 15 to May 15

Degree Days (Base 50, simple average)

> April 15 to May 15

Diagram of a pitfall trap that can be used to monitor surface-inhabiting insects and mites.



Pitfall trap in turf with two billbugs as well as other insects and mites.

Poor Man's Pitfall Trap

From:
Destructive Turf Insects,
Harry D. Niemczyk & David J. Shetlar.
2000. H.D.N. Books, Wooster, Ohio

From: Destructive Turf Insects, Harry D. Niemczyk & David J. Shetlar. 2000. H.D.N. Books, Wooster, Ohio

Linear Pitfall Trap

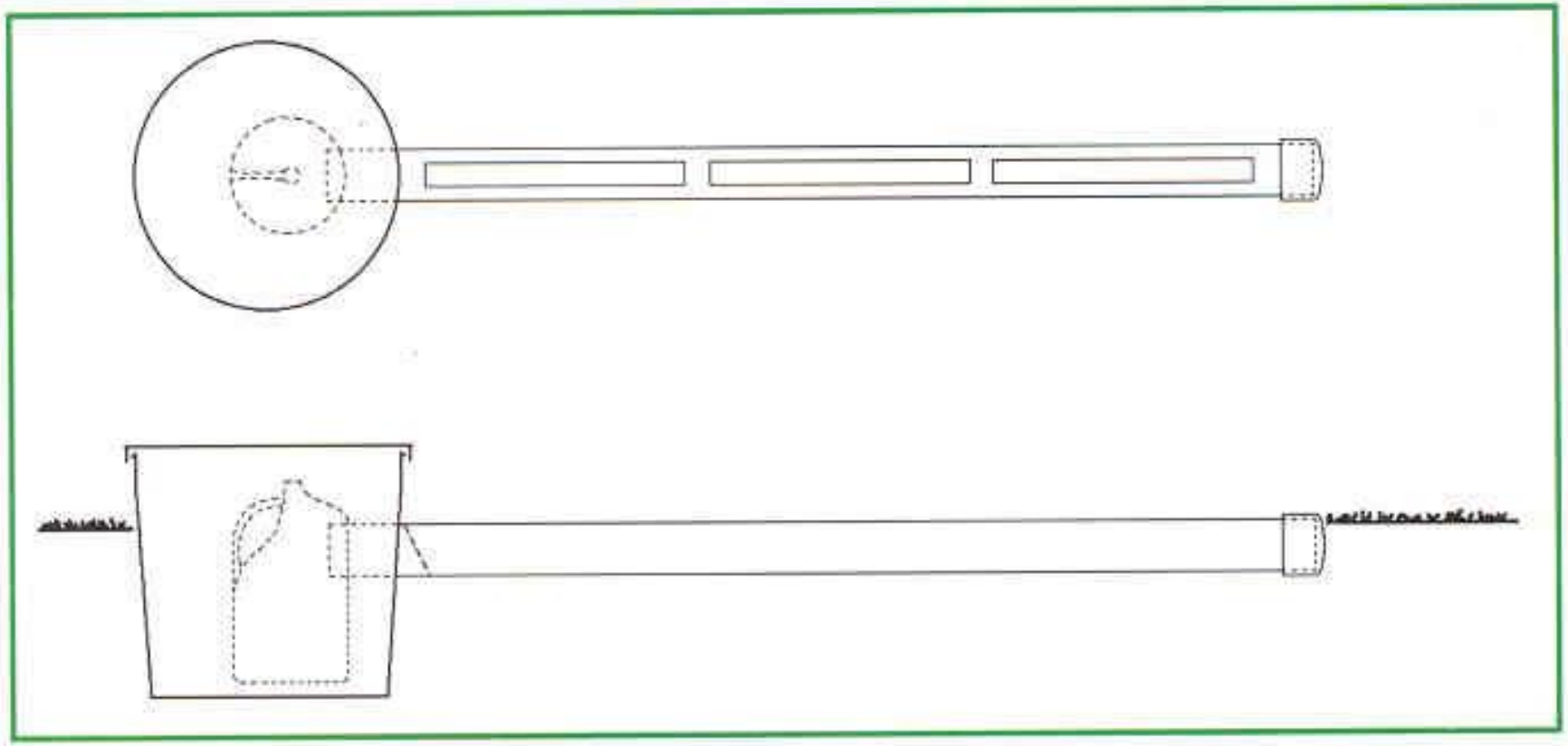
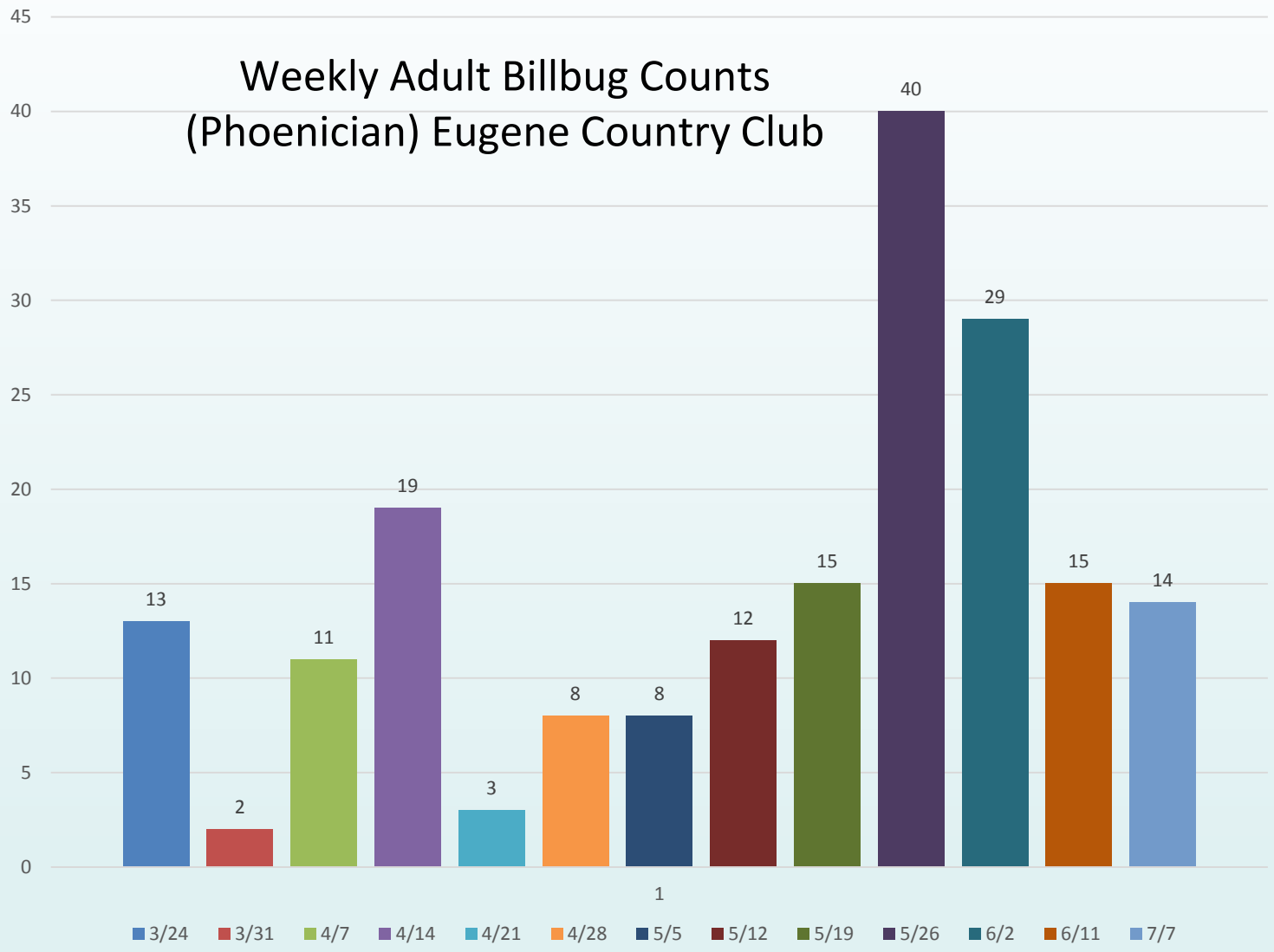


Diagram of a linear pitfall trap used to capture mole cricket nymphs. Two-inch diameter PVC pipe has slits cut out and the pipe is buried at ground level. Captured mole crickets, billbugs, and other insects crawl to the openings move down the pipe and fall into a plastic jug fitted over it.



