A New Effective Option for Moss Control
MAKE THE CHANGE TO A SAFER MORE EFFECTIVE MOSS KILLER
Your customers will appreciate the quick visible results, environmental safety, and fresh citrus scent.
MOSS MELT
CONCENTRATE

Multi Site Use

OMRI LISTED
For Organic Use
Fast Acting / Effective Moss & Algae Control

- Low Dose Technology
- Multi Site Use
- Non Staining / Non Corrosive Formulation
- Superior Worker & Environmental Safety
- NOP Organic Listed – OMRI listed
- Fresh Citrus Smell
Visual results with in 1-3 days

- Moss in grass typically will turn white
- Roof and hard surface moss will turn yellow to dark orange/brown

Benefit

- Customers see results quickly
- Less wait time to remove dead moss
What is Moss Melt?

Active Ingredient

- 70% d-limonene formulated as an emulsion to reduce volatilization and increase wet time

Mode of Action

- D-limonene is a natural degreaser that dissolves the protective coating (cuticle) of moss and algae
  - Leading to quick desiccation and death of treated moss & algae.
- Herbicide selectivity – 2% concentration kills moss & algae but does not affect turf or plants
Product Overview

- An ‘EC’: emulsifiable, concentrated liquid
- List 4, organic ingredients, NOP compliant
  - Formulation contains surfactants, plant extracts and inerts critical to efficacy
- CAUTION Signal Word
  - Moderate eye irritation

Pack Size
- 1 Gallon & 2.5 Gallon jugs
- 55 Gallon Drums – Special Order
Product Overview

- Limonene occurs naturally in citrus and certain fruits, and is used in soaps, foods and perfumes
- A natural industrial degreasing agent
  - which removes / dissolves the waxy cuticle found on all plants, causing them to desiccate and die
- Knockdown activity - fast wilting or necrosis of moss
Low Dose Technology

- Moss Melt is effective at a 2% spray solution concentration – 2.56 ounces per gallon of water
- One gallon of Moss Melt will treat up to 12,500 sq. ft.
- Typical application rate is 3-4 gallons of spray solution/1000 ft²

Benefits
- Less material handling
- Reduced pesticide use
- Reduced environmental impact
Labelled Use Sites:

Hard Surfaces and Roof Care

- Roofs, Driveways, Fences, Decks, Siding, Steps, Patios,
- Other Outdoor Surfaces constructed of Composition Shingles, Wood, Asphalt, Concrete, Brick, Tile, Stone and Plastic Resins
Labelled Use Sites

Hard Surfaces and Roof Care

- non-staining formula, does not stain concrete, brick, pavement, stucco or wood
- Will not damage: gutters, metal flashing or downspouts
- Safe to landscape plants when used at 2% concentration
- Reduced concern for gutter spout run off & off target mist
- Avoid treating newly painted surfaces
Labelled Use Sites

Lawns and Turf

- Field tested safe on ryegrass & bentgrass
- Non-staining, ideal for lawn use along sidewalks, patio etc. where iron products can stain
- Ideal for organic landscape, or customers concerned about pet or children exposure
Labelled Use Sites

Borders and Landscape Areas

- Spray beneath and around base of plant material
- Not labeled for over the top applications
- Safe around landscape plants when used at 2% concentration
Worker Safety

- Moss Melt Carries the lowest signal word “Caution”
  - The concentrate can cause moderate eye irritation

- Protective Equipment
  - Long sleeved shirt and pants, shoes plus socks, protective eyewear.

