ASIC 2016
SOUTHEAST REGIONAL CONFERENCE

March 10 – 11, 2016

Decatur, GA

ASIC 2016 REGIONAL CONFERENCES

Southeast, Southwest, Northeast, & California

American Society of Irrigation Consultants

Brent Mecham

Codes, Standards and Green Initiatives

Brent Mecham, CID, CLWM, CLIA, CIC, CAIS

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Market Transformation

Voluntary	Mandatory
BMPs	Ordinances
Standards	Codes
Green Initiatives	Executive Orders
Consumer Expectations	

Irrigation BMPs

- BMP & Practice Guidelines
- Design
- Installation
- Management
- Appendices
  - Inspection & Commissioning
  - Water Budgeting
  - Scheduling

IRRIGATION ASSOCIATION & AMERICAN SOCIETY OF IRRIGATION CONSULTANTS

Landscape Irrigation Best Management Practices

May 2014

Prepared by the Irrigation Association and American Society of Irrigation Consultants

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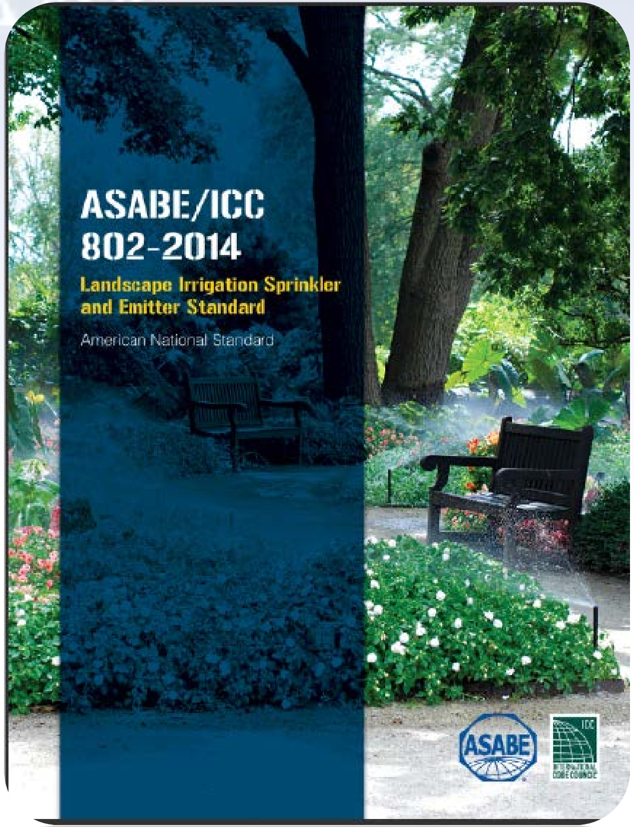
The Irrigation Association and the American Society of Irrigation Consultants have developed the *Landscape Irrigation Best Management Practices* for landscape and irrigation professionals and policy makers who must preserve and extend the water supply while protecting water quality. The BMPs will aid key stakeholders (policy makers, water purveyors, designers, installation and maintenance contractors, and consumers) to develop and implement appropriate codes and standards for effective water stewardship in the landscape.



Tests—Sprinklers & Bubblers

- Flow Rate
- Distance of Throw
- Distribution Uniformity
- Burst Pressure
- Check Valve
- Pressure Regulation

Tests—Emitters and Microsprays

- Uniformity of flow rate
- Flow rate as a function of pressure
- Emitter exponent for PC emission devices
- Check valve function

ANSI/ASABE S623
Determining Landscape Plant Water Demands

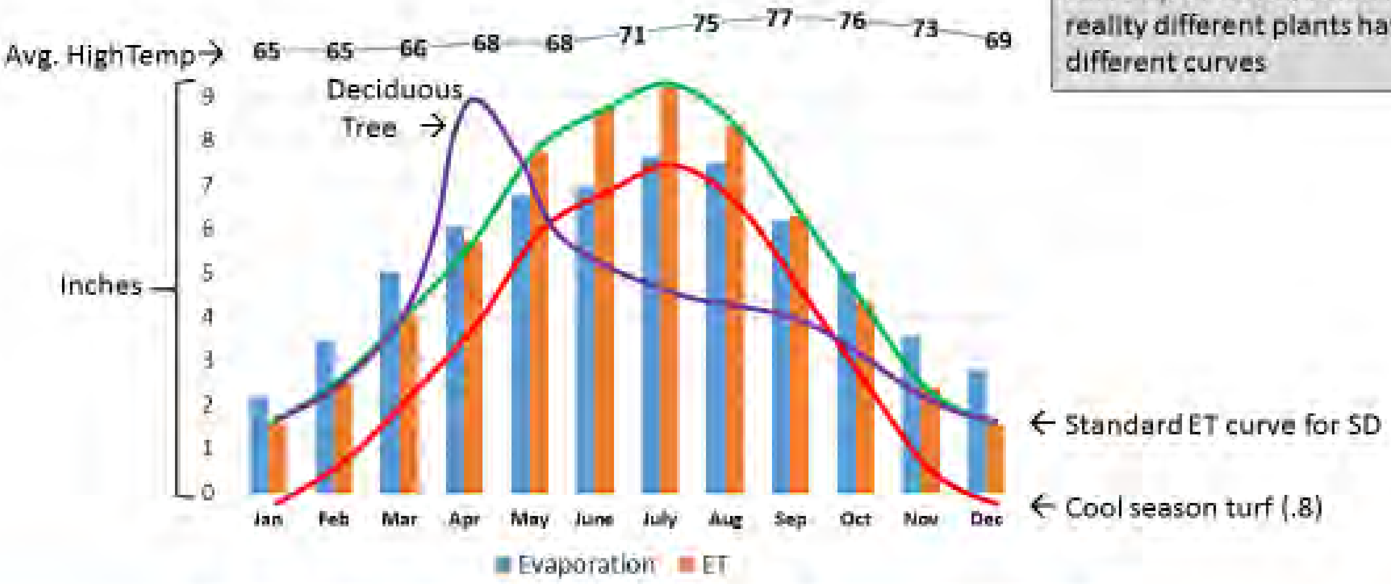
EPA WaterSense photo gallery

Annual Average Fraction of ET_o

Plant Type	Plant Factor
Turf – Cool Season	0.8
Turf – Warm Season	0.6
Annual Flowers	0.8
Woody plants, herbaceous perennials—Wet* (> 20 inches of precipitation)	0.7
Woody plants, herbaceous perennials—Dry*	0.5
Desert plants (< 10 inches of precipitation)	0.3

San Diego CA

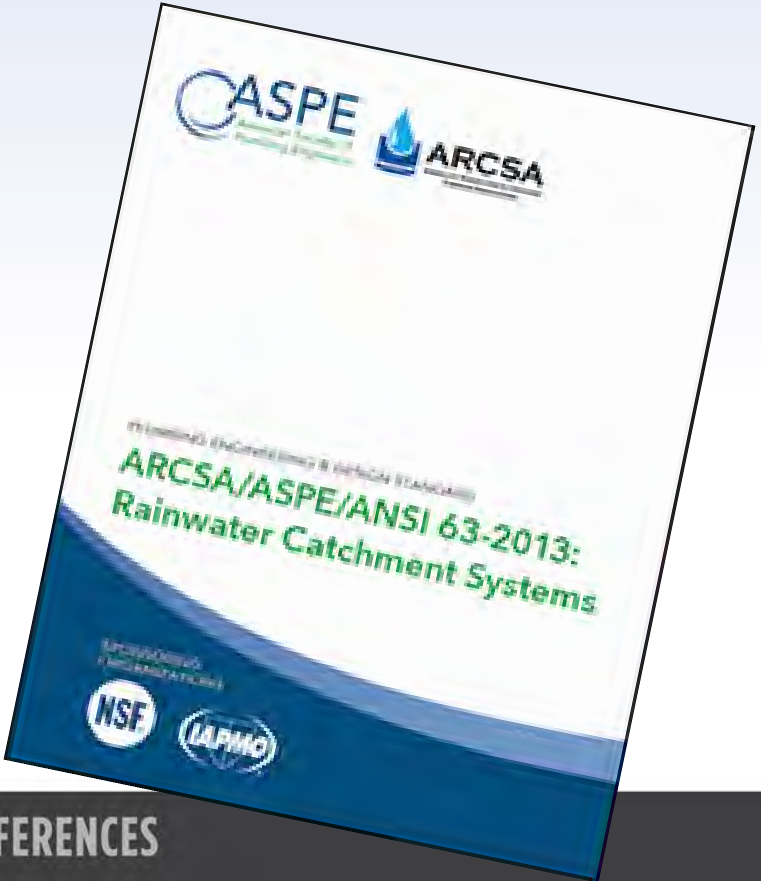
One challenge to using ET data is that a crop coefficient only moves the curve up or down, when in reality different plants have different curves



San Diego goes from 1.55 to 9.30 with only 12° of Temperature change.

ASIC

Other ANSI Standards



PINS—Professional Qualifications Standard for Rainwater Catchment System Designers

- IAPMO (ASSE Chapter) (ASSE International Chapter of IAPMO)
- This standard applies to any individual involved in the design, installation, maintenance, and inspection of rainwater catchment systems. The system catches rain water, which can be used for a variety of plumbing and/or irrigation applications. This standard identifies a minimum level of knowledge required to install, design, and inspect these systems. Project Need: There is not currently a standard that sets minimum training requirements for individuals who install, design, or inspect rainwater catchment systems. Stakeholders: Building owners, managers, plumbing professionals, engineers, inspectors, AHJs and the general public. MHI (Material Handling Industry)
- Marianne Waickman marianne.waickman@asse-plumbing.org Contact: Fax: E-mail: BSR/IAPMO 21000-201x,

Standards in Progress

- ASABE S626 20__ **Landscape Irrigation System Uniformity and Application Rate Testing**
- ASABE S627 20__ **Weather-based Landscape Irrigation Control Systems**
- Both are out for public comment to ASABE
- ASABE S633 draft **Soil Moisture Sensor for Landscape Irrigation** in beta testing

Market Trends

- Native-type landscapes that won't require irrigation.
- Minimal turf grass areas.
- No potable water for irrigation.

Codes

- Shift to write standards in mandatory language.
- Adopted by code setting bodies or rating systems
- ICC, IAPMO, CalGreen

ASHRAE 189.1—2014

- Standard for High-Performance Green Buildings
- Continuous maintenance next version 2017
- A number of proposed irrigation provisions

IgCC--2015

- Has numerous irrigation requirements
- ASHRAE 189.1 is alternate compliance path
- MOU between ICC-ASHARE-USGBC/LEED-AIA
- 2018 IgCC will use ASHRAE 189.1 as technical content and qualifies as LEED

IAPMO Green Technical Supplement

- 2015 version has a number of irrigation provisions.
- Becoming WEStand-2017 using water provisions.
- Additional / modified provisions for irrigation.

Green Building Initiative

- Green Globes
- 2010 ANSI Standard
- Rating System for “greenness”

National Green Building Standard

- 2015 version not yet released
- Rating system for residential properties
- EPA Water Budget Tool
  - Points for less turf
  - Follow BMP document
  - Mandatory irrigation plan by certified WS labeled program
  - WS labeled controllers
  - Pressure regulation
  - Maximum Precipitation Rate 1.20 in/h
  - Points for non potable water use

LEED v4

- Prerequisites:
  - Option 1 No irrigation
  - Option 2 Water Budget Tool, 30% reduction
- Credits
  - 50% reduction 1 point
  - 100% reduction 2 points
- Confusion about water, versus potable water
- Points for using onsite harvested water

Sustainable SITES v2

- Patterned after LEED
  - Use EPA Water budget tool with 50% reduction
  - Landscape that doesn't require permanent irrigation.
- Credits
  - Reduce demand by 75%   4 pts.
  - Significantly reduce (no potable water) 5 pts.
  - Eliminate long-term irrigation   6 pts.

Observation

- Efficiency = reduction or elimination
- Assumes no benefit comes from plants
  - LID
  - UHI effect
- Natives are superior
- No points for superior irrigation systems
- No follow up to the water budget

Strategy

- Use of BMP document
- IA has written a model landscape irrigation ordinance
  - Works with existing landscape ordinances
  - Modify for local circumstances
- Separate landscape issues from irrigation issues

Concern

- Lack of understanding that plants provide and create ecosystem services that gets more valuable with time.
- Benefits are enhanced with actively growing plants—they need water.
- Trade water for ______________________________

Discussion

- What key irrigation elements save water?

Kyley Dickson

What's New in Athletic Field Irrigation & Artificial Turf

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Importance

- 5.7% of high school football injuries were definitely related to field conditions, 15.2% were possibly related to field conditions

(Harper et al., 1984)

- 10% of lawsuits related to sports injuries claim that the athletic field was inadequately maintained

(Dougherty, 1988)

Importance

- Poor playing quality of athletic fields can negatively impact player performance and safety

(Cockerham et al., 1993)

Astrodome

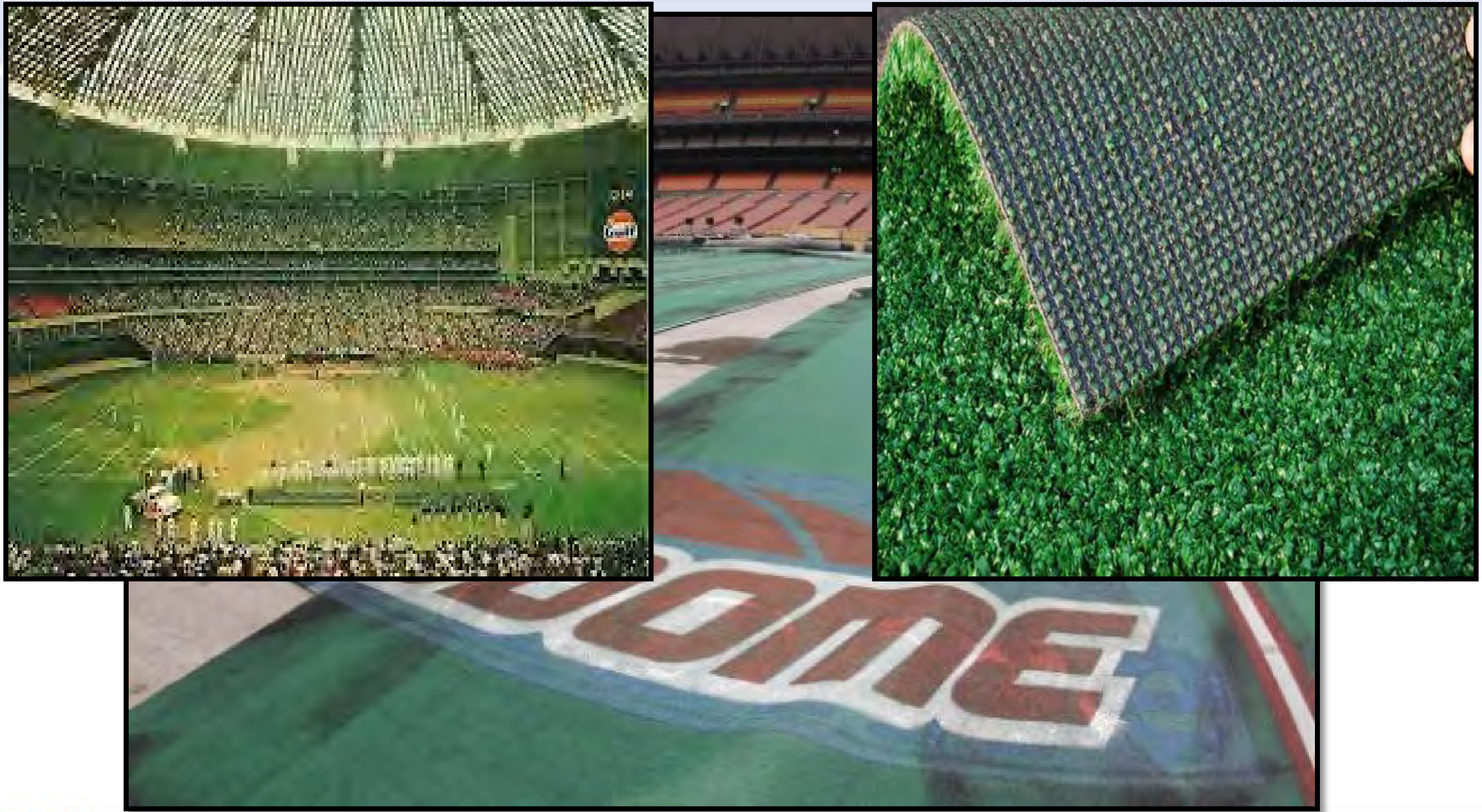
Astrodome - 1965

4/7/65 Astros owner Roy Hofheinz overlooks the Astrodome from his suite two days before it's opening. #Astrodome50

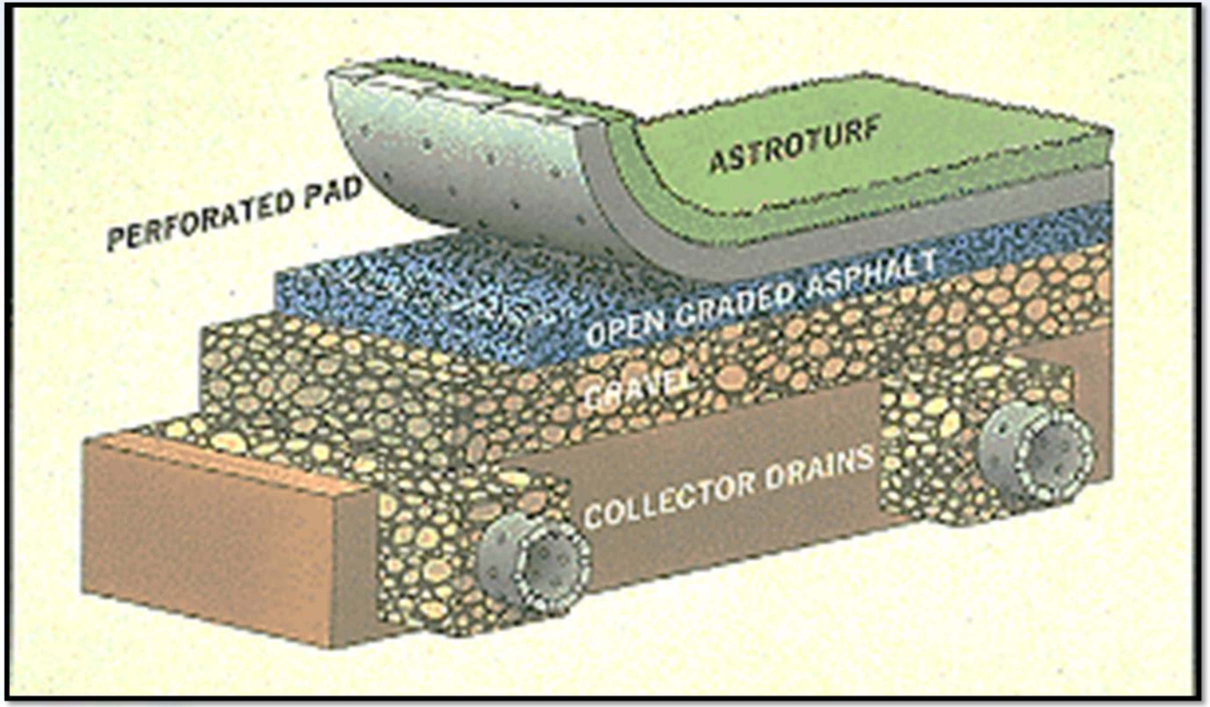
4/7/15, 4:55 PM

4/7/65 Blinding glare from the Astrodome's 4,596 skylights alarms the Astros during afternoon practice. #Astrodome50