David Shetlar, Ohio State	
Growing Degree Day Model	
280 - 352	1st activity
560 - 624	30 % Activity
925 - 1035	Emergence
1330 - 1485	Significant damage

		50
Date	Adult Counts	GDD
3/24	13	45
3/31	2	50
4/7	11	74
4/14	19	107
4/21	3	124
4/28	8	132
5/5	8	196
5/12	12	219
5/19	15	299
5/26	40	378
6/2	29	434
6/11	15	536
7/7	14	910

David Shetlar, Ohio State

Growing Degree Day Model

280 - 352	1st activity
560 - 624	30 % Activity
925 - 1035	Emergence
1330 - 1485	Significant damage

Controlling Overwintered Adults

Synthetic Pyrethroids (toxic to bees)

- Deltagard
- Scimitar
- Talstar
- Tempo

Organophosphates (toxic to bees)

- Dylox

Carbamates (toxic to bees)

- Sevin

Controlling Overwintered Adults

Neonics

Meridian, Merit, Arena, Zylam (toxic to bees)

Diamides

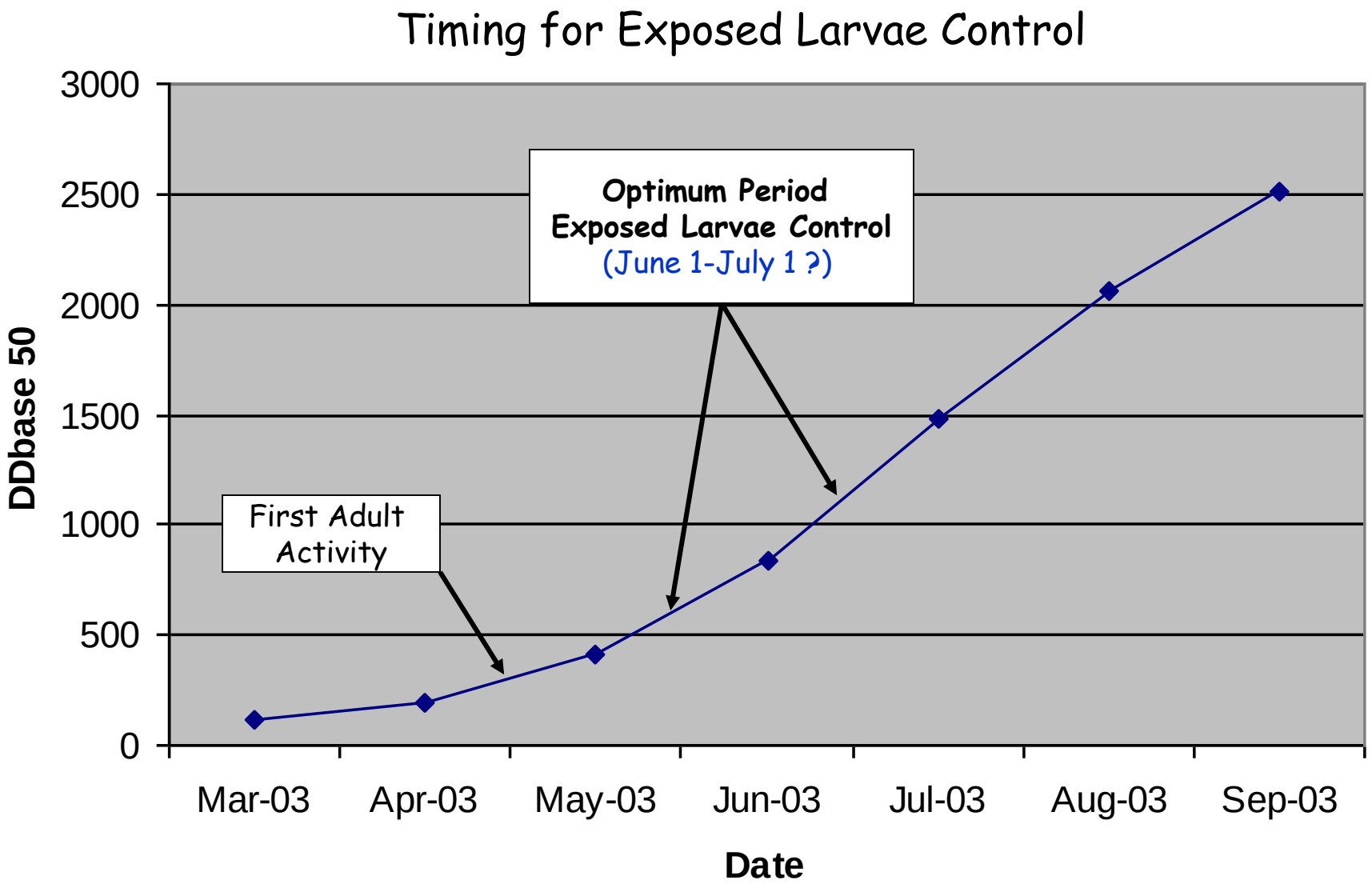
Ference (toxic to bees)