- Re-entry safe when spray solution is dry
Environmental Safety

- Moss Melt is NOP organic listed & OMRI listed
- USDA classifies limonene as GRAS (Generally Recognized As Safe), essentially no measurable toxicity
- Has very low to minimal environmental impacts
- Dissipates shortly after application through volatilization and biodegradation –ZERO RESIDUE PRODUCT
- Reduced concern for run off into sensitive areas
# Environmental Safety

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<th>Human Toxicity</th>
<th>Other Mammals</th>
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<th>Bee Toxicity</th>
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Ideal For Cool Cloudy Conditions

- Moss Melt provides an option to treat moss under cool and cloudy conditions resulting quick visual results
- Moss control can be obtained in 40 degree temperatures under cloudy conditions.
- This allows treatment at the optimal time when moss is moist and actively growing
- Competing acid based or soap based organic herbicides require warm temperatures and/or direct sunlight for effective control.
Basic Moss Biology

- Most mosses are bryophytes, not a vascular plant and they have no roots.
- Because mosses do not have roots, they can't take up water from soil as many other plants do.
- This means that they need flowing or falling water in order to thrive.
Basic Moss Biology

- Some mosses are able to take up nutrients from water flowing over them, thus they have very effective absorptive surfaces.
- Their leaves are mostly one cell thick, they have no true roots, stems, flowers, or fruit, and instead of seeds they have spores.
Basic Moss Biology
Effective Moss Herbicides

- Since moss grows without xylem or phloem, they have no means to translocate foliar-absorbed nutrients or pesticides.
- Contact herbicides are most effective and the spray solution must come in contact with most of the living tissues to effectively kill moss.
Effective Moss Herbicides

- Moss Melt dissolves the protective coating eliminating the moss’s ability to hold moisture.
- The treated moss will not be able to recover from a treatment.
Why Control Moss?

- Hardsurfaces
  - Can be a slip hazard
  - Over time the moss contributes to the breakdown of cement, stone and other surfaces
Why Control Moss?

- Roofs
  - Reduces water flow and increases debris accumulation
  - Over time the moss contributes to the breakdown of roofing materials reducing their life
Why Control Moss?

- Lawns / Turf Areas
  - Unsightly and leads to thinning of stand
  - Difficult to re-seed or establish grass in mossy areas
What Damage Does Moss Do?

Contrary to popular belief, moss does not directly destroy hardsurfaces or roofs.

It is the persistent accumulation of moisture that causes the problem.

• The pH of the water leads to mineralization

The rhizods however, can penetrate cracks or go beneath roof shingles and expand with moisture & freezing
How Long Does Moss Melt Keep the Away?

Moss Melt has no residual activity, it kills the active moss and spores and is gone fairly quickly. The moss will die and become black and can easily be removed within 1-2 weeks. If the moss carcass’s are not removed they will continue to be a site for moisture and nutrient accumulation leading to a return infestation.

** Our experience is a treatment will eliminate moss for 6-9 months depending on the time of year of the treatment.
Liverwort
Liverwort

• The general features of the liverwort life cycle are the same as in mosses.

• They are a division of non-vascular bryophyte land plants commonly referred to as hepatics.

• Moss Melt is effective on Liverwort – but it can require a 3-4% concentration of spray solution.
Application Tips

❖ Application Methods
  ❖ Most backpack or tank sprayers (use high volume spray tip)
  ❖ Watering Can, Hose End Sprayers Etc.

❖ Concentration is key
  ❖ 2% concentration will kill the moss an algae, for thicker moss use more spray solution
  ❖ Higher concentrations wont necessary work better or faster and can injury grass and plants (10% ++ concentrations)
Coverage is Essential

- This is a contact Herbicide - only contacted areas will be affected
- Use spray equipment, ground speed and nozzles for optimal/complete coverage

Moss Conditions

- Spray moss that are actively growing & not drought stressed

Spray Conditions

- Wet Time is Key to dissolving the moss cuticle / make applications during cooler time of the day to allow a slower drying time.
**Application Tips**

Rate – 2.56 oz / gallon of water (2% spray solution)

Water Volume – 3-4 gallons of spray solution / 1000 ft²

Coverage –

- Lawn & Turf thoroughly coat moss with spray solution
- Dense Moss – ensure entire moss clump gets soaked

**Application Timing**

- Apply to moist actively growing moss
- Avoid applications when moss is water soaked
- Allow heavy dew to dissipate, do not apply shortly after a rain shower

**Temperature Range**

- When daytime temperature are between 40 & 75 F
- Rain Fast – Moss Melt is rain fast with in 1 hour of application
Application Tip: **Wet Moss**

Moist to wet moss is the best treatment condition.