4/7/15, 5:18 PM

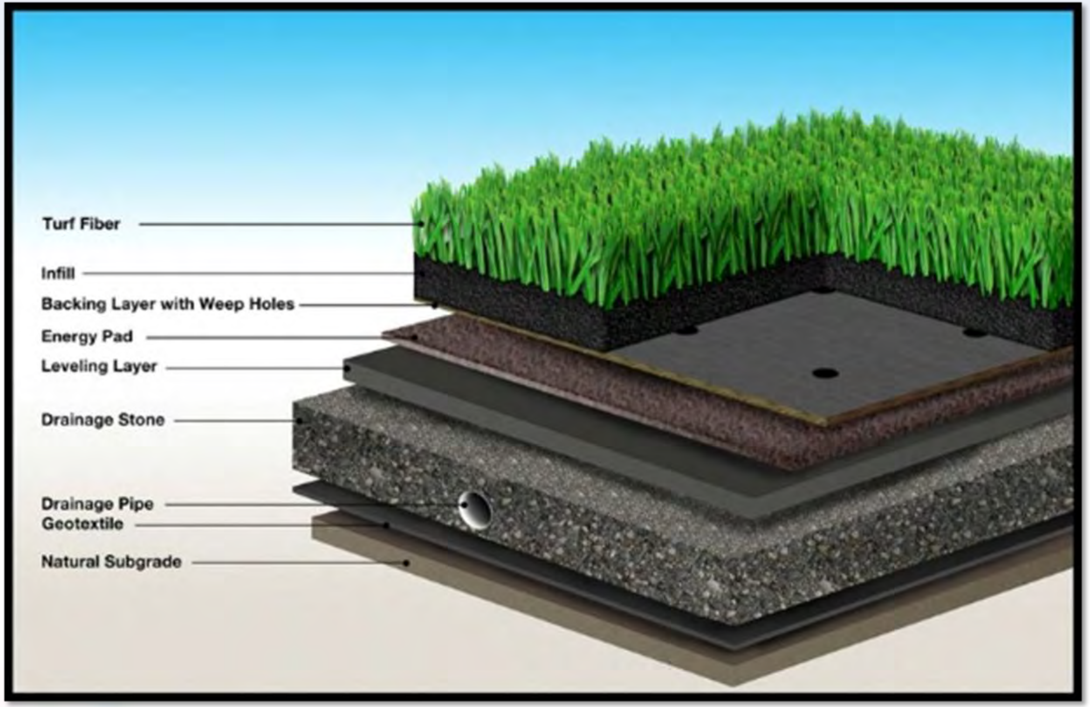


History and Development of Synthetic Turf
1st Generation



History and Development of Synthetic Turf
2nd Generation

History and Development of Synthetic Turf
3rd Generation

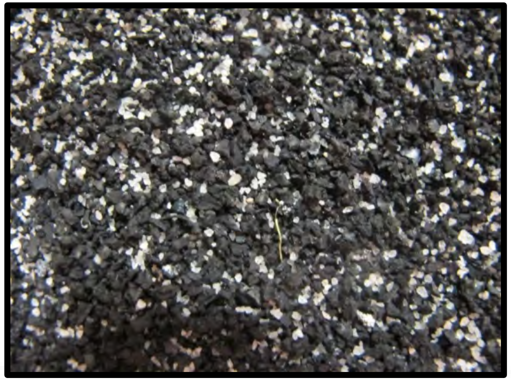


Components of Third-Generation Turf Backing and Pile Fibers

- Backing
  - Must provide drainage
  - Polyester or polypropylene
  - Woven or non-woven
  - Single or multilayered
  - Fibers tufted or glued
- Pile Fibers
  - Nylon, polypropylene, polyethylene
  - Slit-film or monofilament
  - Diamond or horseshoe shape

Components of Third-Generation Turf
Infill Materials

- 100% crumb rubber
- Crumb rubber/sand
- 25 to 45 mm depth
- Crumb rubber
  - Styrene-butadiene rubber
  - Ambient or cryogenic
- Alternatives
  - EPDM, TPE
  - Elastomer-coated sand
  - Polyurethane-coated SBR
  - Organic materials



Problems?

Surface Hardness

Temperature of Synthetic Turf

Player to Surface Interactions

Definitions

G-Max – Measures likelihood of head injury using a flat projectile

GMAX

- Measure of deceleration of missile striking the ground relative to the acceleration due to gravity

- Commonly used for road base preparation, to test lunar landing gear

F355 Synthetic Turf Surface Hardness Device

(ASTM 1936)

9.1 kg (20 lbs) flat missile
61 cm (24”) drop height
Flat surface on projectile

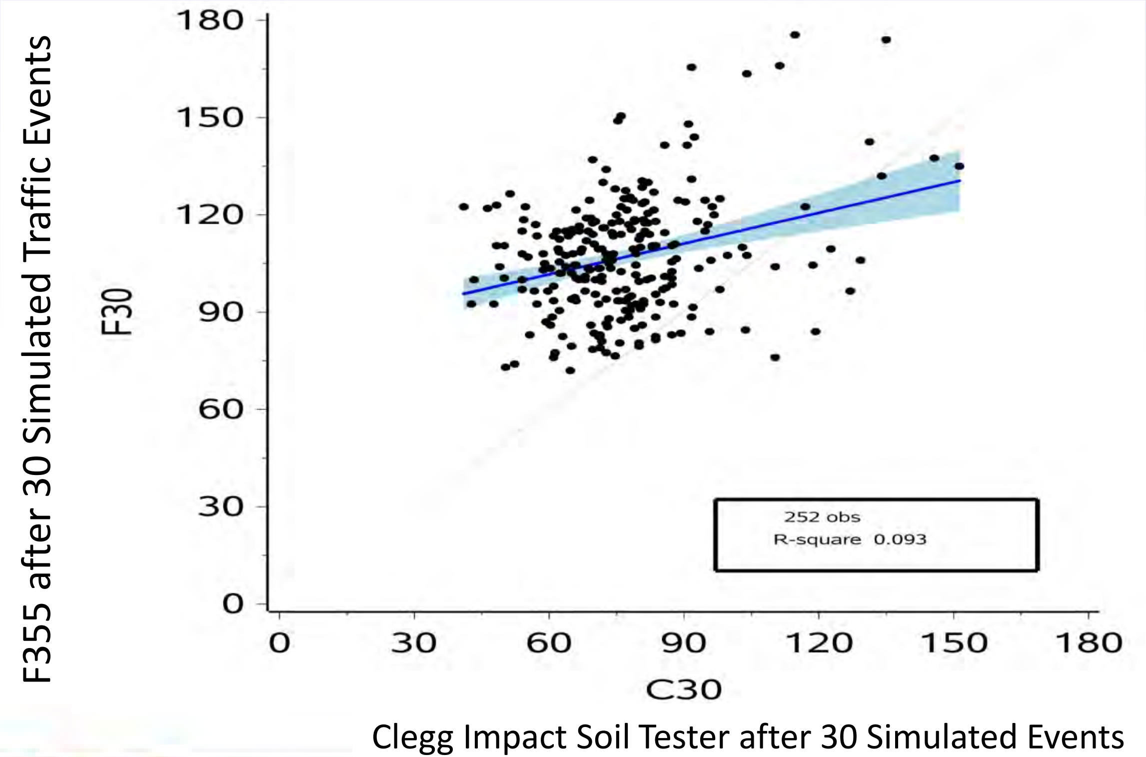
Used to measure high level body impacts

Clegg Surface Hardness

(ASTM F1702)

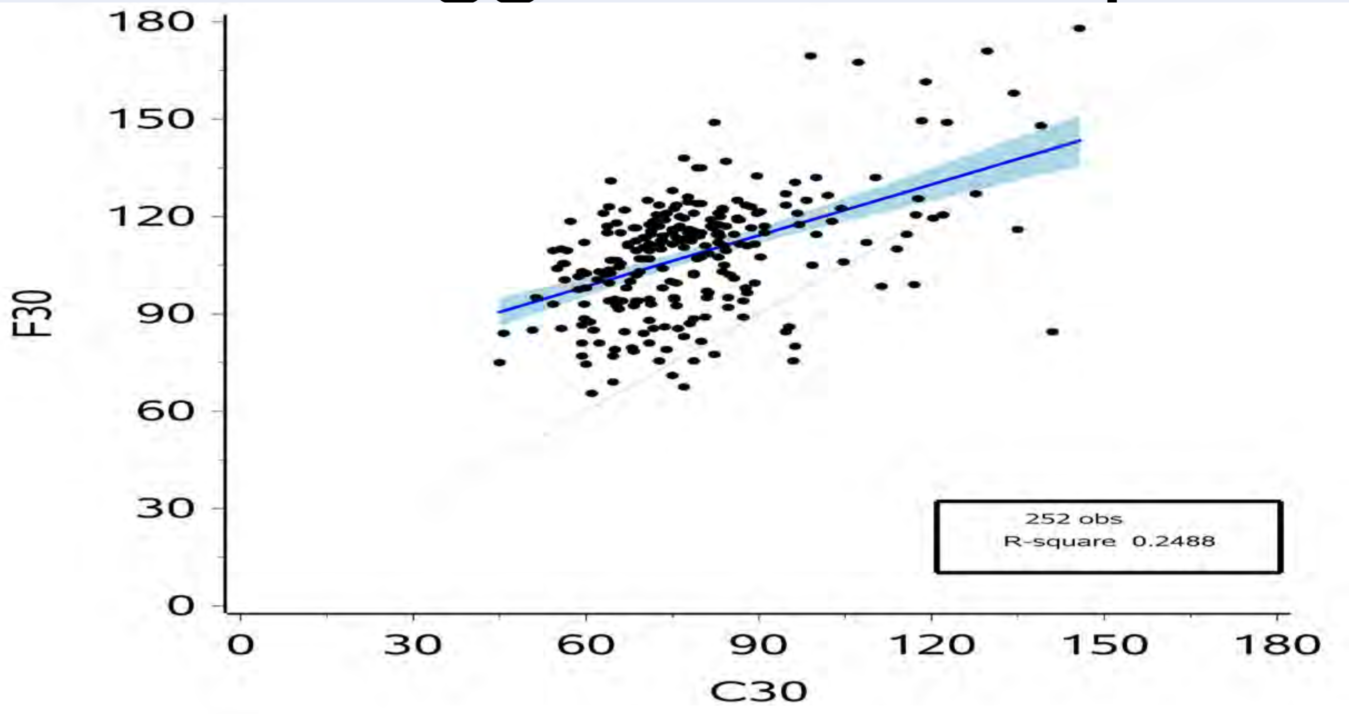
2.25 kg (5 lb) missile
45 cm (18”) drop height

F355 to Clegg Relationship 2012



F355 to Clegg Relationship 2013

F355 after 30 Simulated Traffic Events



Clegg Impact Soil Tester after 30 Simulated Events

Benchmarking Natural Grass Playing Surfaces for Safety Characteristics

Materials and Methods

<u>Surface Composition</u>

1. Kentucky bluegrass (cool-season) turfgrass
2. Bermudagrass (warm-season) turfgrass

<u>Surface Root Zone Construction</u>

1. ASTM Sand Specification
2. Silt Loam Native Soil
3. 6-inch Sand Cap system
4. USGA Sand Specification

Fig 1. F 355 Surface Hardness values for Root Zone Construction, 2012

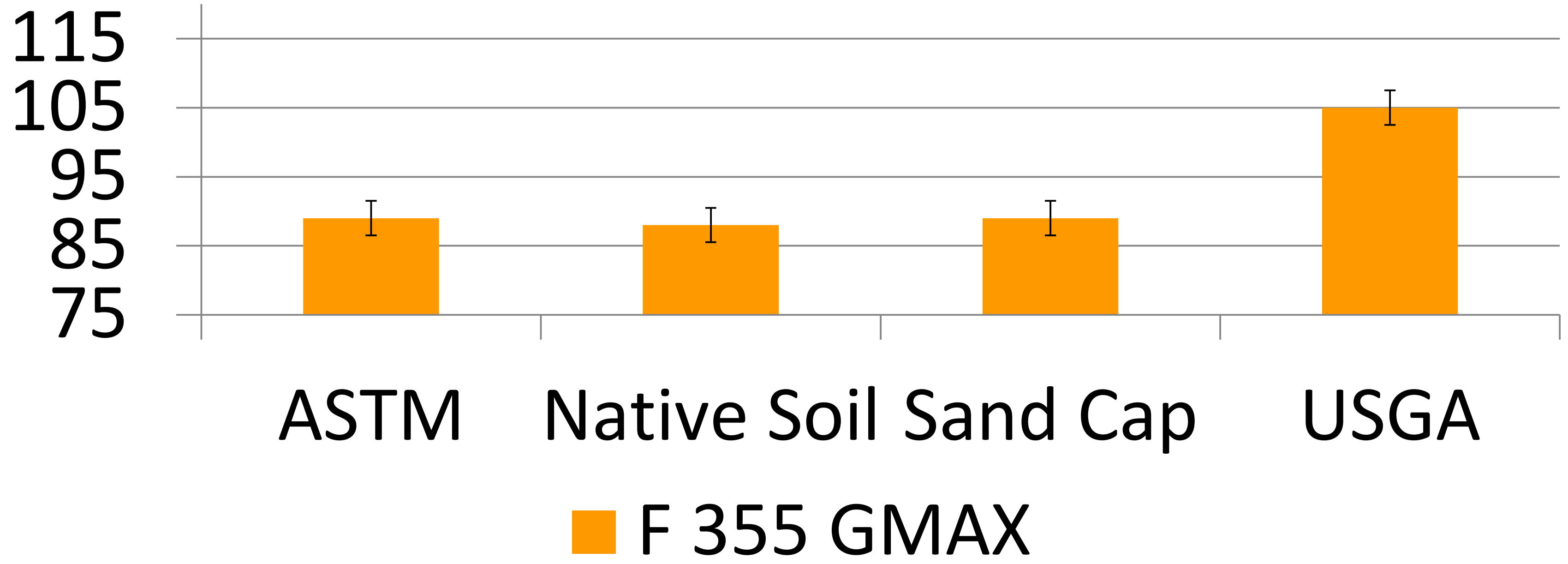


Fig 2. F 355 surface hardness for turfgrass type by root zone construction 2012

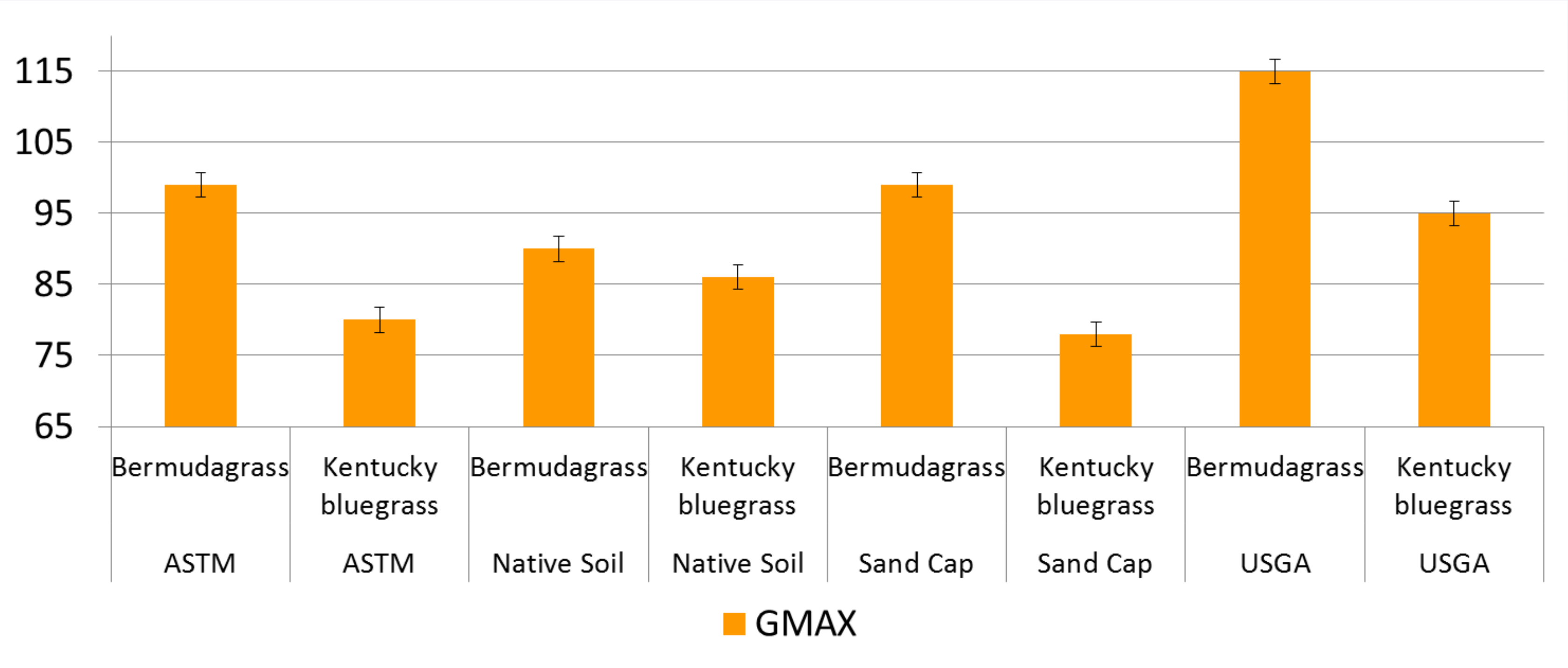
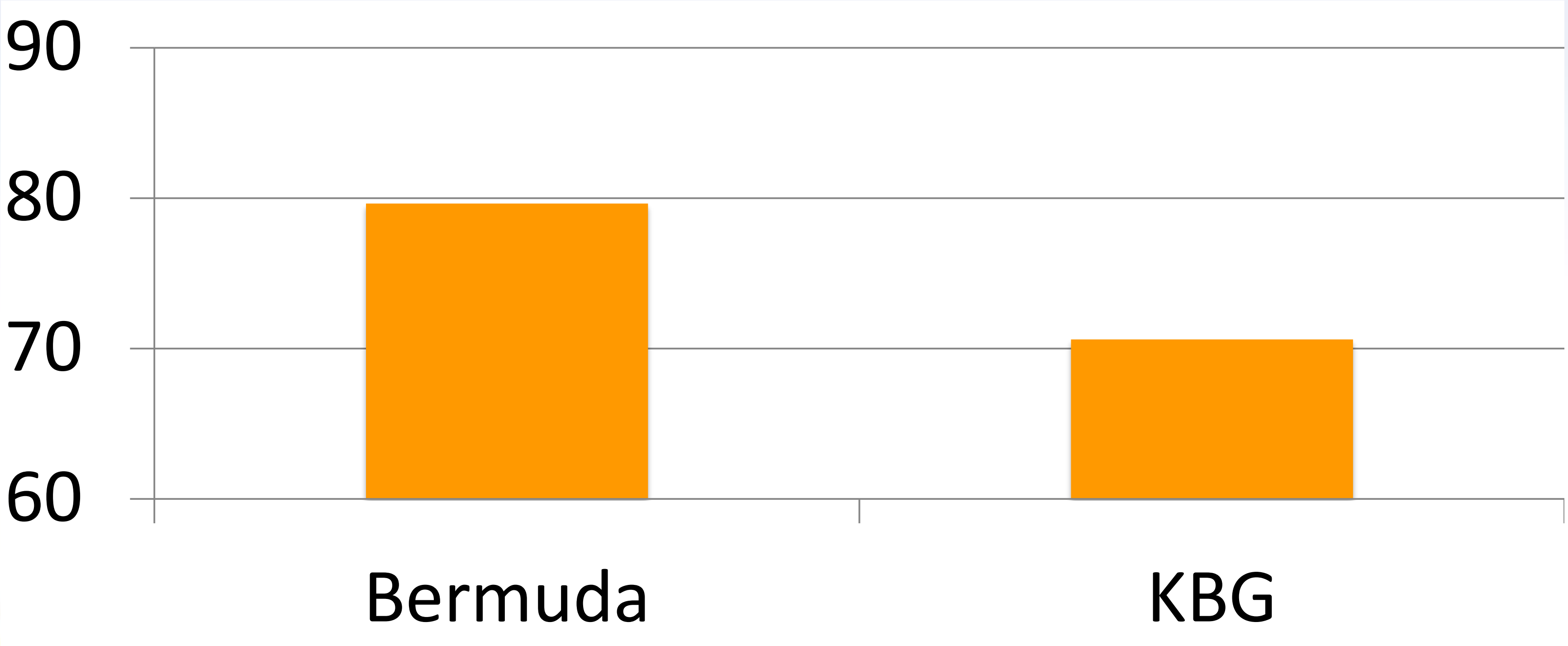