Acelepryn (**Low toxicity on bees**)

Parasitic Nematodes

Steinernema carpocapsae

Controlling Exposed Larvae



Exposed Young Larvae Control

Synthetic Pyrethroids

- Deltagard
- Scimitar
- Talstar
- Tempo

Nematodes

- S.carpocapsae

Trichlorfon

- Dylox

Carbaryl

- Sevin

Exposed Young Larvae Control

Neonics

Meridian, Merit, Arena, Zylam (toxic to bees)

Diamides

Ference (toxic to bees)

Acelepryn (**safe on bees**)

Older Larvae in Soil - Control

Carbaryl

Sevin

Diamides

Ference

Trichlorfon

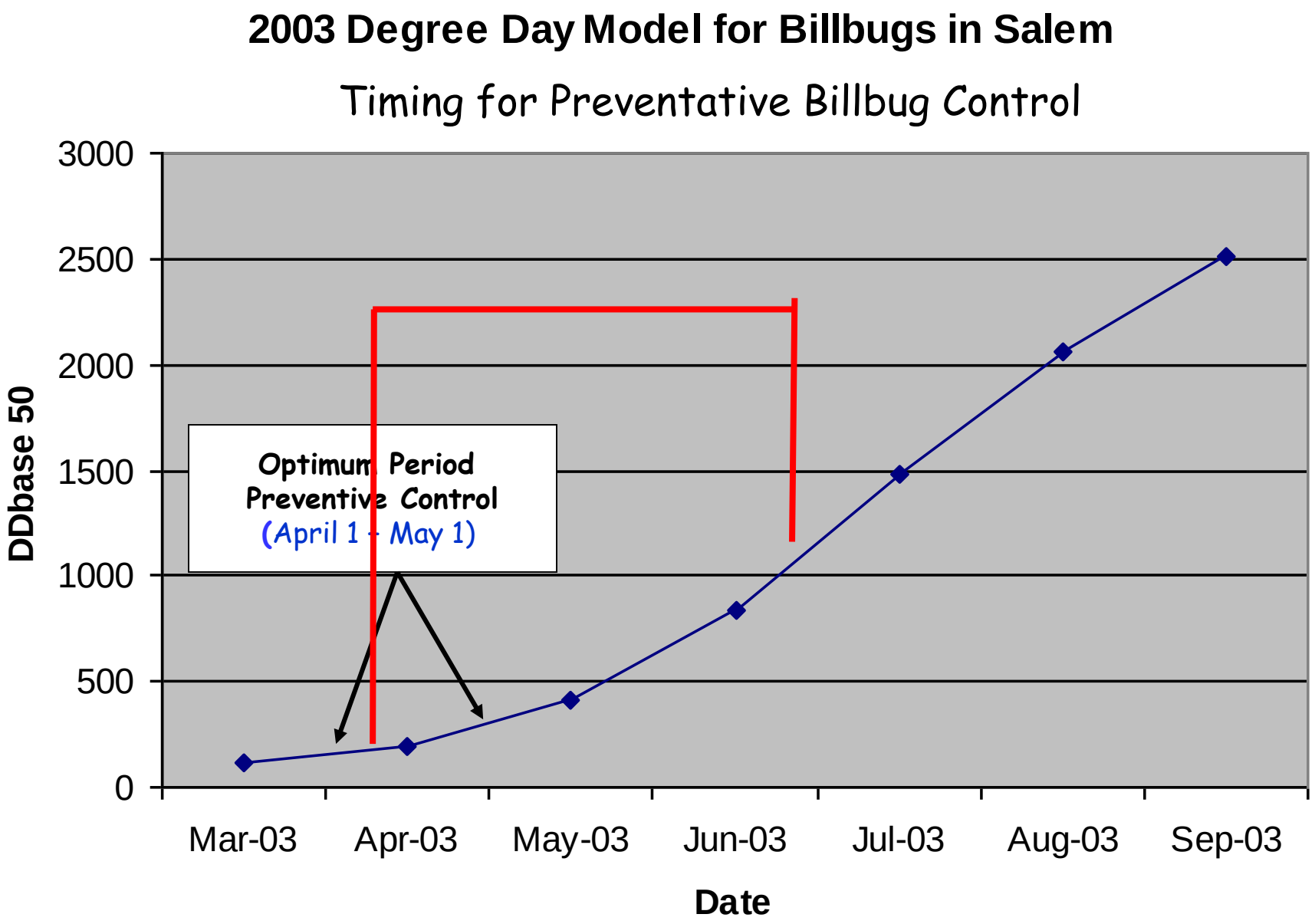
Dylox

Nematodes

Parasitic nematodes – *Heterorhabditis bacteriphora*

Neonics?

Slower but can can be effective.


2003 Degree Day Model for Billbugs in Salem
Timing for Preventative Billbug Control
3000
2500
2000
1500
1000
500
0
DDbase 50
Optimum Period
Preventive Control
(April 1 - May 1)
Mar-03
Apr-03
May-03
Jun-03
Jul-03
Aug-03
Sep-03
Date

Preventive Control

Chemicals:

Neonics: Merit, Meridian, Area, Zylam, etc

Diamides: Ference,Acelyprn

Apply before or during egg lay.
Water in.

Most Effective Control Strategies

1. Sites with long history of problems

   Preventive Treatments:

   Neonics, Acelepryn, Ference

2. Recent infestations or moderate damage

   Over Wintered Adults:

   Pyrethroids, Sevin, Dylox

3. Sporadic damage in small areas

   Older Larvae in the Soil:

   Sevin, Dylox, Ference, Neonics

Repeated Bill Bug Problems

- Inter seed with Perennial ryegrass variety that has endophytic fungi
- Spray out and seed with Tall Fescue enhanced with endophytic fungi if you also want lower water use.
- Note: Endophytes make livestock sick.