– The cuticle is typically thin
– The moss is taking in free moisture.

Water logged moss or application during rain may take slightly high volumes of spray solution.
Treatment Site & Spray Volume

Turf & Lawn Areas:

Spindly loose growing moss in lawns can require lower spray volumes.

– 2 gallons spray solution / 1000.

Dense clumps of moss in lawns will require the standard 3-4 gallons of spray solution.
Moss Melt Concentrate

Treatment Site & Spray Volume

Dense Moss vs Spindly Moss
Application Tip: **Dormant Moss**

You Can’t Kill Dormant Moss!

*Applications to dormant moss are ineffective!*

During hot dry periods, moss will go dormant, it dries down and is no longer active. When in this state it is pretty much impervious to chemicals.
Silver Thread Moss

Golf Course Greens

Testing & commercial use this season showed the best results were with 2% spray solution applied @ 1.5 – 2 gallons / 1000.

Slight tip burning was observed

** Very cost effective at this lower use rate!**
MOSS MELT
CONCENTRATE

2% Spray Solution Before & 3 DAT
MOSS MELT CONCENTRATE

2% Spray Solution Before & 3 DAT
MOSS MELT
CONCENTRATE

2% Spray Solution Before & 3 DAT
Application Tip: Backpack Sprayers

USE THE CORRECT SPRAY TIP!

High volume, larger droplet size work best, 8008, 8010, 8011 are good tip sizes to use

**Standard spray nozzles will work but, most are low spray volume and increase application time.**
Application Tip: **Hose End Sprayers**

Treatment Site: Best for roof & hard surfaces

– For roof treatments allows treatment from the gutter level

– Hard surface treatments ensures good spray solution volume

**Most of the hose end sprayers I have tested are not highly accurate in mixing the correct ratio.**
Application Tip: Hose End Sprayers
Application Tip: Tank Sprayers
Treatment Site: Ideal for all surfaces

High volume & adjustable spray pattern, make this ideal for all treatment sites.
Application Tips

- **Hard Surfaces**
  - Use a directed spray method when bands of Moss are growing between pavers
  - Lower spray tip to increase penetration of thicker moss
  - Ensure thorough wetting of treated moss

- **Landscape Areas**
  - Use directed spray method, do not spray over plant material

- **Turf**
  - Typically this moss will grow more loosely and lower spray volumes can be used.
Tank Mixing

- Hard Surfaces & Landscape Areas
  - Compatible with most herbicides, and soil applied insecticides
    - If unsure jar test for compatibility
  - May not fit based on spray solution rate per 1000 or concentration of herbicide
- Lawns & Turf
  - Use caution with herbicides as Moss Melt can act as a surfactant / penetrant possibly reducing selectivity or increasing grass damage
IMPORTANT MIXING INSTRUCTIONS

- This is an EC formulation, the entire tank load must be mixed well to ensure a complete emulsion is created.
- Fill tank or back pack ½ full and begin to add Moss Melt while agitating
  - Backpack sprayers stir vigorously or use a jet stream while filling.
- Once sprayer load is emulsified the product will remain stable
IMPORTANT MIXING INSTRUCTIONS

- If the spray solution is not properly mixed there can be a separation in the tank, where the d-limonene is at the top and the surfactants are lower.