Fig 3. F 355 Surface Hardness values for Turfgrass Species, 2013



Results

Surface Hardness

1. Turf measured represented “ideal” condition for natural sports turf (A “dream” natural grass field)

2. GMAX range was between 78-115 for all turf types

Results

Surface Hardness

3. Range of GMAX for KBG and Bermudagrass over native soil (most common at school level) was 86-90

4. Results demonstrate that a high quality playing surface can have GMAX well below ASTM limit of 200, and STC current limit of <165

Results

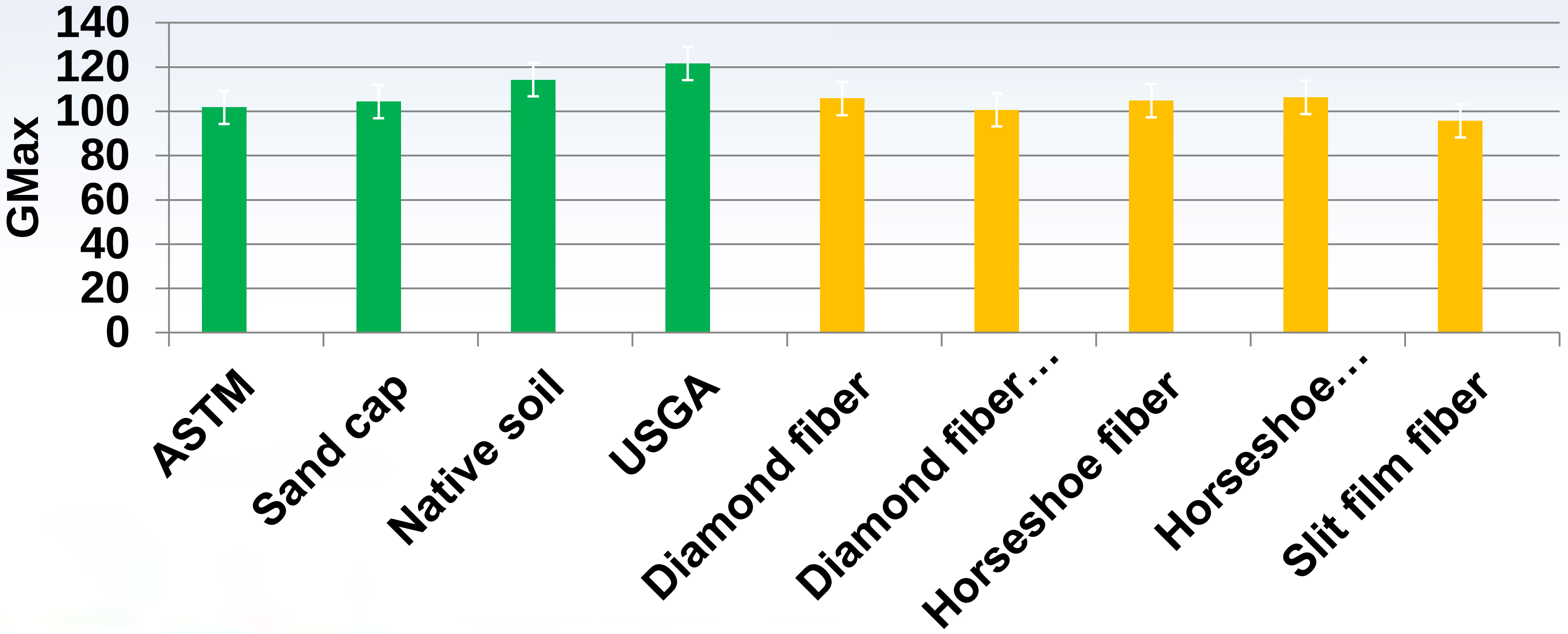
Surface Composition

- Bermudagrass (80) provided a significantly higher surface hardness (GMAX) than Kentucky bluegrass (71) when tested with the F355 device (Fig. 3)

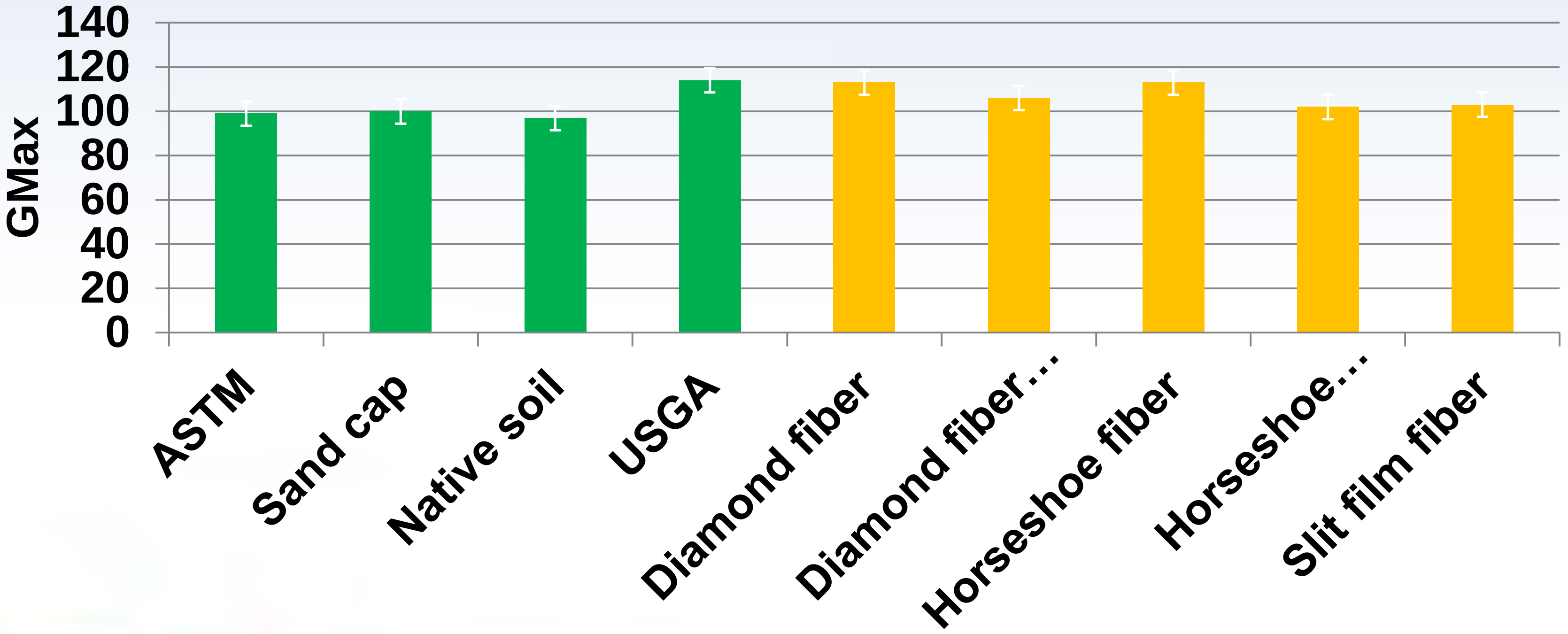
- All turf still well below 100 g's

- Results consistent with 2012 study

2012 Surface Hardness Values

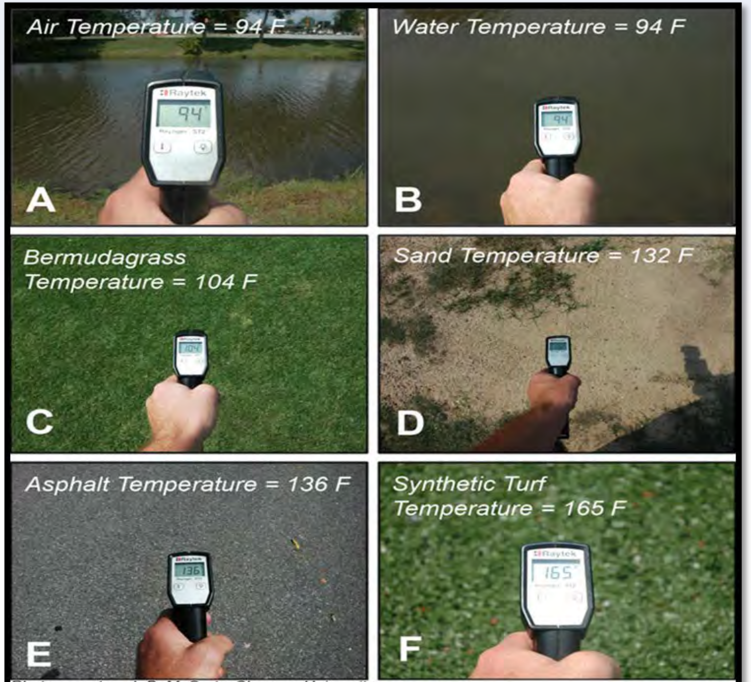


2013 Surface Hardness Values



Temperature

Surface Temperatures Comparison



Photos courtesy L.B. McCarty, Clemson University

Synthetic Turf Surface Temperature

- Traditional AstroTurf measured to be 30 to 60°C hotter than natural turfgrass (Buskirk et al. 1971)

- Infilled synthetic turf, temperatures ranging from 158 to 199° F have been reported in Utah, Tennessee, and Pennsylvania (Williams and Pulley, 2002; Thoms et al. 2014; McNitt et al. 2008)

- Solar radiation exposure to synthetic turf, will significantly increase surface temperature (Buskirk et al. 1971; Koon et al. 1971; Kandelin et al. 1976, Williams and Pulley, 2002; Akoi, 2005; Devitt et al. 2007; McNitt et al. 2008; Petrass et al. 2014)

Effect on Athletes

- Heat transfer from the surface to the inner soles of shoes could result in heat-related illnesses

Effect on Athletes

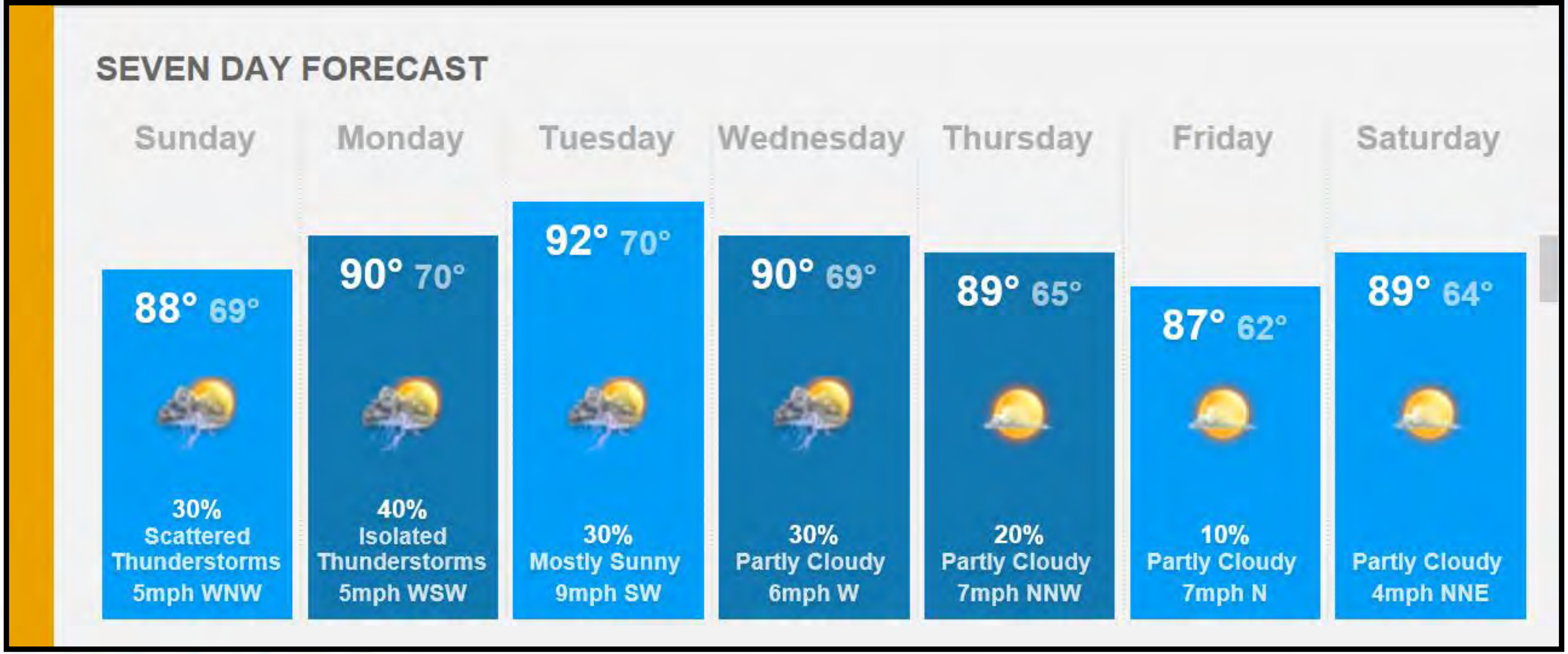
Elevated surface temperatures resulted in higher player injuries on synthetic turf than natural grass when temperatures were between 81 to 99 °F

(Meyers and Barnhill, 2004)

Recognized by the NYC Dept. of Health and Mental Hygiene as the #1 health concern associated with infilled synthetic turf

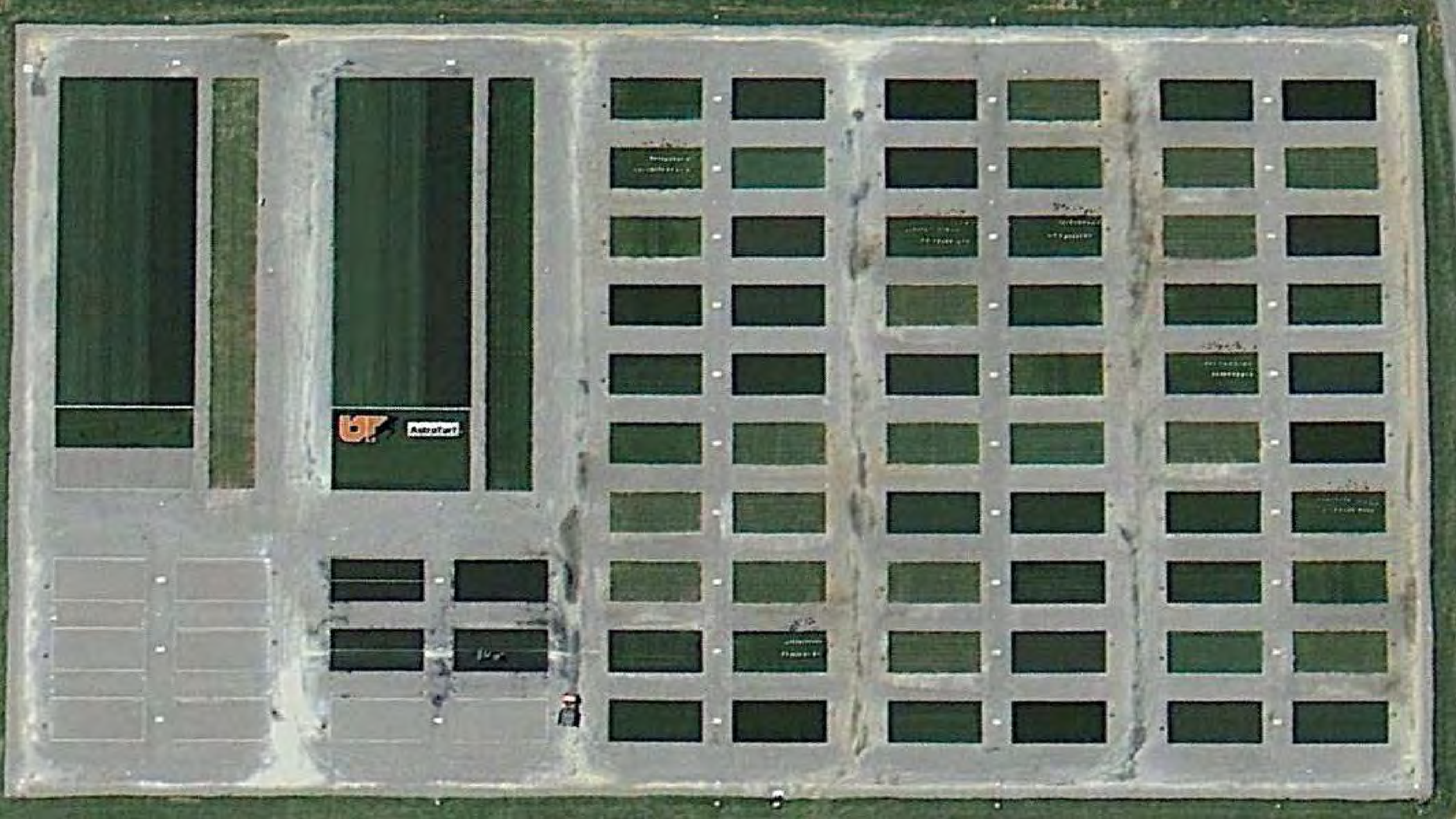
Synthetic turf playing surfaces are restricted in some municipalities when temperatures are above 120 °F

