

# **Snow Mold Control on Putting Greens in the Intermountain West**

**IEGCSA 2007 Pesticide Short Course**

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**Pullman, WA**

# Outline

- Status of PCNB
- 3 snow molds
- Cultural control
- Chemical control
- Biological control

# PCNB or not PCNB?

- Put on the market in 1964. Standard for snow mold control in turf
- PCNB (a.k.a.):
  - Terraclor 75WP
  - Turfcide 400
  - Revere 4000
  - Par-Flo
  - FFII 14-3-3
- 1988 and 2003 amendments to FIFRA bring databases of older chemicals up to modern standards

# PCNB or not PCNB?

- Fall 2006 Reregistration Eligibility Decision (RED) designated PCNB as “ineligible for reregistration” for use on turf and many other crops
- Public comment ended Jan. 2007
- EPA is crafting a response to comments and may come out with an amended RED by the end of the year, at the earliest
- Decision can still be challenged

# Reregistration Eligibility Decision (RED) for PCNB

- High Risk factors
  - Hazardous air pollutant
    - Significant volatilization
      - Increase exposure
      - Long range transport
  - Soil breakdown 0.5 to 3 years
    - Immobile (low leaching)
    - Increase potential for surface water contamination (long-range transport)
  - Bioaccumulation
    - Very high in fish (>1100X)
    - Aquatic plants (>3100X)

# Reregistration Eligibility Decision (RED) for PCNB

- **Risk/Benefit - High/Low**
  - Numerous highly effective, economically feasible alternatives with lesser environmental risk
- **EPA's decision:** PCNB is "Ineligible for reregistration" for use on turf and many other crops
- **Website:**  
<http://www.epa.gov/oppsrrd1/reregistration/pcnb/>

# Snow molds

- Pink snow mold
  - *Microdochium nivale*
- Gray snow molds
  - *Typhula incarnata*
  - *Typhula ishikariensis*

# Pink Snow Mold (*Microdochium nivale*)

- Cool moist conditions 30-60 °F
- Does not require snow cover
- Circular patches up to 20" diameter
- Reddish bronze to light gray
- Likes annual bluegrass

# *Microdochium nivale*



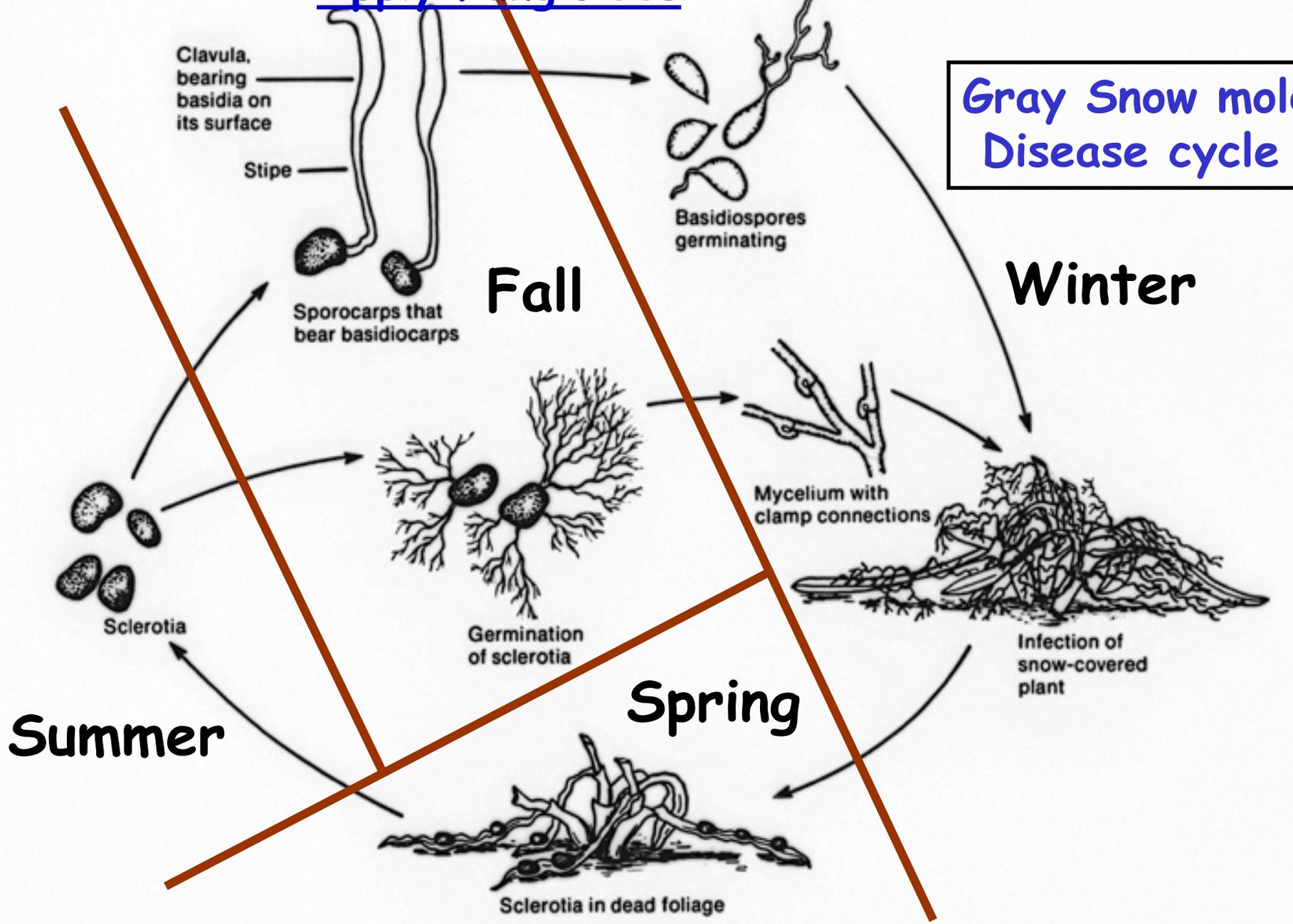
Interior recovers as  
disease spreads outward