What about diseases?

- Most lawn diseases are foliar and do not kill turf.
- Turf will recover.
- Fall applications of fertilizer will go a long way in reducing severity of fall and winter diseases. Not too much though!
- Mulch or remove leaves promptly from turf.

Common Lawn Diseases of Boise

- Necrotic Ringspot on Ky. Bluegrass
- Leaf blight (*Ascochyta*)
- Rust
- Red Thread
- Powdery Mildew
- Fairy Ring
- Snow Molds (Microdochium Patch)?
- Brown Patch?
- Dollar spot?

Foliar Diseases

- Rust
- Red Thread
- Leaf blight
- Powdery Mildew

- Rare that they would ever kill any turf.

Root Pathogens

- Necrotic Ring Spot
- Fairy Ring

Necrotic Ringspot on Kentucky bluegrass

Ophiosphaerella korrae

Necrotic Ringspot

Older Infections

Symptom Variability

Newer Infections

Necrotic Ringspot on Kentucky Bluegrass

- Develops 2 – 4 years after planting
- Affects both sodded and seeded lawns
- Root pathogen
- Foliar symptoms reflect damaged roots
- Primary disease activity occurs in fall and spring
- Symptoms show in fall, spring, or summer
- Recovery is slow

Necrotic Ring Spot Control

- Maintain balanced fertility (5 -1 - 4 ratio) vs. N alone.
- Utilize slow release nitrogen – don’t overstimulate leaf growth
- Maintain consistent irrigation
- Manage thatch and core annually

Necrotic Ring Spot Control

- Plant a resistant Ky. Bluegrass Cultivar
- Inter-seed perennial ryegrass
- Apply Fungicides in the spring
- Switch to a newer Tall Fescue

Fungicides

- Headway (3.0 oz), Heritage 50WG (0.4 oz)
- Banner Maxx (4.0 oz)
- Cleary’s 3336 (6.0 oz)
- Armada 50 WP (1.2 oz) (Bayleton + Compass)