(Lim and Walker, 2009)



Research Objective:

Build a model to predict synthetic turf surface temperature using forecasted atmospheric data


AstroTurf

Materials & Methods

- Logged surface temperature (°C) every 10 minutes

- Atmospheric data collected on same interval

Air temperature (°C)
Relative humidity (%)
Precipitation (mm)
Solar radiation (W/m^2)

Different Types of Fibers

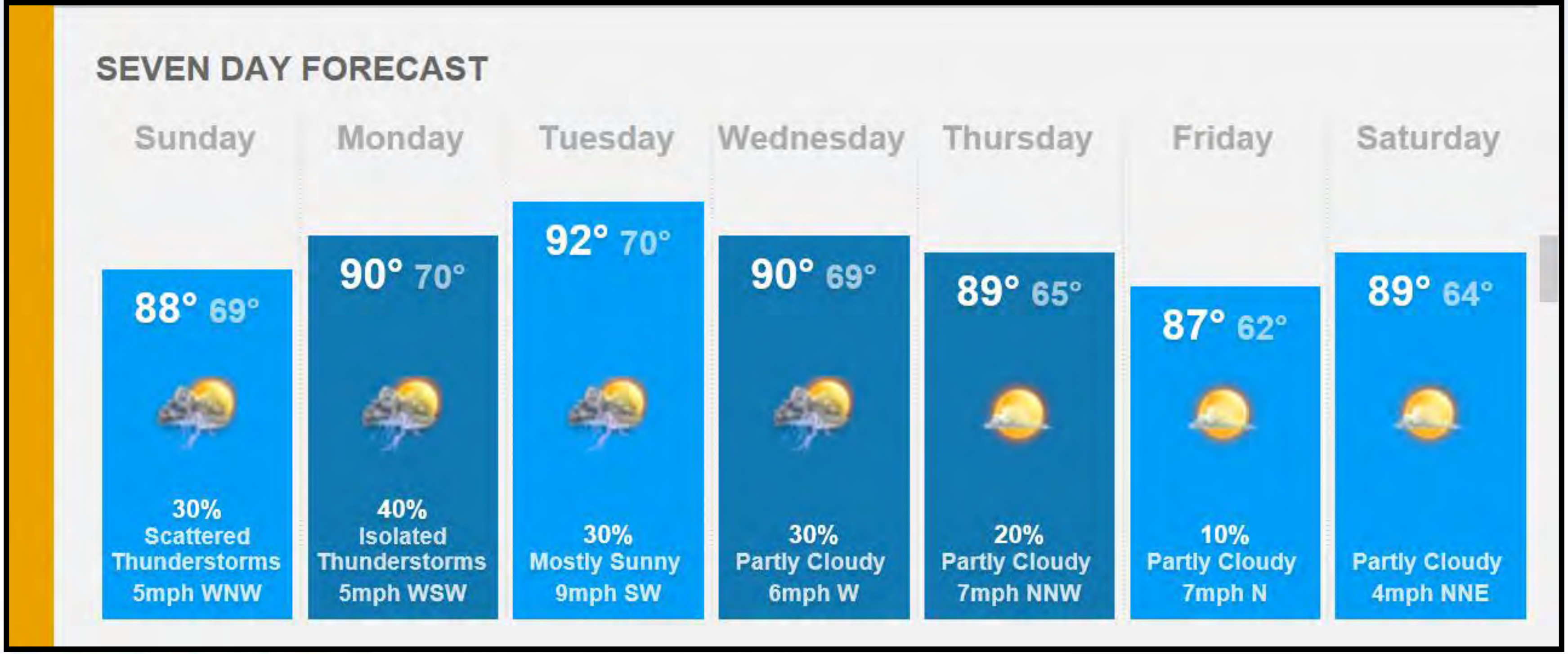
Surface Temperature Results

- Surface temperature range: 30 to 187 °F at ambient air temperatures of 31 to 99 °F
- Surface temperatures differed less than 6° C among surfaces
- High solar radiation was likely the driving force behind increased surface temperature

Synthetic Turf Models

Synthetic Turf Surface Temperature Model	R^2- value
Maximum Temperature = -10.25 + (1.622*Max forecasted air temperature °C) + (0.023*Max forecasted solar radiation W/m^2)	0.87
Mean Temperature = 0.58 + (0.948 *Mean forecasted air temperature °C) + (0.035 * Mean forecasted solar radiation W/m^2)	0.95
Minimum Temperature = -0.73 + (0.98 *Minimum forecasted air temperature °C)	0.94

Forecasted data can be used for predicting synthetic turf surface temperature



Model Accuracy

	Synthetic Turf Surface Temperature		
Forecast Data	Maximum	Mean	Minimum
24 hours	+/- 4.4^{0}C	N/A†	N/A
48 hours	+/- 5.3^{0}C	+/- 1^{0}C	+/- 1^{0}C
72 hours	+/- 4.8^{0}C	+/- 1^{0}C	+/- 1^{0}C

Conclusions

- Synthetic turf surface temperature greatly exceeds ambient air temperature when sunlight is present

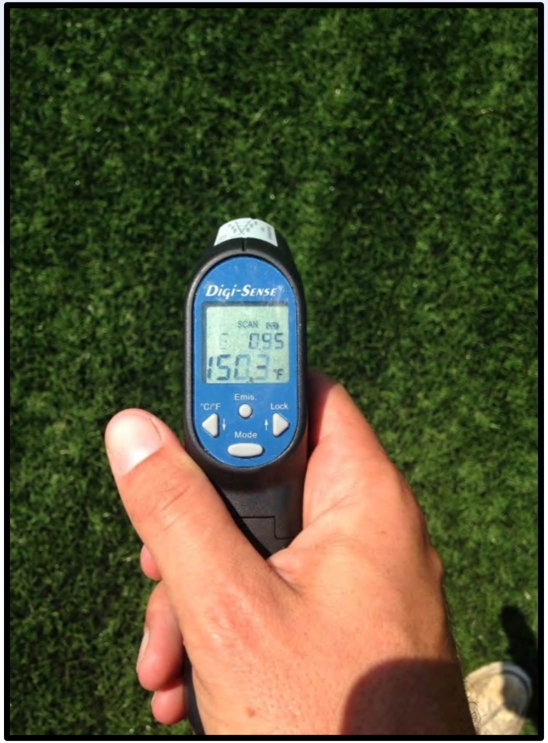
- Air temperature and solar radiation account for more than 84% of the variability in synthetic turf surface temperature measured

Conclusions

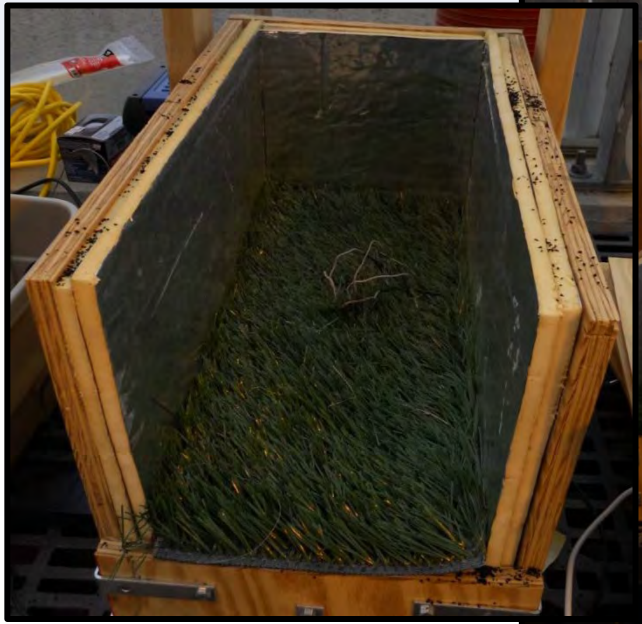
- 72 hour forecasted air temperature and solar radiation data can be used to predict maximum, minimum, and mean surface temperature data

- Mean and minimum temperature models offered greatest accuracy

What causes the heat?



Set Up



Materials

Surface Temperature of Synthetic Turf Components

Treatments	Surface Temperature (°F)
Infilled synthetic turf over aggregate base	145
Infilled synthetic turf	144
Synthetic turf without infill	142
Turf backing only	130
Aggregate base only	118

What Causes High Temperatures?

- White painted crumb rubber reduced temperatures by 5.3°C compared to black crumb rubber

- Penn State Center for Sports Surface Research
  - Black rubber – 69°C
  - Tan – 67°C
  - Green – 64°C

Fiber Color

- PSU Center for Sports Surface Research
- Silver – 65°C
- Black – 62°C
- Green – 60°C
- White – 54°C

Results and Discussion

- Non-infilled systems demonstrated increased surface temperatures (Kandelin et al., 1976; Buskirk et al. 1971)

- Greater infill depths did not affect surface temperature (Petrass et al. 2014)

- Both Thoms et al. (2012) and McNitt et al. (2008) reported that non-infilled synthetic turf surface temperature were less than 5° C different from infilled synthetic turf surface temperature

Can we lower synthetic turf surface temperatures?

Cooling Treatments

- Pivoting utility blower
- Applied both to the surface as well as through the aggregate base
- Duration: 4 hours

Cooling Treatments

- Moisture absorbent pad
- Saturated pad
- Pad application under backing and above aggregate base
- Pad was dry to touch after 4 hours

Cooling Treatments

- Green Reflective Pigment with carrier
- Applied with high pressure sprayer to fibers and infill

Surface Temperature of Various Cooling Treatments Applied to Synthetic Turf

Treatments	Surface Temperature (°F)
Infilled synthetic turf over aggregate base	145
Infilled synthetic turf over an absorbent pad	137.8
Infilled synthetic turf with reflective fibers	122
Infilled syntheitc turf with forced air applied through the aggregate base layer	117
Infilled syntheitc turf with forced air applied to the surface	88

Irrigation & Synthetic Turf

(Williams and Pulley, 2002; McNitt et al. 2008)

Results and Discussion

- Forced air has reduced surface on Creeping bentgrass (*Agrostis stolonifera*) (Guertal and Han, 2002; Guertal et al. 2005; Han et al. 2006; Guertal and Han, 2009)
- Reflective colored fibers have reduced surface temperature compared to less reflective colors (Devitt et al. 2007; Williams and Pulley, 2002)
- Evaporative cooling has limited success in other studies (Reasor, 2014; McNitt et al. 2008; Williams and Pulley, 2002)

Irrigation to Reduce Temperatures

- Irrigating traditional AstroTurf lowered temperature similar to natural turfgrass

- Irrigating infilled synthetic turf also lowered temperatures

- Cooling effect lasted longer on traditional AstroTurf due to longer surface wetness

McNitt et al. 2008; Koon et al. 1972; Williams and Pulley 2002

3rd Generation Turf and Irrigation

- 30 minutes of irrigation = surface temperature of 29°C (similar to nearby natural turfgrass)
- 5 minutes after irrigation: 49°C
- 20 minutes after irrigation: 73°C

(Williams and Pulley 2002)

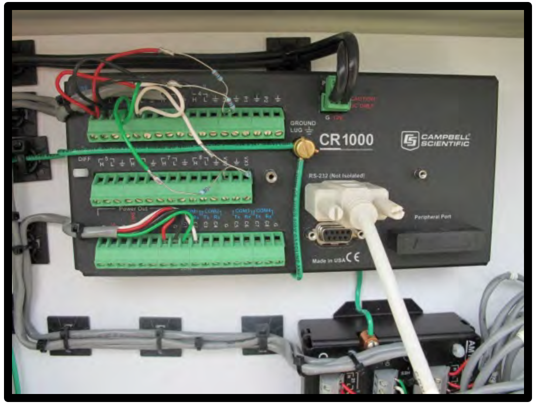
Temperature Measurements

- Thermistor sensors 100K (-80 to 150°C range ± 0.1°C)
  - Circuit complex 80.6 Kohm resistor with thermistor

- CR1000 data logger with multiplexter excites circuit with 2500 mV and reads the voltage in the circuit

Set Up

- Temperature calculated from voltage output using Steinhard-Hart equation and a voltage calibration equation
- Sensors calibrated by comparison to lab grade thermometer in ice water heated to boiling point

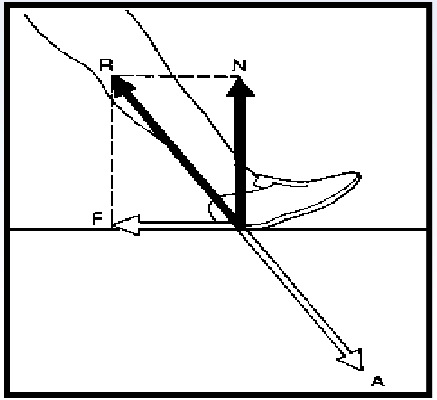


Conclusion

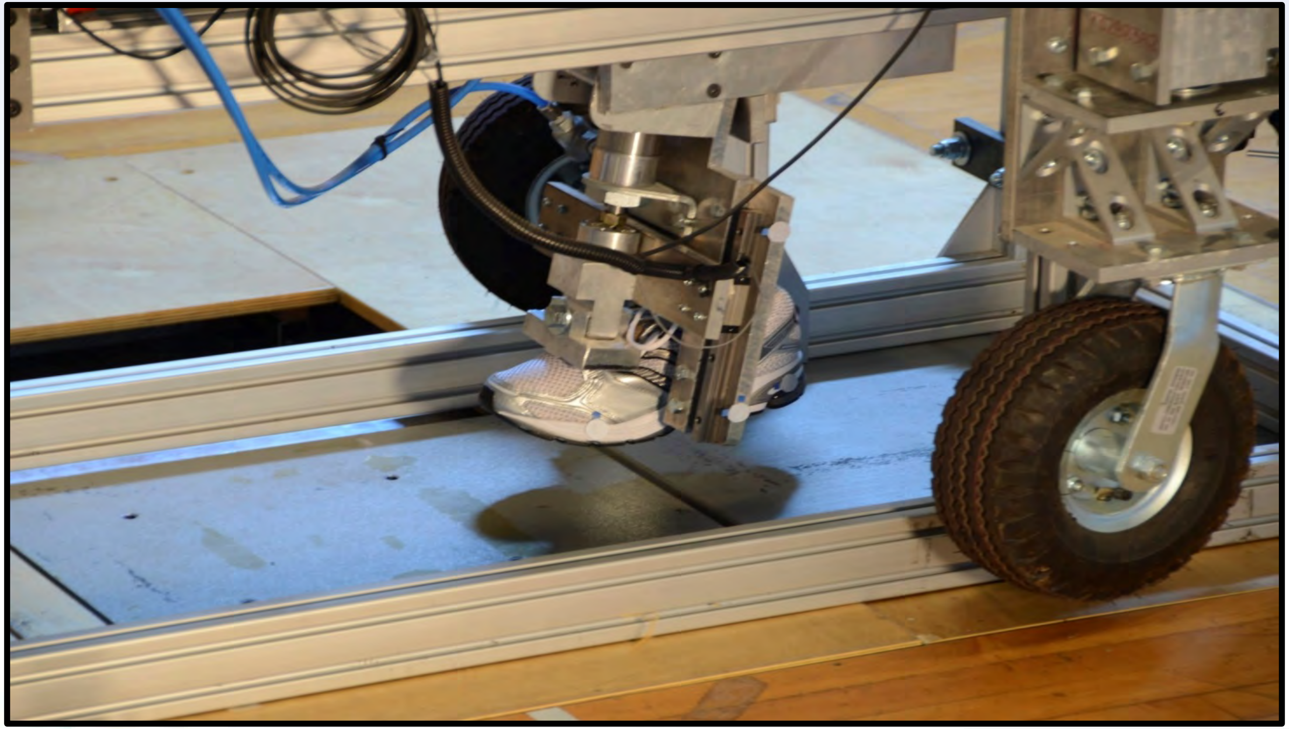
- Irrigation reduced surface temperatures to 60 – 84.5% of the temperatures 10 minutes prior to irrigation
- 30 minutes after irrigation, temperatures increased to 74.3 – 101.7%