- This will lead to poor erratic performance and allow the active ingredient to volatilize before it can melt the cuticle.
Spray Solution Volume

Large Treatment Areas: Roofs, Pavement

- Tank sprayers or hose end sprayers may be best.
  - It can be difficult to get 3.5 – 4 gallons per / 1000 sq. ft. using a backpack on dense moss.
  - If using a back pack use a higher volume bigger droplet nozzle to ensure good penetration of dense moss.
Trouble Shooting

With proper application moss should be visibly dead with in 2-3 days

If the moss appears to be unaffected review

– Was proper agitation was used
– Was there heavy rain during or at the end of treatment
– Was the moss water logged at the time of treatment
– Was the moss dormant or drought stressed during treatment
Trouble Shooting

Dense moss appears to be dead around the edges but the centers are still green
– Not enough water volume was used for the application

Treatment area looks blotchy
– Check spray pattern and water volume over entire treated area.
– Was treatment applied during temperatures over 75 degrees
Common Questions

How long will the material be around?
- Typically the d-limonene will volatilize away within 1-2 hours

Will treated surfaces be slippery?
- When applied at the 2% rate, treated areas are not slippery

Should I use a heavier concentration for thick moss?
- No, a 2% concentration is all you need; just increase the spray solution volume on the treated area.

Will Moss Melt remove black algae staining?
- It will kill the algae but not sure if it will remove the stain
Common Questions
Because it is organic does work as well as non organic / conventional products?
- It works as well or better in most applications
Does being organic make it more expensive than other products?
- No- because the use rate is so low it is very comparable or less expensive than conventional products.
Is there risk of residue remaining or moving offsite ?
- Very little – Moss Melt is a zero residue product, and the active ingredient volatilizes away with in 1-2 hours.
Common Moss Control Herbicides

Iron
- Use in lawns & landscape
- Turns moss black
- Mode of action, chemical toxicity
- Issues, staining / odor / soil build up

Zinc
- Use on hard surfaces & roofs
- Need rain or moisture to activate
- Mode of action, Chemical toxicity
- Issues, worker safety, aquatic & ecotoxin, environmental build up
Cost Effective

- Hard Surfaces and Roof Care
  - Lowest use rate per 1000/sq. ft. of EPA registered moss herbicides
  - Lowest cost / 1000/sq. ft.

- Lawns and Turf - Borders and Landscape Areas
  - Lowest use rate per 1000/sq. ft. of EPA registered moss herbicides
  - Slightly higher cost than fertilizer grade iron sulfate
Moss Melt Coverage Area Comparison

1 Gallon of Moss Melt treats 12,560 square feet

To treat the same area you would need
- 75 pounds of Zinc Sulfate
- 50 pounds of Iron Sulfate
- 5-8.8 gallons of Quik-Fire

The Benefit
- Reduced Material Handling
- Decreased residual entering the environment
# Comparison Of Liquid Moss Products

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Brand</th>
<th>Concentration</th>
<th>Oz / gallon / Dilute</th>
<th>Dilution</th>
<th>Treatment Area</th>
<th>Spray Solution Gallons / 1000</th>
<th>OZ /1000</th>
<th>Cost / Gal</th>
<th>Cost / 1000</th>
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<tbody>
<tr>
<td>d-limonene</td>
<td>Moss Melt Concentrate</td>
<td>70%</td>
<td>2.56</td>
<td>2%</td>
<td>1,000</td>
<td>3.83</td>
<td>9.8</td>
<td>$95.00</td>
<td>$ 7.28</td>
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<td>d-limonene (Lawn Treatments)</td>
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<td>91</td>
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## Comparison Of Granular Moss Products

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Treatment Opportunities

- Hard surfaces adjoining lawns
  - Reduce staining potential of hard surfaces by applying Moss Melt along these hard surfaces

- Driveways / Sidewalks / Curbs
  - Eliminates moss with a single application, moss carcass’s will die and eventually weather away or can be brushed away later
  - Reduces concerns over entry into drainages

- Siding
  - Safely eliminates green algae on building siding

- Organic Customers
  - Entire yard moss control
Summary:

– Effective Moss & Algae Control
– Cost Effective Enough to Use on All Treatment Areas
– Lower Worker Safety Risk / Reducing Concerns About Applicator Exposure
– Excellent Environmental Safety
QUESTIONS?
Moss Melt Concentrate

2008 Moss Trials

December 8, 2008
2 sets of trials were conducted by UM:

1. **Trial #1**: Comparative trials between Moss Melt applied by **backpack** and **hose-sprayers** (July, 2008) compared to WF Moss & Algae and Lilly Miller Moss-Out. Trials were at two (2) different locations.