- Best timing is April or May

Fairy Ring Symptoms

Type 1. Dead or Damaged Turf in Ring
Mushrooms may be Present

Type 2. Turf in Ring Stimulated

Type 3. No Damage, Mushrooms Present


Type 1 Fairy Ring
La Grande, OR


Type 2 Fairy ring without mushrooms
Olds, Alberta, Canada


Fairy Ring mycelium in soil


Hydrophobic zone caused by Fairy Ring mycelium

Controlling Fairy Ring

1. Mask Symptoms
2. Renovate Site - $$$
3. Apply Fungicides

Mask Symptoms

- Core affected areas
- Apply wetting agent
- Repeatedly soak stressed turf
- Fertilize with slow release nitrogen

Renovate Turf

1. Kill existing grass
2. Remove surface debris (dethatch or sod cut)
3. Till area thoroughly
4. Drag debris & soil to ensure mixing
5. Replant with new seed

Fungicides?

- None work very well curatively
- Preventative applications? Apply in spring when soil temps are 55-60 degrees.
- Bayleton, Torque, and ProStar are known to be effective preventatively. Velista is new and reportedly is also good.

Rust Diseases
Puccinia sp.

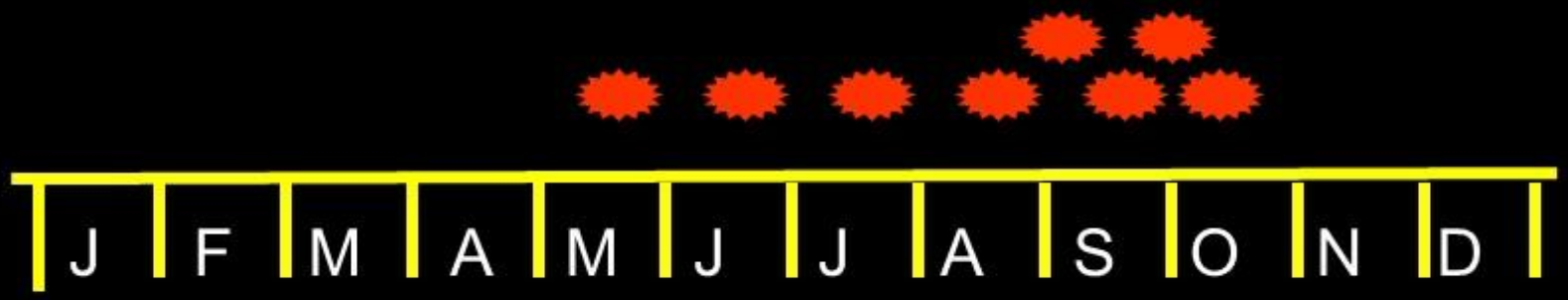
- Hosts:
  - Kentucky Bluegrass — Stripe Rust
    P. striformis
  - Perennial Ryegrass — Crown Rust
    P. coronata

General appearance of Rust infected turf


Stripe Rust on Kentucky Bluegrass
Medium Fertility
Low N fertility
Corvallis, OR


Ky. Blue: susceptible
Fine Fescue: resistant

Rust activity cycle:



Factors:

- Low Nitrogen Fertility
- Low Grass Vigor - drought, low temps
- Pure Stands of Grass
- High Mowing Heights

What to do about Rust

1. Stimulate growth via water or fertilizer.
2. Wait for the weather to change.
3. Go fishing!

Lawn rust can be exciting to see but rarely damages the lawn. It causes more problems for the lawn OWNER than for the lawn.

Leaf Blight on Kentucky Bluegrass

- Foliar pathogen
- Symptoms often appear quickly
  - On drought stressed turf
  - Most common in hot weather followed by wet soil conditions.
- Can be caused by over irrigation or watering in daytime.
- Dull mowers and frequent mowing may contribute to disease.

Leaf Blight on Kentucky Bluegrass

- Reduce thatch
- Core annually to improve infiltration
- Keep uniform moisture levels
- Avoid excess nitrogen especially in the spring
- Usually recovers in 2 – 3 weeks.

Powdery Mildew on Kentucky bluegrass

- Leaf pathogen
- Environment is key to infection.
- Occurs in shaded areas with little air movement.
- High humidity needed but not leaf wetness.
- Young growth is more susceptible.

Managing Powdery Mildew

- Prune plants to create air flow and more light.
- Inter seed areas with fine fescue.
- Maintain adequate moisture and fertility
- Don’t plant Kentucky bluegrass in the shade.