Player to Surface Interaction

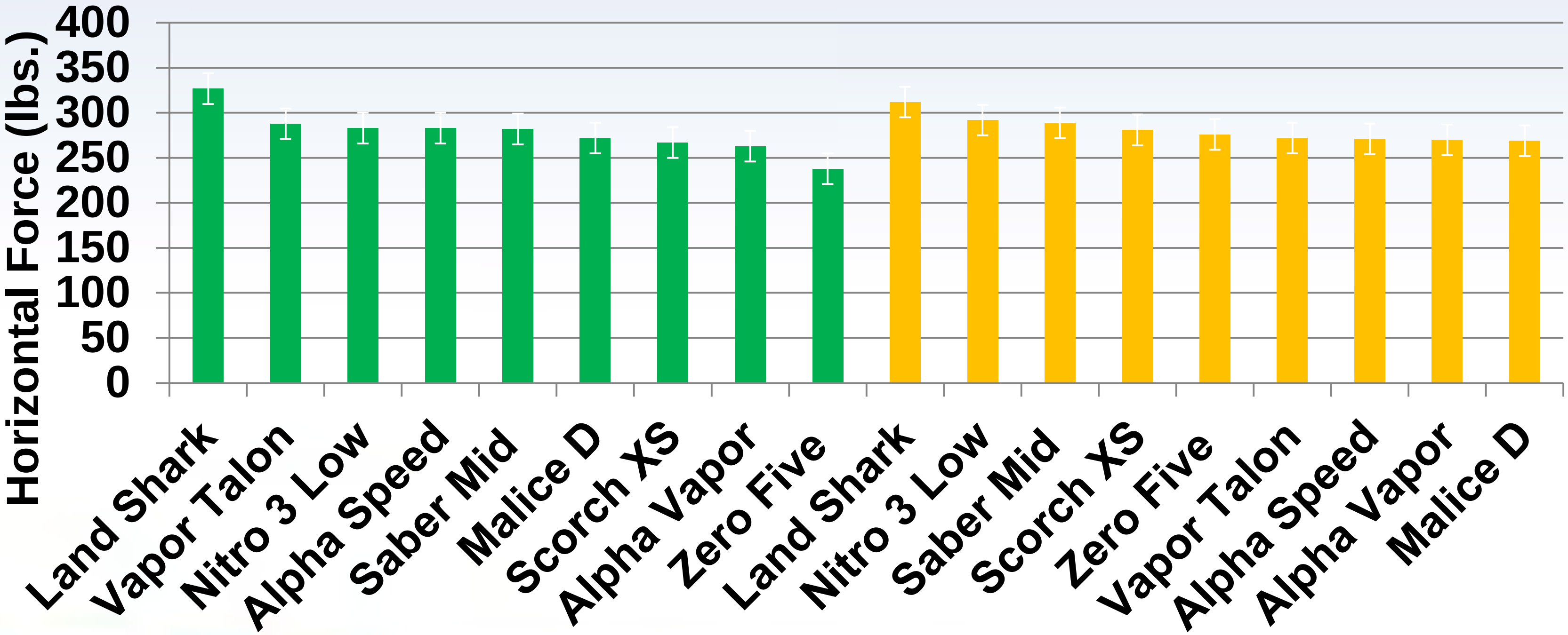
Tennessee Athletic Field Tester



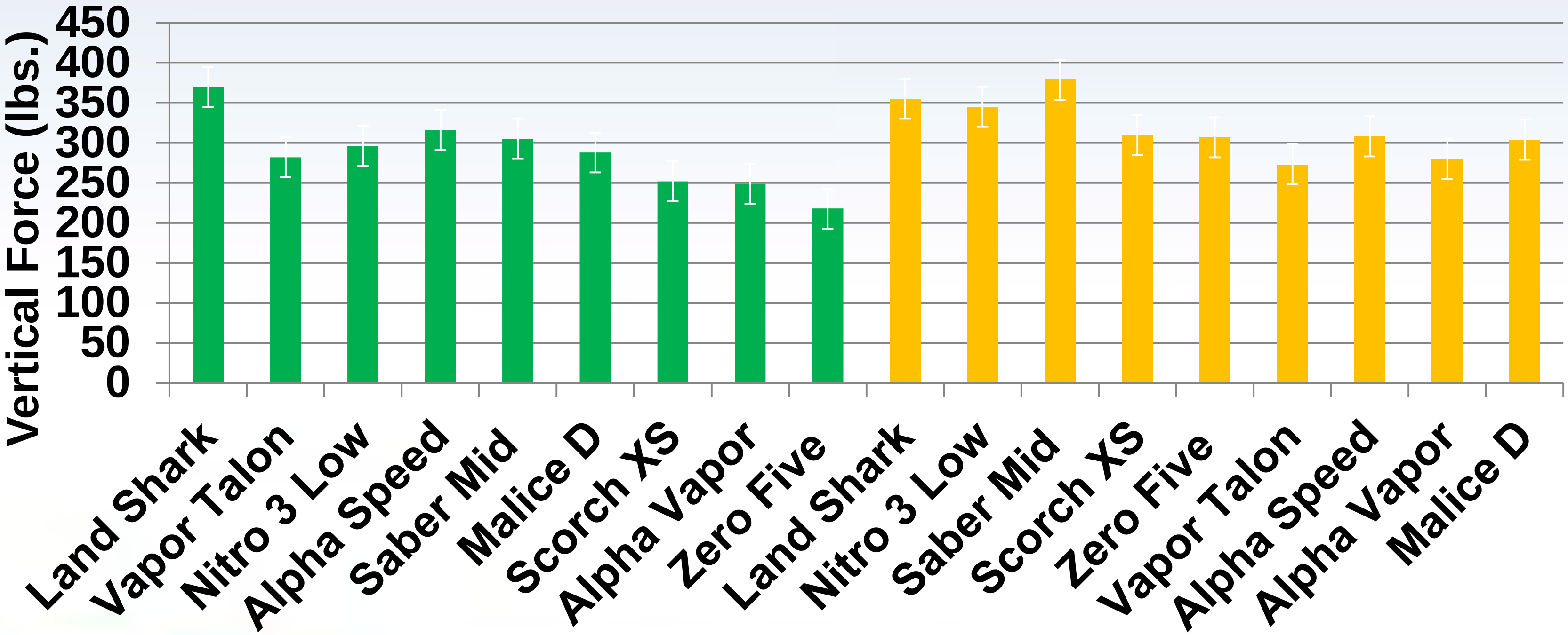
Taft Testing



Monofilament vs. Slit Film

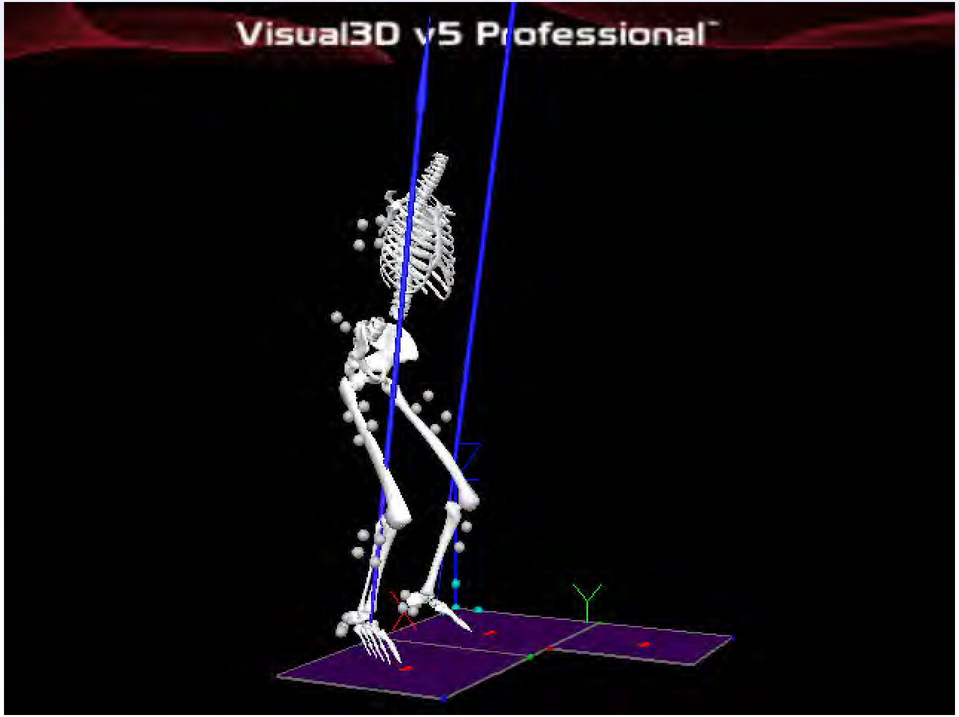


Monofilament vs. Slit Film



Testing

Testing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What Next?

Future Studies

- Look more into more detailed forced air cooling reduction
- Polymers to hold irrigation water longer
- Base pads ability to store and release water

Thank You

Any Questions

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Cary Wiley

Backflow Prevention in Irrigation Systems

Cary Wiley
Apollo Valves

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Southeast, Southwest, Northeast, & California

American Society of Irrigation Consultants

Agenda

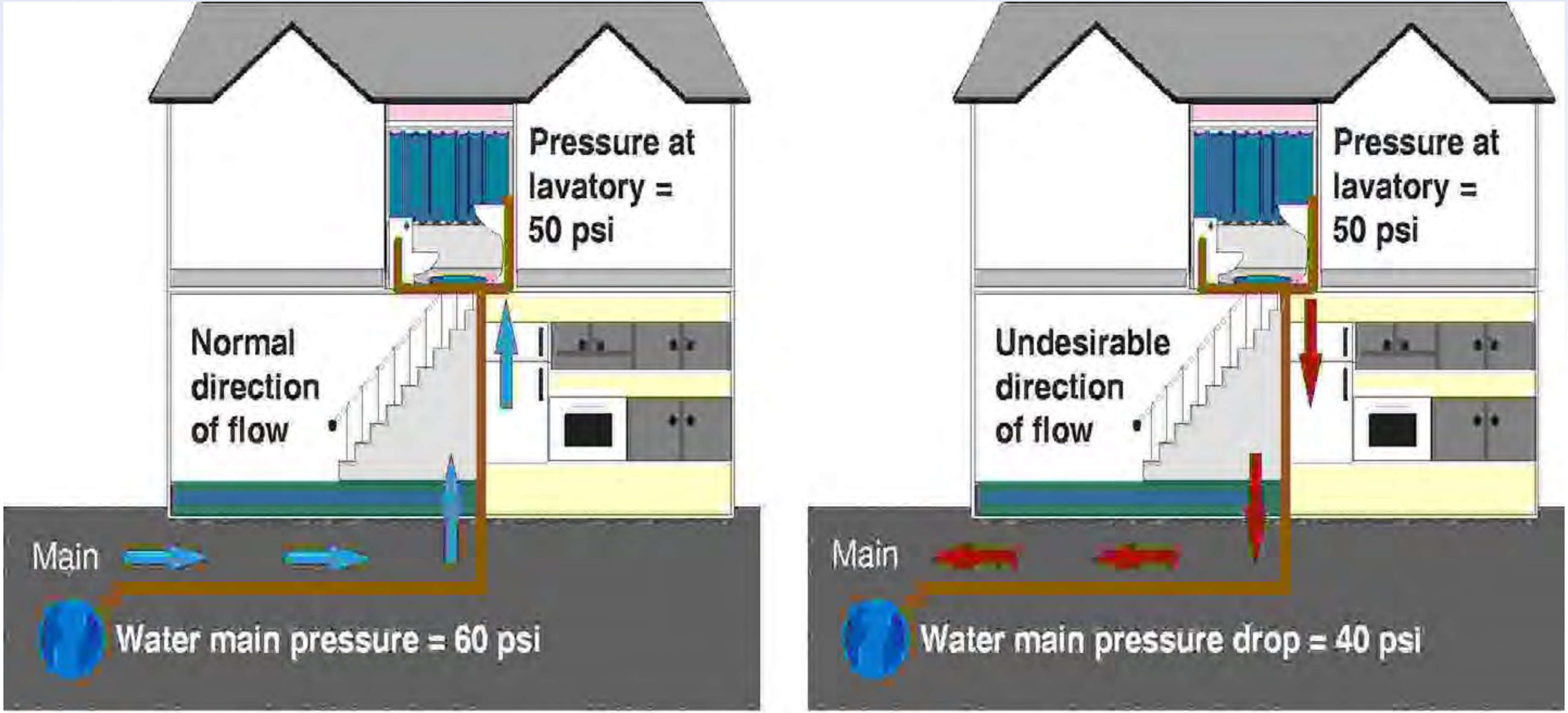
- Backflow Basics
- Backflow in Various Irrigation Systems
- Freeze Protection and Winterization
- Lead Free Law in Irrigation Systems
- Future of Irrigation Backflow

ASIC

Cary Wiley

Business Development Manager

Backflow Basics



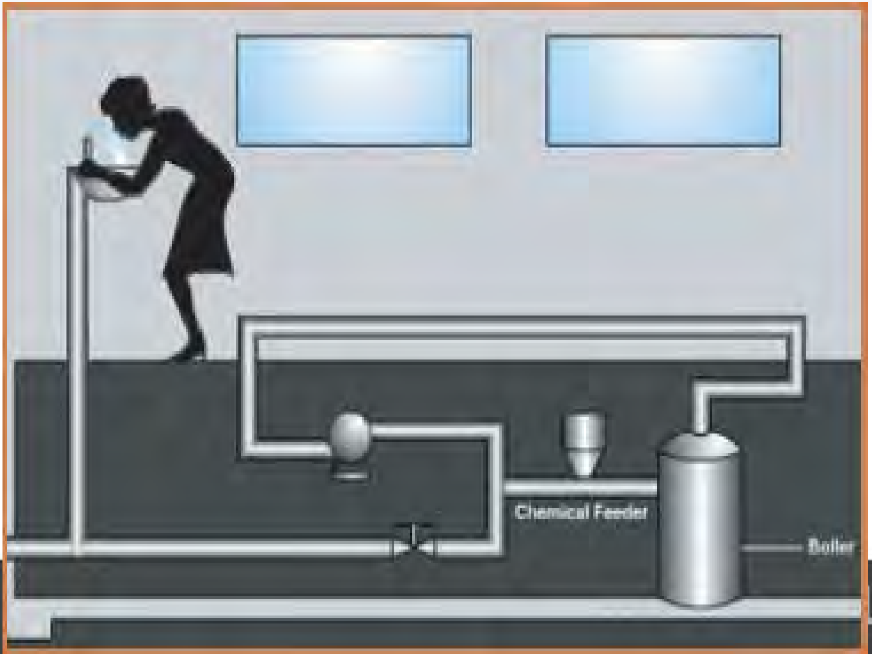
Water flows from high to low pressure. Normal direction of flow is into the house.
Backflow is the undesirable flow reversal from the house to the main in the street.

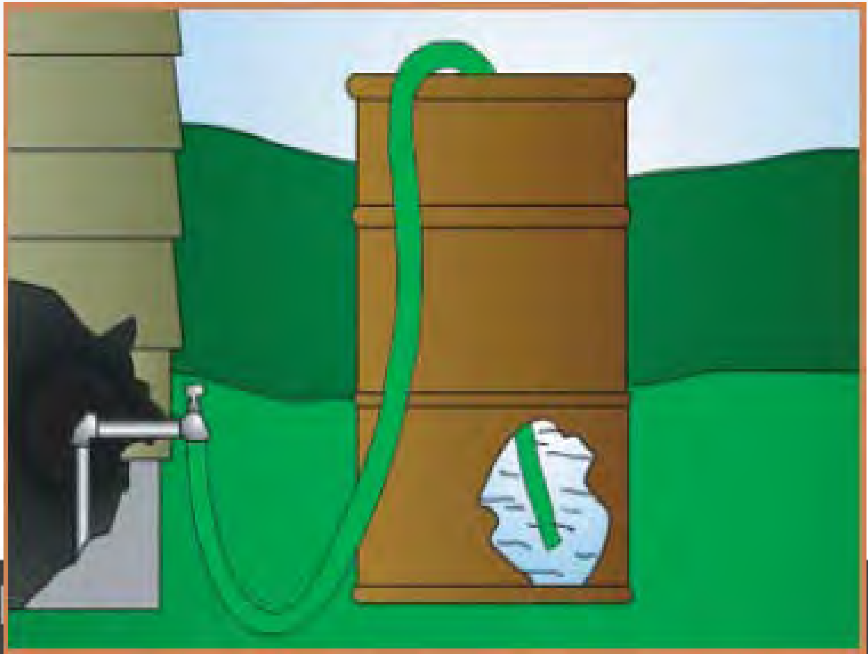
Cross Connection

Any actual or potential connection to a drinking water line where a non-potable material could come in contact with that drinking water.

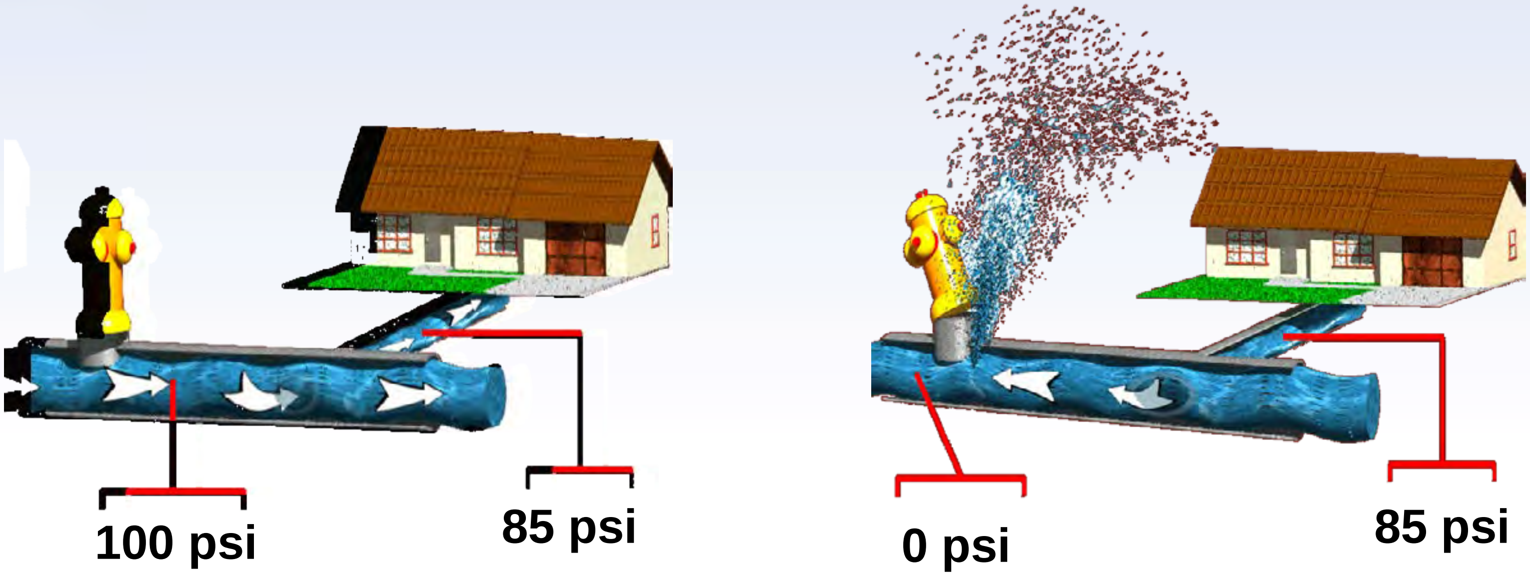
Direct (fixed) connection
connection

Indirect (temporary)





Back Siphonage



Normal Flow

Back-Siphonage

Over 240,000 water main breaks in US EACH YEAR

Back Pressure

Situation When the Piping System Pressure Becomes Greater than the Supply Pressure Pushing the Water Back to The Lower Supply Pressure

(**<u>Only 2 Backflow Preventer Categories Protect Against Back Pressure</u>**)

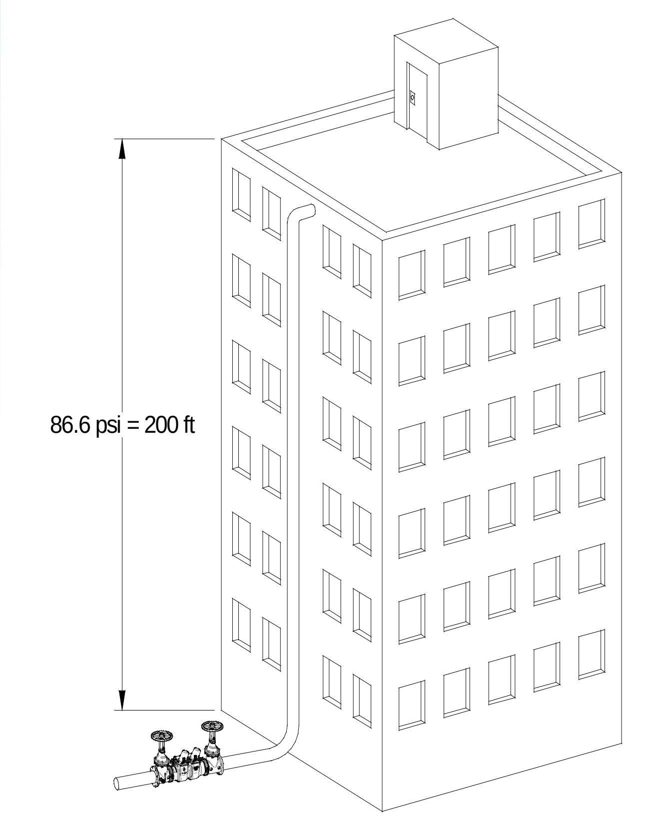
What Causes Back Pressure?