2. **Trial #2**: Greenhouse trial comparing Moss Melt (Oct, 2008)

Products & Rates Applied:

1. **Moss Melt** (70% d-limonene) –
   - 10.51 fl oz/1000 ft²
2. **Worry Free Moss & Algae** (15% sodium lauryl sulfate & 6% citric Acid) –
   - 32 fl oz/1000 ft²
3. **Lilly Miller Moss-Out** (9.75% ferric sulfate) –
   - 64 fl oz/1000 ft²
4. **Spray Solution on backpack trials** – 2.3 gal/1000 ft²
Bentgrass: Backpack Spray – Day 7
University of Massachusetts, Amherst Resident - July, 2008

Dr. Prasanta Bhowmik, Dept. of Plant, Soil, and Insect Sciences

2.29 gal/1000 spray solution TeeJet 1104 VS
Bentgrass: Garden Hose End – Day 23
University of Massachusetts, Amherst Resident - July, 2008

Ratings are from 0 to 100: 0 = no effect, 100 = total effect
Bentgrass: Garden Hose End – Day 7
University of Massachusetts, Amherst Resident - July, 2008

Moss Melt
LM Worry Free
LM Moss Out

Ratings are from 0 to 100: 0 = no effect, 100 = total effect
Ratings are from 0 to 100: 0 = no effect, 100 = total effect

2.29 gal/1000 spray solution
TeeJet 1104 VS
University of Massachusetts (UM) Trials
Trial #2
Greenhouse Trials - Moss Control

- Greenhouse trials were set up to determine why there were such difference between Moss Melt in the outdoor trials.
- The highest dose tested is equivalent to the 1X label rate
- No real differences were observed in the greenhouse trials
Moss Control: Greenhouse Trial
University of Massachusetts - October, 2008

Dr. Prasanta Bhowmik, Dept. of Plant, Soil, and Insect Sciences.
Note: 5% represents 1X dose rate.
The Moss Melt

Lilly Miller is the industry standard in terms of moss control and safety to turf.

Garden Safe was typically efficacious, but quite phytotoxic to grass.

Worry Free Moss & Algae caused the least injury to grass but often had little effect on moss.

In the cooler and higher temperatures of the PNW, Moss Melt was equivalent to LM Moss-Out in regards to turf safety. In the Northeast, Moss Melt sometimes caused some injury to turf.

Regarding moss control, Moss Melt was often statistically equivalent to LM Moss-Out, but numerically less than Moss-Out.
Oregon State University (OSU) Trials
Moss Control & Turf Phytotoxicity
by Dr. Tom Cook and Brian McDonald

- 3 sets of trials were conducted by OSU:
  1. Trial #1: Rate trials for Moss Control and Phytoxicity with Moss Melt formulation – all applied by backpack sprays (Feb, 2008)
  2. Trial #2: Comparative trials between Moss Melt applied by backpack and hose-sprayers (May, 2008)

- Response by the moss was fairly quick (< week):
  - Data presented in slides will be evaluations at 2 weeks after treatment

- Any turf injury showed up almost within 3 to 4 days:
  - Data in following slides will be evaluations at 1 week treatment

- Standards in all trials were:
  1. Worry Moss & Algae (15% sodium lauryl sulfate & 6% citric Acid)
  2. Garden Safe Moss & Algae (22% potassium soap of fatty acids)
  3. Lilly Miller Moss-Out (9.75% ferric sulfate)
Trial #1
Efficacy Rate Trial
Turf Injury Rate Trials
all applications by backpack sprayer (6 gallons/1000 sq.ft.) comparing Moss Melt to other consumer products