Reddish bronze  
fringe (active)

# Gray Snow Molds

# Apply Fungicides

## Gray Snow mold Disease cycle



# *Typhula incarnata*

- >60 days continuous snow cover
- Temperatures 34-36 °F
- Variable patches of gray/white matted turf
- Sclerotia: up to 5 mm diameter red/brown embedded in dead leaf tissue (spring)
- Sporocarps: pinkish gelatinous looking upright structures 20 mm tall (fall only)
- Less destructive

# *Typhula incarnata*



*T. incarnata* sporocarps in  
low cut turf in the fall



# *Typhula ishikariensis*

- >100 days continuous snow cover
- Temperatures 34-36 °F
- Bleached crust of mycelium after drying
- Sclerotia: <2 mm dark brown/black visible on crust ('Speckled' snow mold) (spring)
- Sporocarps: silvery-white; very small <15 mm tall (very rare) (fall only)
- Destructive



**Typhula ishikariensis**

# McCall, ID

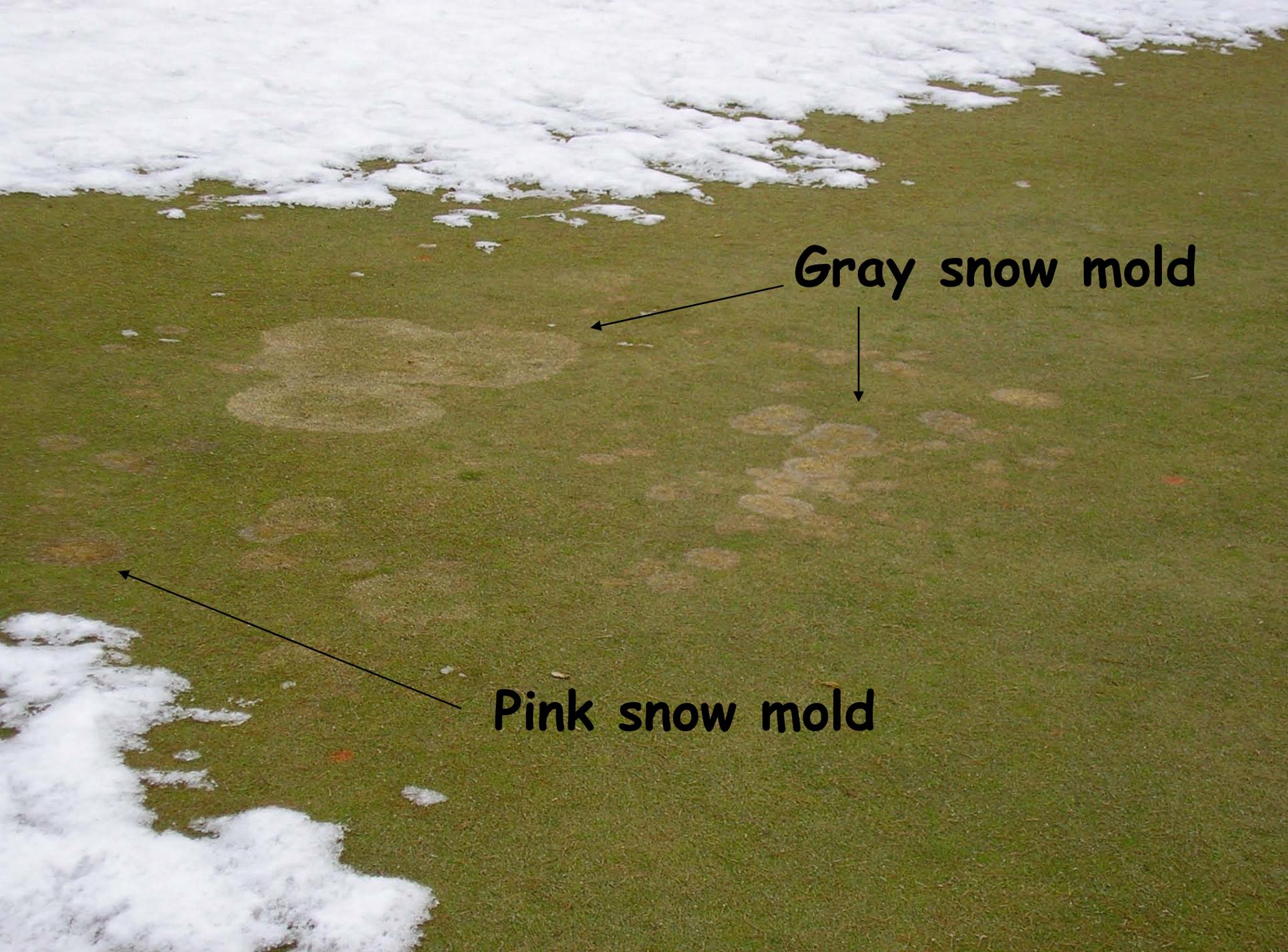
167 days snow cover

95 % *T. ishikariensis*

5 % *T. incarnata*

**CHECK**

**Typhula Blight = New Job**



**Gray snow mold**

**Pink snow mold**

# Disease Severity

Snow cover

Diseases

100 days

*Typhula ishikariensis*

60 days

*Typhula incarnata*

0 days

*Microdochium nivale*

- Cultural control
- Chemical control
- Biological control

# Cultural control

- Control thatch
  - Aerify/topdress
  - Verticut/topdress
- Avoid excess nitrogen late in the fall
- High K fertilizer in the fall (2-3 lbs/M)
- Mow as long as possible
- Surface drainage
- Clear debris
- Trim or remove trees
- Extreme case remove snow