- Elevation (Weight of Water)
- Pumps
- Thermal Expansion
- Water Hammer

50 PSI

55 PSI

Back Pressure



ASIC

Hose Bibb Vacuum Breakers

Installation Requirements

- Not suitable for Continuous Pressure Service
  - 12 hours Out of 24 Hours Intermittent Pressure MAX
  - No Downstream Shut-offs Allowed
- Protects Against Back-Siphonage & “Low Head” Back Pressure
- Plumbing Codes allow 10 Feet of Elevation Head Downstream of HBVB
- Required by All Plumbing Codes
- ASSE Approved
- LF Not EPA Required

PVBs

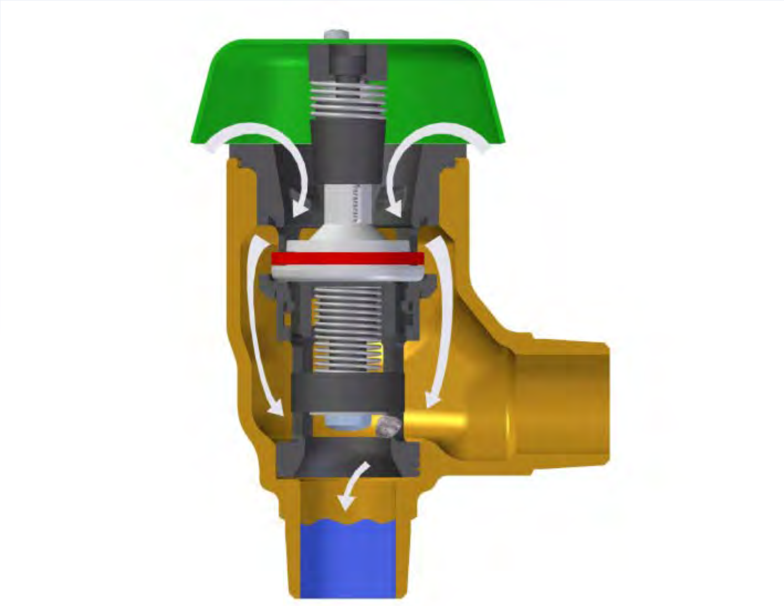
<u>Installation Requirements</u>

- Designed for Continuous Pressure Service – 24/7, 365 Days a Year
- Protection Against Health Hazards
- ***Protects Against Back-Siphonage Only***
  - Must Be Installed 12" Above Highest Point of Downstream Piping
- Must be Installed Where Spillage is Not a Problem
- Typical Applications
  - Turf Irrigation Systems
  - Swimming Pools w/ Auto Fill

PVBs

Function: Back-Siphonage

- Check Valve Fouled Open by Debris
- Air Inlet Opens by Float Dropping With Spring Assist Allowing Air to Satisfy Siphon Demand Rather than Water From Downstream



Dual Checks

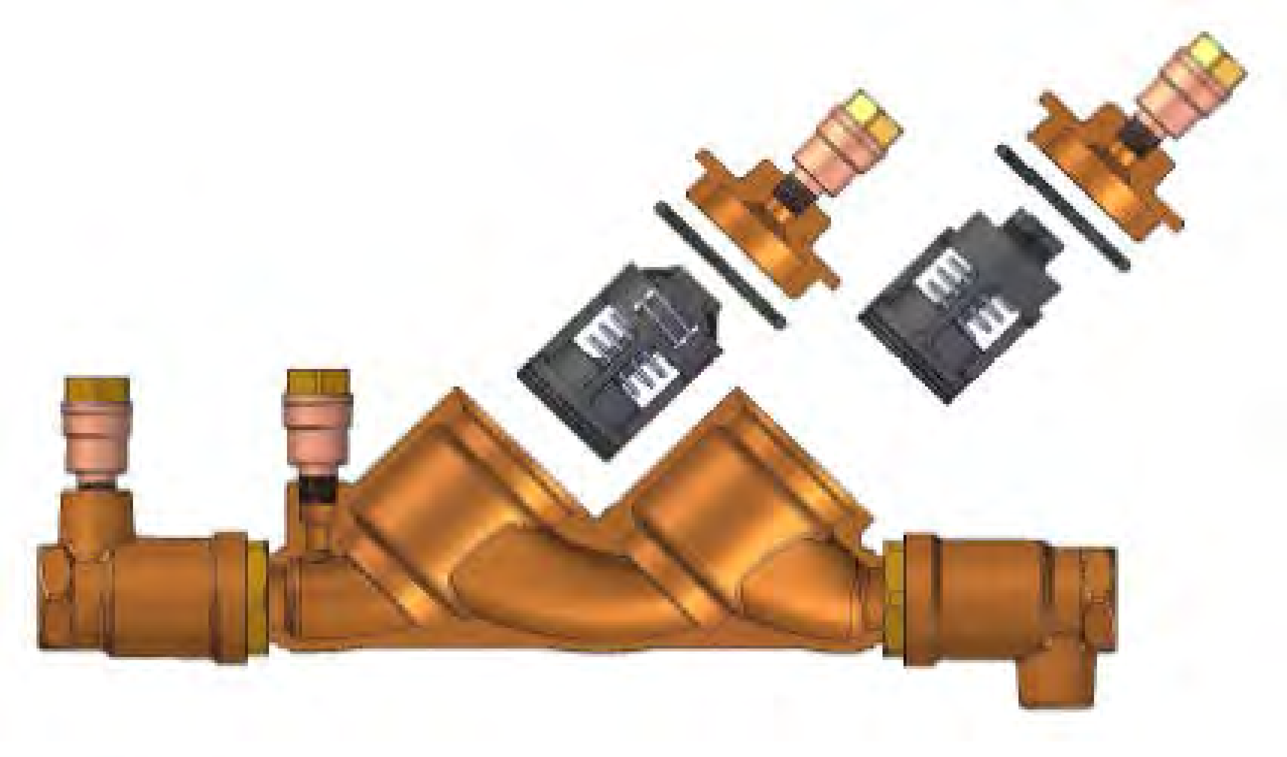
- **<u>Installation Requirements</u>**
- Operates Under Constant Pressure
- Approved For Low Hazard Potential Cross Connections
- Protection Against Back Pressure & Back Siphonage
- Typical Application:
  - Residential Meter & Residential Fire Protection

Double Checks

Installation Requirements

- Designed for Continuous Pressure Service – 24/7
- Protection Against Non-Health Hazards only
    - ALWAYS CHECK WITH LOCAL CODE AUTHORITIES!!!
- ***Protection Against Backpressure and Back-Siphonage***
- May be Installed Above or Below Ground
    - Adequate Clearance for Testing & Maintenance Required
- Typical Applications:
    - Non-Health Hazard Domestic / Plumbing Systems
    - Fire Protection Systems
    - Irrigation Systems (No chemigation or fertilizer injectors)

Double Checks



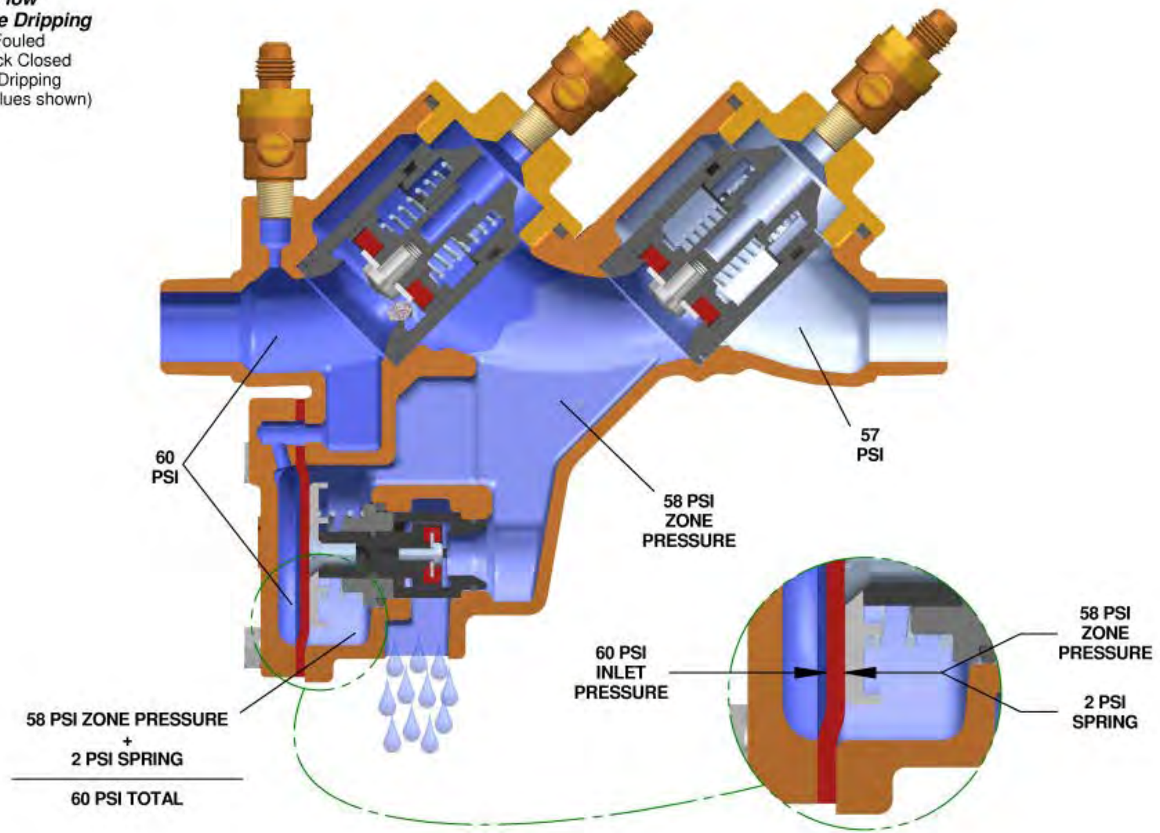
RPZs

Installation Requirements

- Designed for Continuous Pressure Service
- Protection Against Health Hazards
- Protection Against Backpressure and Back-Siphonage
- Must be Installed in Horizontal Position
- Must be Installed Above Ground with Adequate Clearance – Typically 12"
- Provisions Required For Adequate Drainage from Relief Valve Discharge
- Typical Applications:
  - Plumbing Applications
  - Domestic Supply Lines
  - Irrigation Systems
  - Chemically Treated Boiler Lines
  - Fire Sprinkler Systems w/ Antifreeze

MODEL RP4A

Static, No Flow
Relief Valve Dripping
First Check Fouled
Second Check Closed
Relief Valve Dripping
(Minimum values shown)

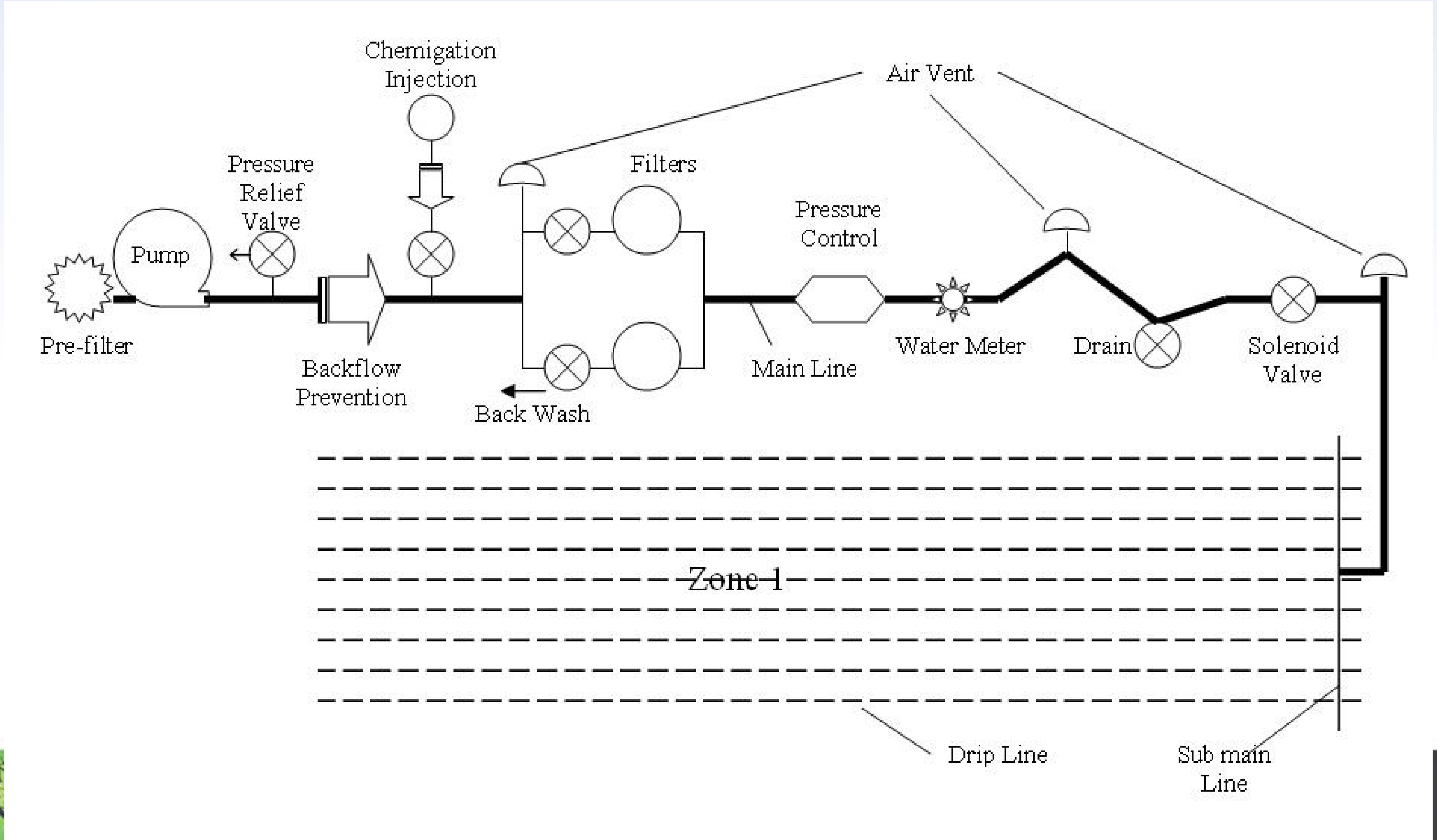


What Backflow Should I Use?

- Rainwater Harvesting System?
- Residential Sprinkler System?
- Cistern Well System?
- Chemical Injection System?

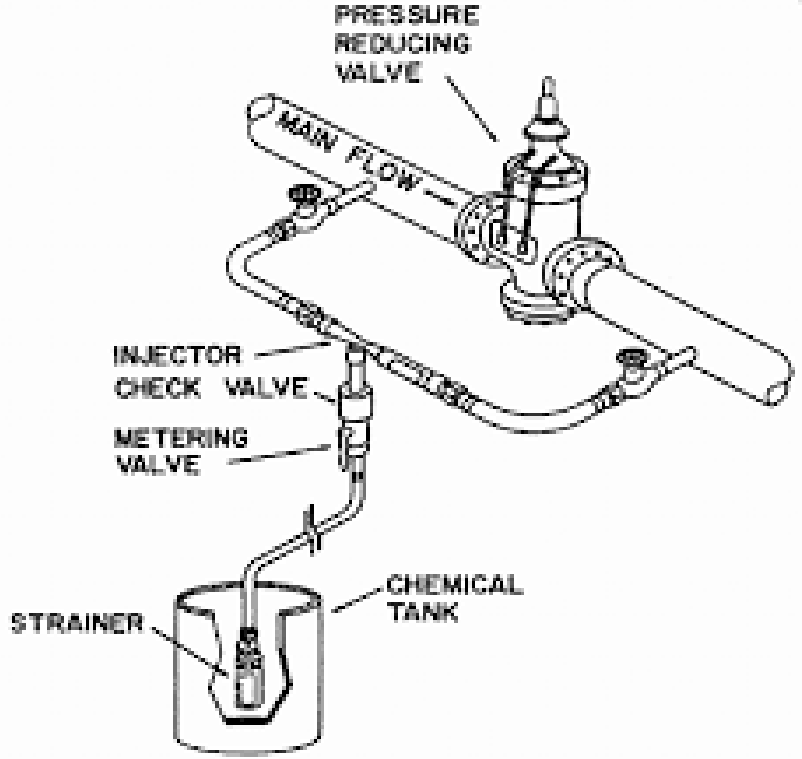
What Backflow Should I Use?