Initiated February, 2008
#1 Moss Control – Rate Trials (Backpack)
Oregon State University (OSU) Trials

14 Days After Treatment

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.
Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
#1 Turf Phytotoxicity – Bentgrass Injury (Backpack)
Oregon State University (OSU) Trials

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.
Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
#1 Turf Phytotoxicity – P. annua & P. Rye Injury (Backpack)

### Ratings Scale:
- 0 – 9 (1 = no effect; 9 = complete kill)

### Products Used:
- Moss Melt (1.83 oz/gal)
- Moss Melt (3.66 oz/gal)
- Moss Melt (5.49 oz/gal)
- WF Moss
- Garden Safe
- LM MossOut

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.

6 gal/1000 spray solution
TeeJet 80015 flat fan
Moss Control & Turf Phytotoxicity (Backpack)  
Trial #1 Conclusions

- **Moss Control - Rate (efficacy) trials:**
  - Highest dose of Moss Melt (2.74 oz/gal) becomes label rate
  - Comparative efficacy at label rate:
    - Lilly Miller Moss-Out = Garden Safe > Moss-1 > WF Moss & Algae
    - Moss Melt slightly less effective, but statistically similar to LM Moss-Out

- **Turf phytotoxicity trials:**
  - **Bentgrass:** Moss Melt label rate is safest, comparative phytotoxicity is:
    - Garden Safe >> WF Moss & Algae > Lilly Miller Moss-Out > Moss Melt
  - **Poa annua & Perennial Rye:** WF and LM no effect, but Moss Melt minimal damage
    - Garden Safe >> Moss-1 > WF Moss & Algae = Lilly Miller Moss-Out
Trial #2
Efficacy Rate Trial
Turf Injury Rate Trials
backpack and hose-end sprayer

Initiated May, 2008
#2 Moss Control – Efficacy Trials (Backpack)
Oregon State University (OSU) Trials

14 Days After Treatment

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.
Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
#2 Turf Phytotoxicity – P. rye, P. annua, P. trivialis, and bentgrass (Backpack)
Oregon State University (OSU) Trials

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.
Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
#2 Turf Phytotoxicity – P. rye, P. annua, P. trivialis, and bentgrass (Backpack)
Oregon State University (OSU) Trials

<table>
<thead>
<tr>
<th></th>
<th>Moss Melt</th>
<th>WF Moss</th>
<th>Garden Safe</th>
<th>LM MossOut</th>
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<td>2.5</td>
<td>3.0</td>
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Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.
Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
Trial #3
Turf Injury Rate Trials at High Temps
backpack sprayer
Moss Melt vs. Standards

Initiated August, 2008
#2 Turf Phytotoxicity – P. rye, P. annua, P. trivialis, and bentgrass (Backpack)

Oregon State University (OSU) Trials

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate.

Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
#2 Turf Phytotoxicity – P. rye, P. annua, P. trivialis, and bentgrass (Backpack)

Oregon State University (OSU) Trials

<table>
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<tr>
<th>Product</th>
<th>Application Rate</th>
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<tr>
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<tr>
<td>WF</td>
<td>1X</td>
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<tr>
<td>Garden Safe</td>
<td>1X</td>
</tr>
<tr>
<td>LM</td>
<td>1X</td>
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</tbody>
</table>

Note: WF Moss & Algae, Garden Safe and Lilly Miller Moss-Out applied at 1X label rate. Ratings scale: 0 – 9 (1 = no effect; 9 = complete kill)
All Applications went out at 1X and 2X label rate

Temperatures before and after spraying:
- 3 days before: 74, 72 and 79
- Day of treatment: 85
- 2 days after treatment: 83 and 88

No injury with Moss Melt or WF Moss & Algae

Garden Safe had considerable injury with the 1X and 2X rates

Lilly Miller Moss-Out had some injury with the 1X and 2X rates

** Late summer grasses have hardened off