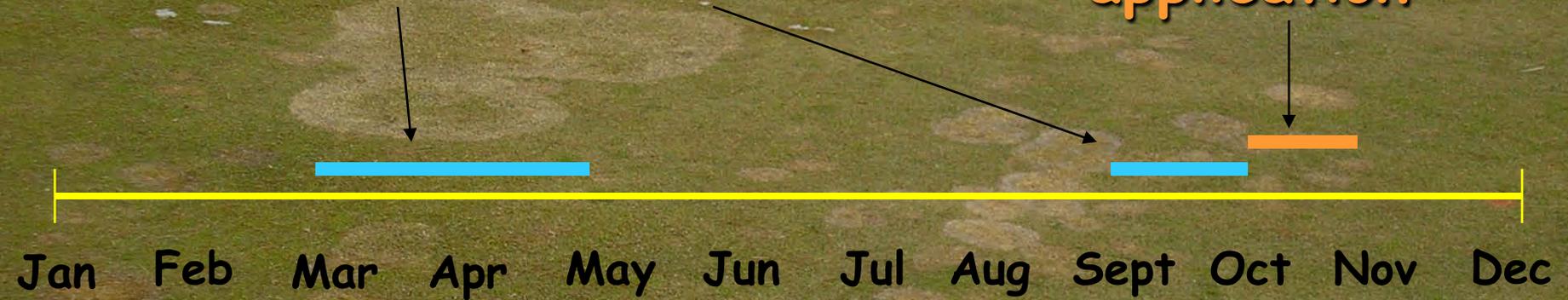
# Chemical Control

Late fall application of  
fungicides before  
permanent snow cover

# Fungicide Timing

■ Pink snow mold control

Trial fungicide application



# DMI Fungicides

- **Banner MAXX, Spectator Ultra**
  - Propiconazole
- **Trinity**
  - Triticonazole
- **Lynx**
  - Tebuconazole
- **Bayleton**
  - Triadimefon

# Strobilurin Fungicides

- **Heritage**
  - Azoxystrobin
- **Compass**
  - Trifluroxystrobin
- **Insignia**
  - Pyraclostrobin

# Fungicides

- **Daconil, Manicure**
  - Chlorothalonil
- **Medallion**
  - Fludioxonil
- **26GT, 18 Plus**
  - Iprodione
- **Cleary's 3336**
  - Thiophanate-methyl
- **Terraclor, Turfcide 400, Revere 4000**
  - PCNB, Quintozene

# Single formulations with 2 to 3 fungicides

- **Instrata** (Propiconazole + Fludioxonil + Chlorothalonil)
- **Headway** (Propiconazole + Azoxystrobin)
- **Concert** (Propiconazole + Chlorothalonil)
- **Tartan** (Trifloxystrobin + Triadimefon + StressGard)
- **TBZ + TFS Green** (Trifloxystrobin + Tebuconazole + StressGard)
- **Reserve** (Tebuconazole + Chlorothalonil + StressGard)
- **Spectro 90** (Chlorothalonil + thiophanate-methyl)

McCall, ID 2006-07  
 150 days snow cover  
 25% Gray and 75% Pink

Disease  
 Rate (% area  
 infected) Turf  
 quality

Treatment

Treatment	Rate (prod/M)	Disease (% area infected)	Turf quality
Instrata 3.61SE	11 fl oz	0.0 a	5.3 a
Instrata 3.61SE	9 fl oz	0.3 a	5.0 ab
Banner MAXX (Propiconazole) + Turficide 400 (40% PCNB)	2 fl oz 6 fl oz	4.3 a	4.3 abc
Turficide 400 (40% PCNB)	12 fl oz	4.3 a	3.3 c
Instrata 3.61SE	5 fl oz	8.3 a	4.0 abc
Banner MAXX (Propiconazole) + Medallion 50WP (Fludioxonil)	4 fl oz 0.33 oz	13.0 a	3.7 bc
CHECK	0	87.3 b	1.0 d