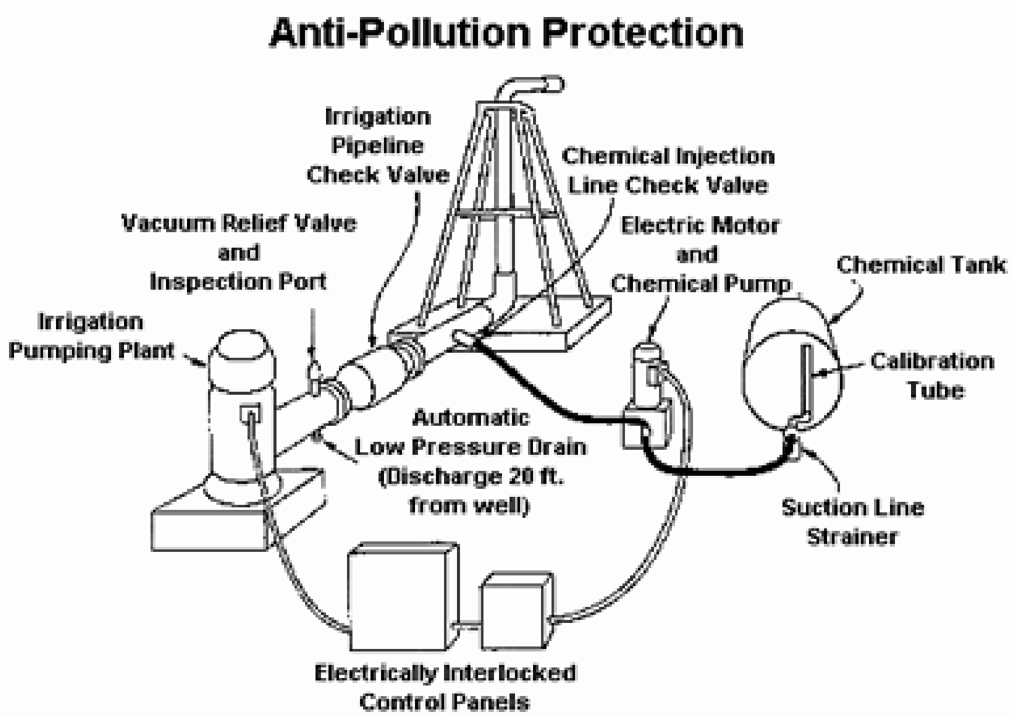
- Chemical Injection System?



What Backflow Should I Use?

- Chemical Injection System?





What Backflow Should I Use?

- High Hazard or Low Hazard?
- Potential Cross Connection with Municipal Supply or Groundwater Supply?
- Possible Backpressure?
- Chemicals of any kind?
- ALWAYS CHECK WITH AHJ

Freeze Protection

- Protects Backflow Preventers, other Valve Products from Freezing Conditions
- Installs on the #4 test cock of any backflow preventer
- Lead Free "LF" Option
- Not dependent on pressure for operation.
- Start-to-open temperature of 35° F.
- Start-to-close temperature of 45° F.
- Discharges about 2.5 gpm at 80 psi.
- Repairable in Line w/ Internals Repair Kit

Freeze Protection

- Valve Enclosures
- Heated (need power source) or insulated
- Insulated Wraps
- Various Sizes
- Decorative options
- Also protects against theft and vandalism

Lead Free Law in Irrigation

- Senate Bill No. S.3874 – Reduction of Lead in Drinking Water Act
- Re-defines "lead-free" as no more than .25% lead when used with respect to wetted surfaces of pipe and plumbing fittings and fixtures.
- The new standard does **not** apply to pipes, pipe fittings, plumbing fittings or fixtures that are used **exclusively for nonpotable services** such as manufacturing, industrial processing, **irrigation**, outdoor watering, or any other uses where water is not anticipated to be used for human consumption. The law also specifically excludes toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger.

Lead Free Law in Irrigation

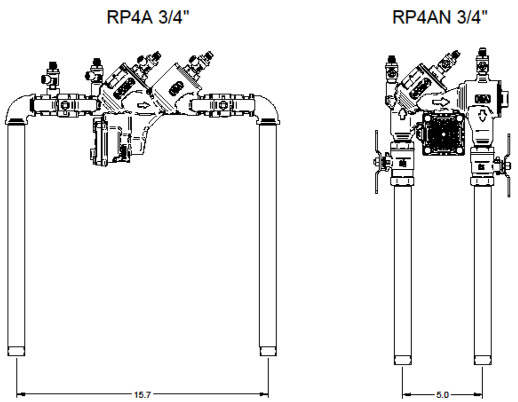
- Dedicated stand-alone irrigation system – totally exempt
- Irrigation system branching off municipal water supply – maybe
- Most manufacturers want to go totally lead-free to cut manufacturing costs. They are pushing for lead free in irrigation, industrial and fire.
- 2-1/2" system exempt?

Future Enhancements

- Smaller, cheaper, faster, better
- Better materials to combat corrosion and harsh water
- Space savings for easier installation
- Better design for higher flow rates, lower pressure drops, easier maintenance

Future Enhancements

Size	"n" style RP **Centerline Distance**, inches					
Make/Model	RP4An	RP4A w/elbows	Febco 825 YA	Watts U009AQT	Wilkins 375SE	Wilkins 975XLSE
3/4"	**5.00**	15.7	8.50	13.8	11.00	15.1
1"	**5.25**	17.3	8.50	18.3	13.75	16.1



Smaller Footprint

Smaller Enclosure

Good Installations?

Good Installations?

Good Installations?

Any questions?

Cary Wiley

678.642.3356

Dr. Tim Wood

Creature Control in Irrigation Piping

Dr. Tim Wood
Bryo Technologies
Dayton, Ohio

BRYO TECHNOLOGIES

ASIC 2016 REGIONAL CONFERENCES

Southeast, Southwest, Northeast, & California

American Society of Irrigation Consultants


Satisfatory sprinkler function

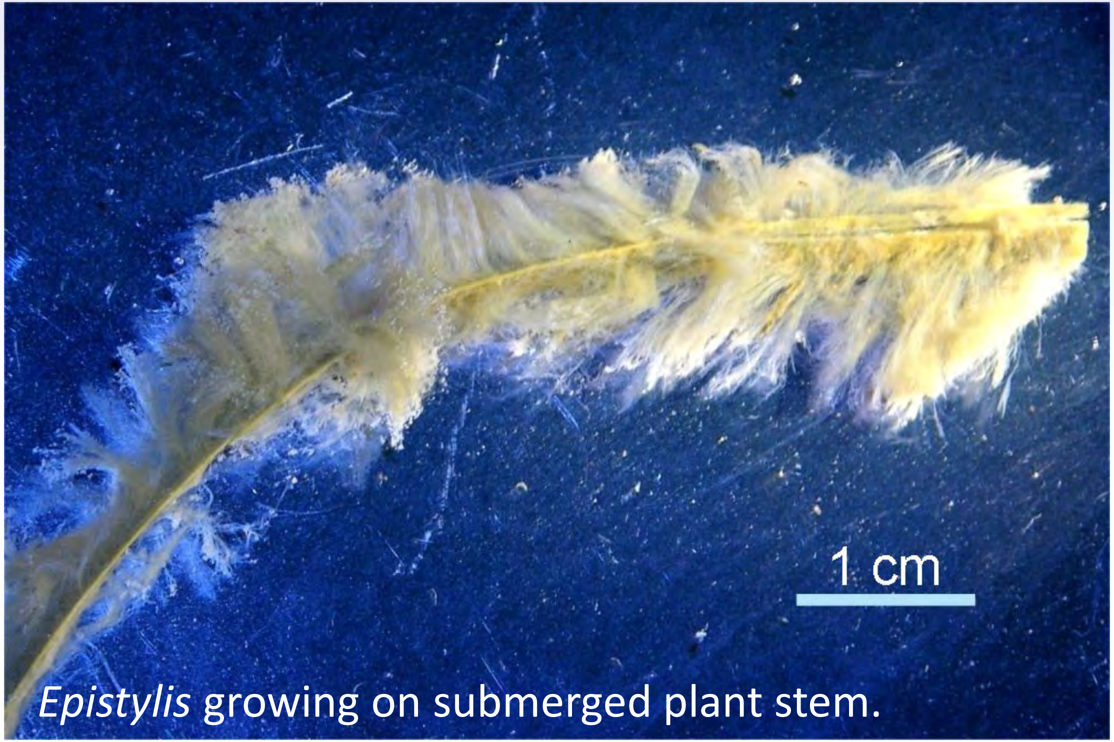
Less than satisfactory sprinkler function: something is clogged.

Insects

Hydroids

Peritrichs

Epistylis



Epistylis growing on submerged plant stem.

Sponges

Ephydatia growing on submerged pipe.

Bryozoans

Topics

- What really are bryozoans?
- What are some good chemical / nonchemical remedies to biofouling?
- What are the complicating factors?
- How are bryozoans best identified?
- What issues have no good solutions (yet)?

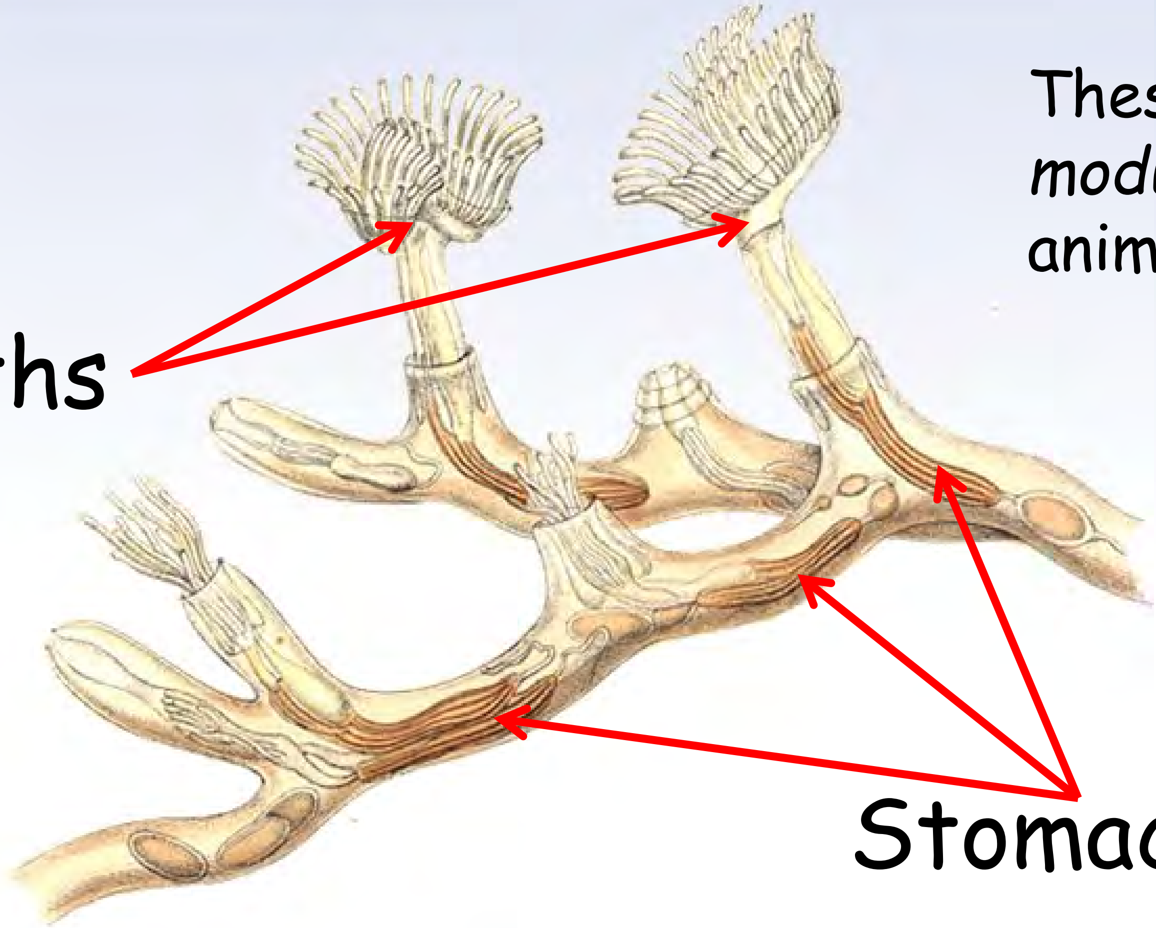
Bryozoans occur in lakes, ponds, and rivers everywhere.

They must always be attached to something.

Flowing water promotes dense growth.


Animals, not plants

These are *modular* animals.



Colonial (modular) animals


Examples of high growth rate.


Warm water, constant flow, high nutrients.

Chemical management

- Heavy metal: copper sulfate, incl. $CuSO_4$ with chelating agents and other enhancements;
- Oxidizers: Oxychlorides, permanganates, hypochlorites, peroxides, ozone;
- Quaternary ammonium compounds;
- De-worming pharmaceuticals.

Which Chemical is Best?

It depends on multiple factors:

- Species involved;
- Receiving water and soil chemistry;
- Fish /other animals / plants to be exposed;
- Layout of the system;
- Water temperature; season of the year, etc.
- Disposal of treatment water.

Equipment needed

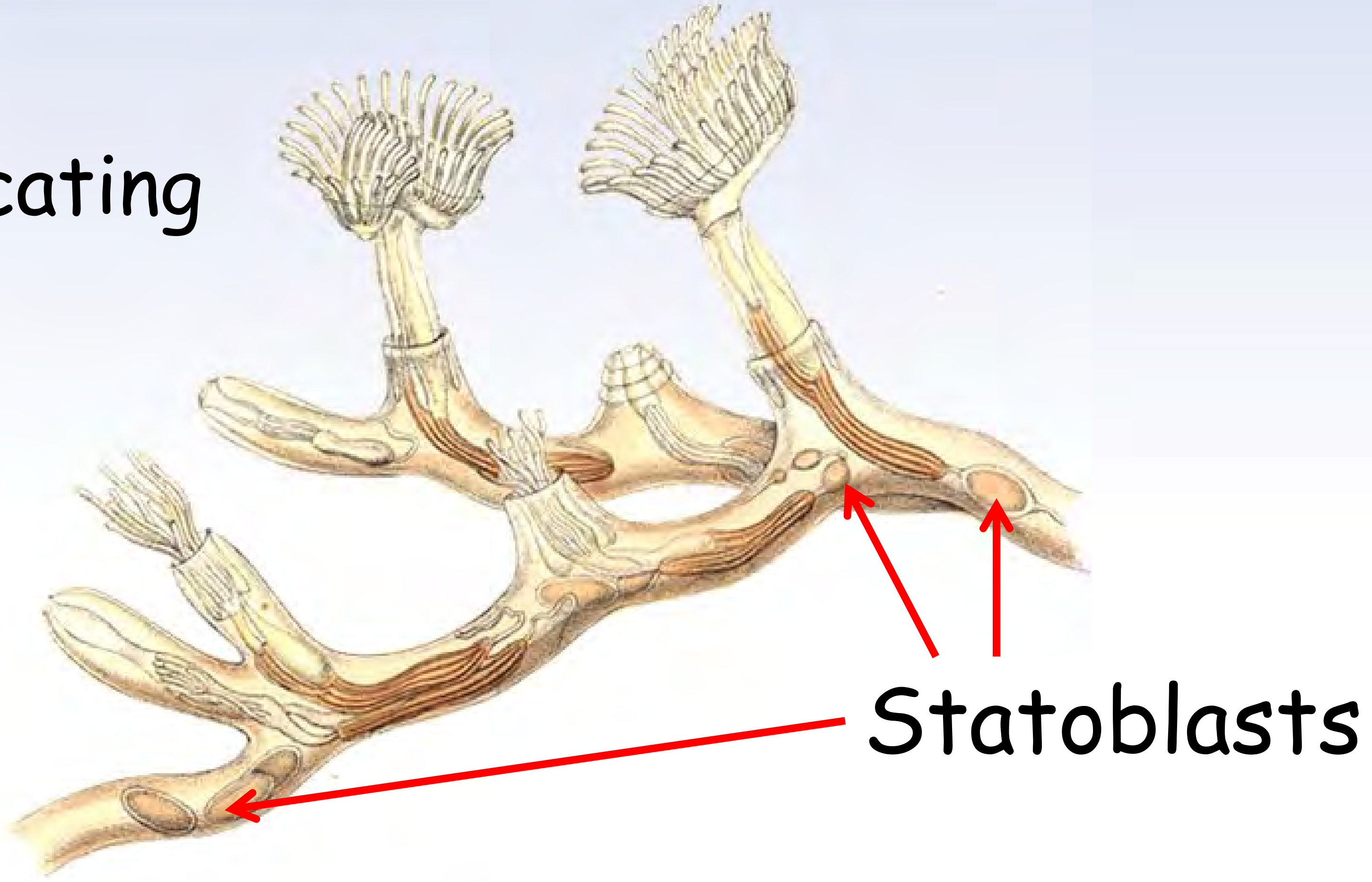
- Tank to hold stock solution
- Accurate metering pump

Aim for minimum chemical concentration, maximum exposure time.

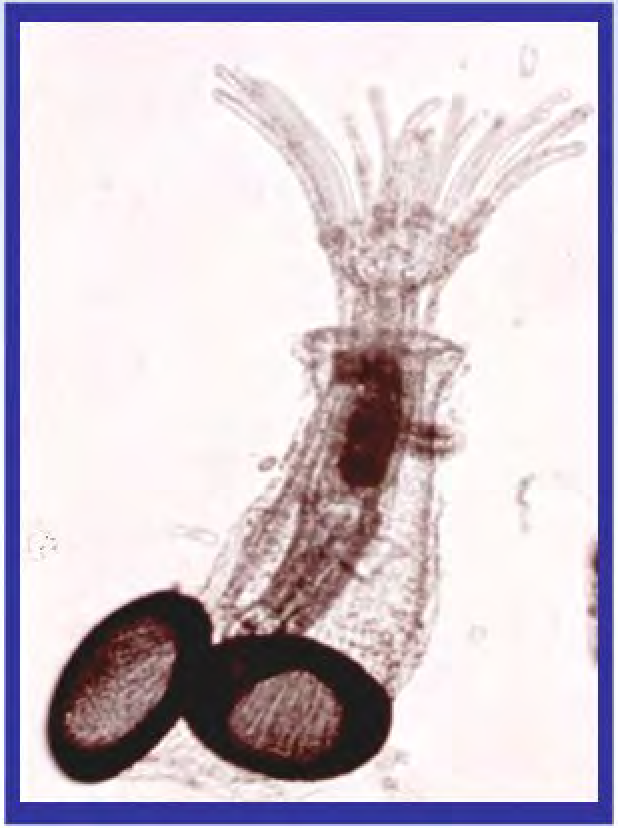
Non chemical management

- Removal of solid substrates
  - Shoreline rubble
  - Decorative fountains, etc
- Fungal teas
  - Requires several months
  - Results depend on many variable factors.