Disease Summary

- Fungicides are rarely recommended – too cost prohibitive and repeat apps are usually necessary to be effective.
- Manage lawn diseases by:
  - Modifying the environment
  - Changing irrigation practices
  - Fertilizing appropriately
  - Changing mowing heights (usually lowering).
  - Inter seeding with different grass species.

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.

Weed Management Basics

- Cultural practices will only reduce weed encroachment, and prevent flowering; they will not kill weeds.
- If weeds are causing a problem (i.e. bee stings, injury potential, etc.) herbicides are the only real option.
- But the goal should be to break the annual cycle of applications.

Weed Management Basics

- Your cultural practices select for the weeds you get.

- Pay me now or pay me later.

Weed Control Basics

- Make 2 applications 3 – 4 weeks apart.

  (check the label for minimum spray intervals.)
- For tough weeds apply in the late summer and early fall (e.g. oxallis, clover, ground Ivy, veronica, etc.)
- Be sure turf and weeds are healthy before spraying (fertilize 2 weeks prior, if necessary).
- Do not irrigate for 24 hours after spraying.
- Don’t mow for a few days to a week before spraying.

Herbicide Selection

- Most people start with 3 – way mix (2,4-D, MCPP, Dicamba). Broad spectrum – controls most weeds with 2 applications. (Dandelions, Plantains, Clover with fall apps).

- If you have difficult weeds use something like SpeedZone, T-Zone, Escalade 2, Q4, or even Sapphire.

3 way Mix – 2,4-D, MCPP, + Dicamba (e.g.Trimec)

- Post emergence herbicides (curative)


False dandelion


Common dandelion


Broadleaf plantain


Mouse-ear chickweed

Speedzone, T Zone, Escalde 2, Q4

- Post emergence herbicides (curative)
  - Herbicide mixes effective on these weeds:
    - May not be effective on Veronica (Fluroxypyr is better)

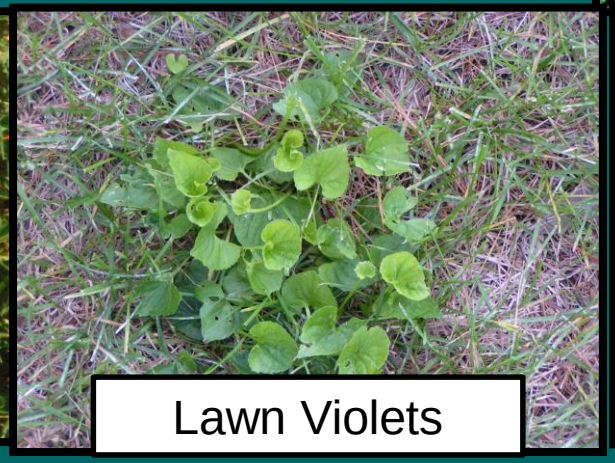
White Clover

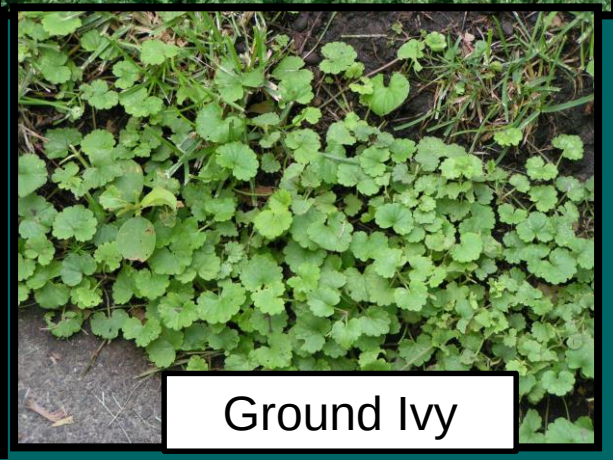
Black medic

Veronica

Tough Weeds need Triclopyr

- Post emergence herbicides (curative)
  - Herbicide mixes effective on these weeds:





English Lawn Daisy

- Post emergence herbicides (curative)

English daisy

T Zone Warning

- T Zone is formulated with an ester that volatilizes in warm weather. I would advise against spraying T Zone in the spring when other plants are leaving out.

- We see a lot of off target injury to trees and shrubs from ester formulations, especially those containing triclopyr.

Worst use of grass?

Thank You!

Brian.mcdonald@oregonstate.edu