Instrata 9.3 fl oz

Instrata 11 fl oz

Instrata 6 fl oz

CHECK

165 days  
snow cover

25% Gray  
75% Pink

Rated: 5/4/06

# Pullman 2006-07 (Pink Snow Mold)

Treatment	Rate (oz or fl oz) prod/M)	Disease (% area infected)	Turf quality**
Tartan (Trifloxystrobin + Triadimefon + SG) + Chipco 26GT (Iprodione)	2 fl oz 4 fl oz	0.0 a*	5.0 a
Compass 50WG (Trifloxystrobin) + Chipco 26GT (Iprodione)	0.25 oz 4 fl oz	0.0 a	4.0 b
TBZ + TFS Green (Trifloxystrobin + Tebuconazole+ SG)+ Chipco 26GT (Iprodione)	2 fl oz 4 fl oz	0.3 a	5.0 a
TBZ + TFS Green (Trifloxystrobin + Tebuconazole + SG)+ Daconil Ultrex 82.5WDG (Chlorothalonil)	2 fl oz 5 oz	0.3 a	5.0 a
Tartan (Trifloxystrobin + Triadimefon + SG) + Terraclor 75WP (PCNB)	2 fl oz 4 oz	0.3 a	4.7 ab
Instrata 3.61SE (Propiconazole + Fludioxonil + Daconil)	9 fl oz	0.3 a	3.0 c
Tartan (Trifloxystrobin + Triadimefon + SG)	2 fl oz	0.7 a	5.3 a
TBZ + TFS Green (Trifloxystrobin + Tebuconazole + SG)	2 fl oz	0.7 a	5.0 a
CHECK	0	18.0 b	2.7 c

**Pink Snow Mold Control with Products from Bayer 2006-07.  
WSU TARC. Pullman, WA.**

**<50 days snow cover  
100% Pink SM**

**Instrata 9 fl oz**

**CHECK**

**Compass 0.25 oz +  
26GT 4 fl oz**

**TBZ + TFS Green w/StressGard 2 fl oz**

# McCall 2006-07

25% Gray and 75% Pink Snow  
Mold

150 days snow cover

Treatment	Rate prod/M)	App. date	Disease (% area infected)	Turf quality
Insignia 20WG + Manicure Ultra + Revere 4000	0.7 oz 5.0 oz 8.0 fl oz	early late late	0.0 a	5.3 bc
Insignia 20WG + 18 PLUS + Manicure Ultra	0.7 oz 4.0 fl oz 5.0 oz	early late late	0.3 a	7.0 a
18 PLUS + Manicure Ultra + Revere 4000	4.0 fl oz 5.0 oz 8.0 fl oz	late late late	1.0 a	5.7 b
Spectator Ultra + Insignia 20WG + Manicure Ultra	4.0 fl oz 0.7 oz 5.0 oz	early early late	2.0 a	6.3 ab
FFII 14-3-3 (PCNB) Granular + Fungicide V (Chloroneb) Granular	6.36 lbs 5.95 lbs	late late	14.7 c	4.0 d
CHECK	0.0		73.3 d	1.0 e

165 days

LESCO 2005-06. City of McCall Golf Course. McCall, ID.

snow cover

25% Gray

75% Pink

CHECK

Par-Flo 12 fl oz (late)

Insignia 0.7 oz (early) +  
18 Plus 4 fl oz (late) +  
Manicure Ultra 5 oz (late)

18 Plus 4 fl oz (early) +  
Manicure Ultra 5 oz (early) +  
Revere 4000 8 fl oz (late)

# BioControl

- *Typhula phacorrhiza*
  - Antagonistic to *T. incarnata* and *T. ishikariensis*
- *Pseudomonas aureofaciens* (Tx-1)
  - Pink snow mold suppression
  - Applied daily in summer
- *Trichoderma atroviride* (Plant Helper)
  - Parasitize gray snow mold sclerotia
  - Summer apply
- Seed meal
  - Mustard, radish, and rapeseed
- Earth Worm castings (Black Gold)
  - May suppress *Microdochium nivale*

# Whitefish Lake Golf Course

4/10/02

Check

Plant Helper (Fungus Helper?)

FFII w/14-3-3  
(2x rate)

# Summary

- PCNB?
- Cultural methods to minimize impact
- Instrata at 9 to 11 fl oz with >60 days snow cover. Pink only 5 to 7 fl oz.
- StressGard in Tartan and TBZ + TFS Green increases turf quality. Use with Daconil with >60 days snow cover.
- Insignia + 26GT + Manicure Ultra very good control and turf quality with >60 days snow cover without a DMI fungicide
- Minimize resistance rotate your fungicides (especially strobilurins)
- Biocontrol agents: some degree of suppression

# WSU Disclaimer

“Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. **It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.**”

A photograph of a golf course in a winter or early spring setting. The grass is green but has patches of snow scattered across it, particularly in the foreground and middle ground. In the background, there is a dense forest of tall evergreen trees. The overall scene is a mix of green, white, and dark green.

Questions?