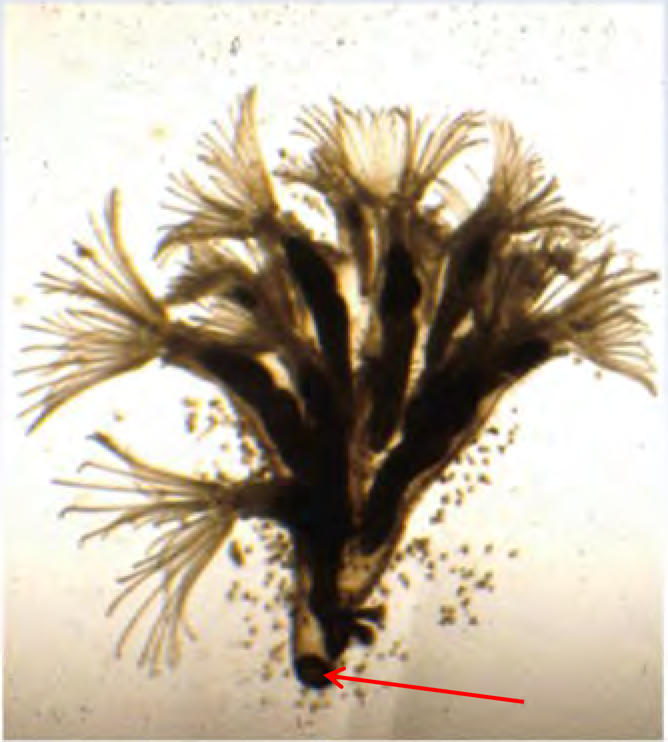
Complicating factor:



Statoblasts before their release.



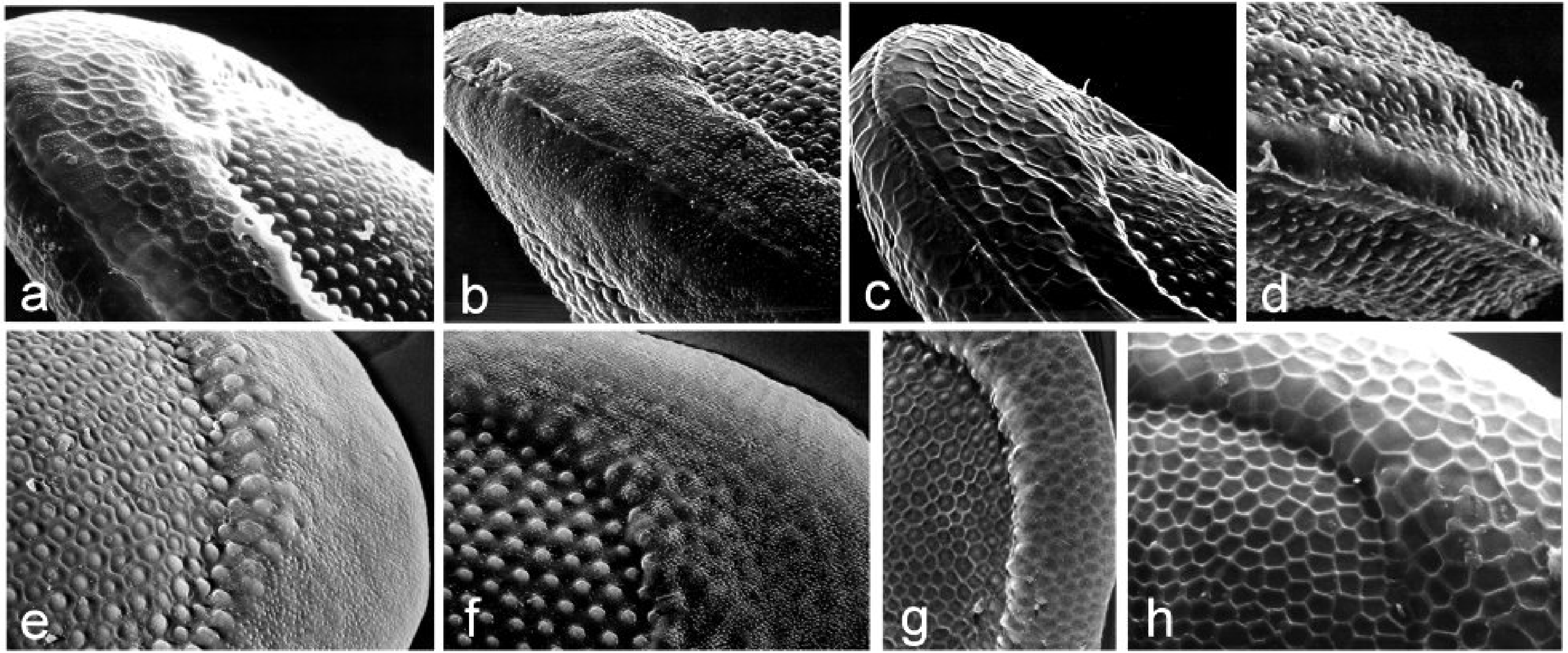
Germinating statoblast



Bryozoan colony with original statoblast still visible (arrow).

Species Identification

Scanning electron microscopy

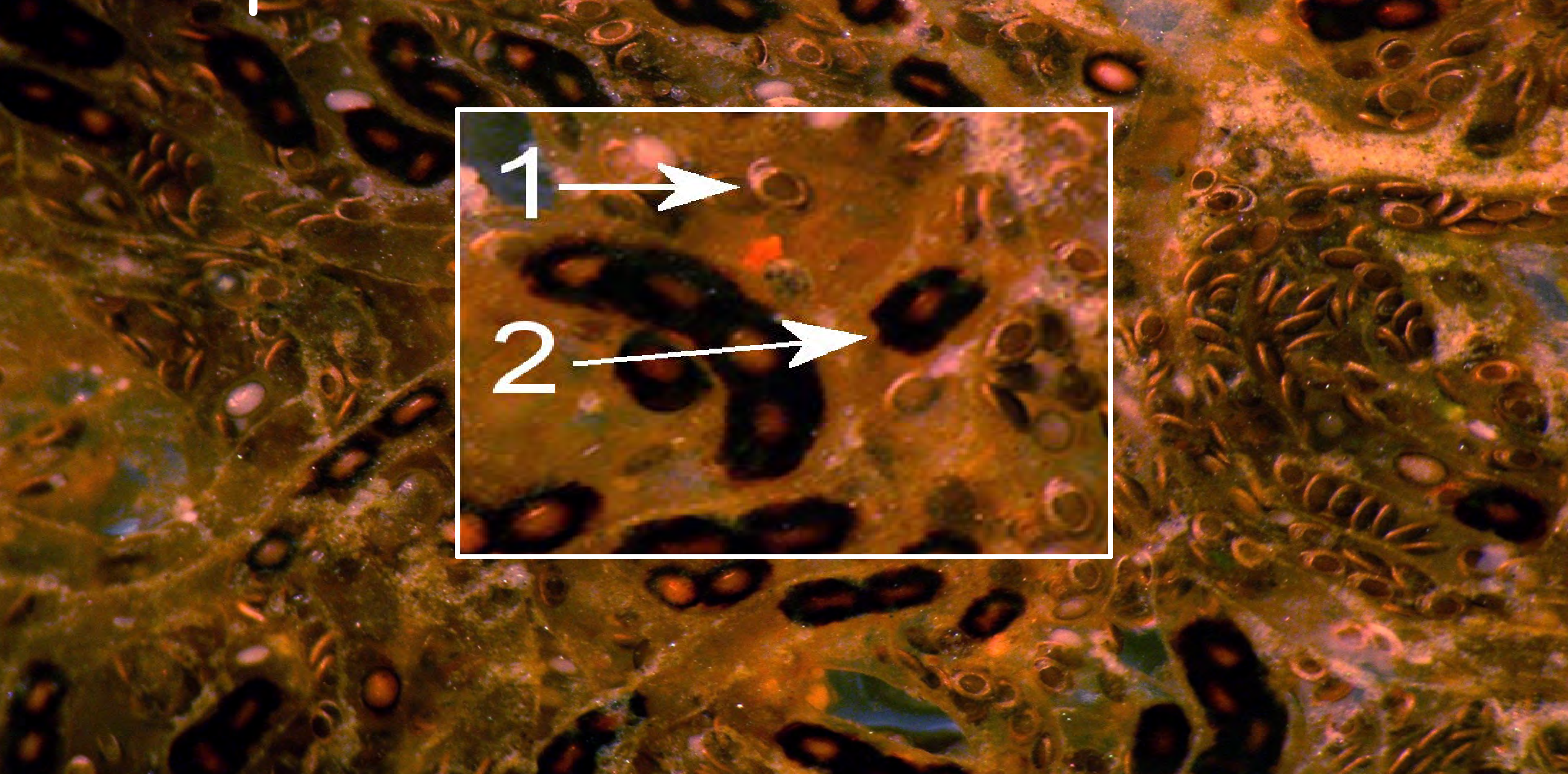


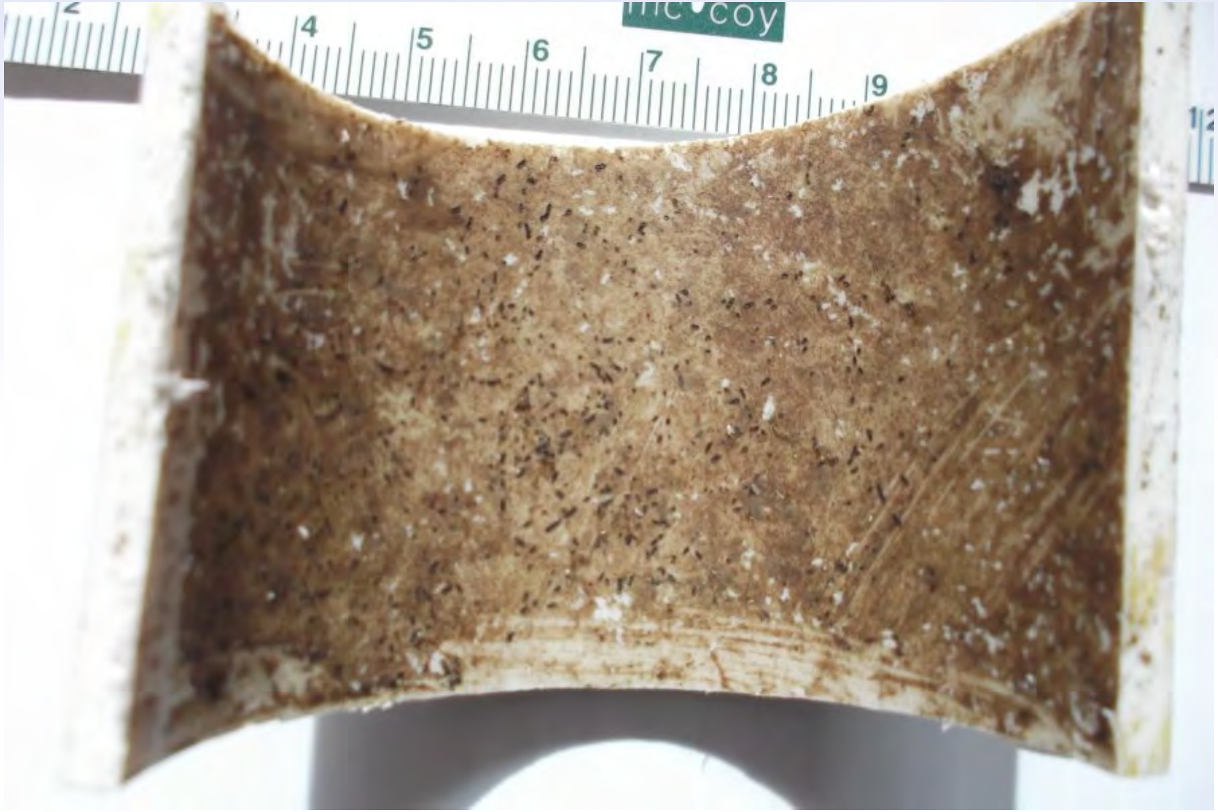
Statoblast Trap

Statoblast Q&A

- What mesh size keeps them out? 100-120 microns
- How long are they dormant? 0-30+ weeks
- What can they survive?
  Temperature extremes, harsh chemicals, drying
- What kills them?
  Boiling, strong alkali

A complication: Attached statoblasts




mc•coy

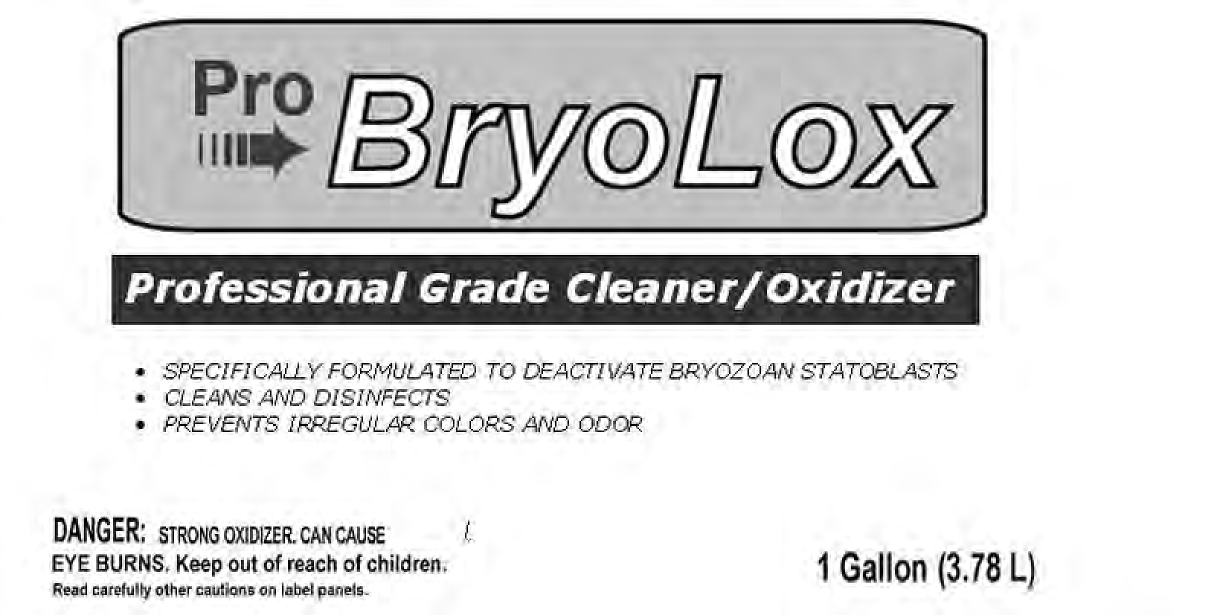
Sessile Statoblasts

Plumatella reticulata

Plumatella fungosa

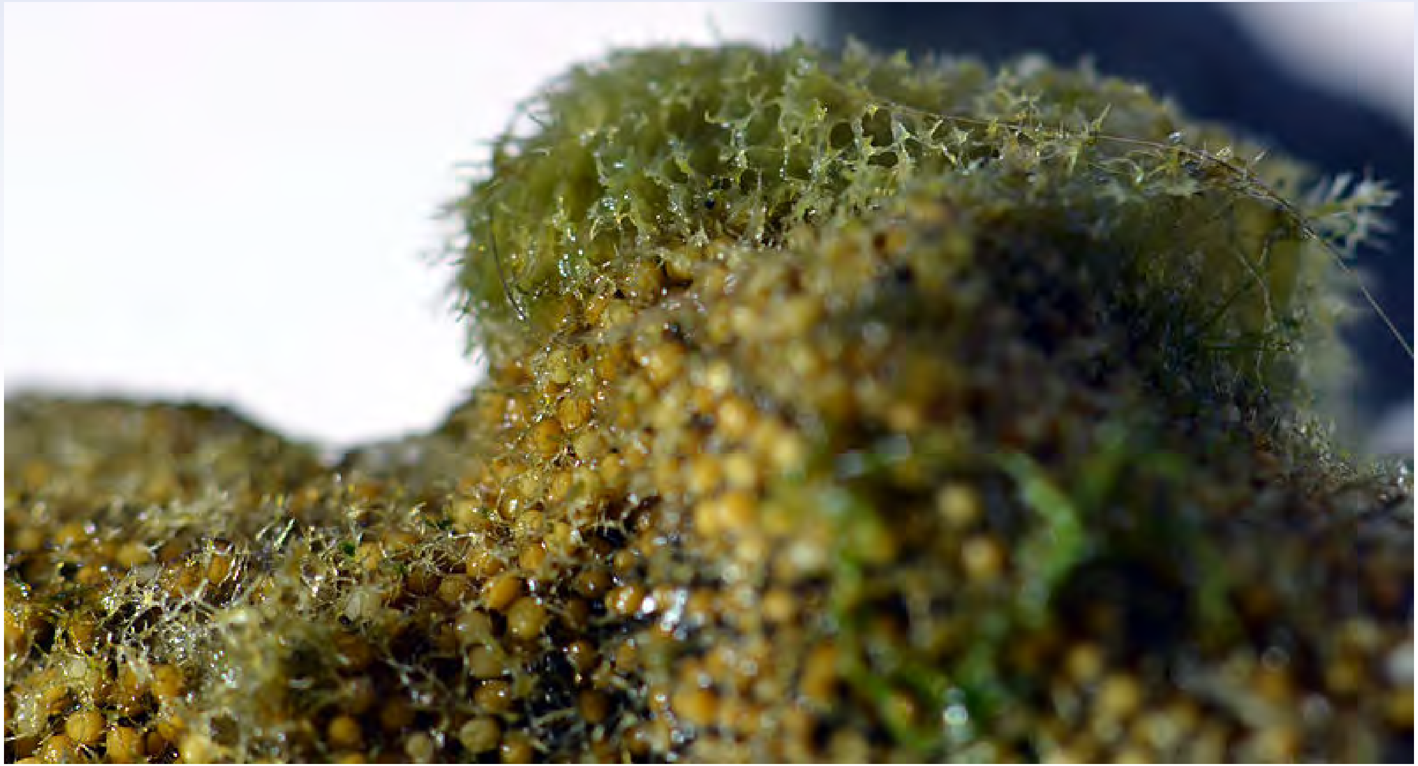
Plumatella geimermassardi

The only chemical specifically designed to kill statoblasts.



Best when sprayed on exposed surfaces out of water.

(Footnote: Bryolox also effective against sponge gemmules)

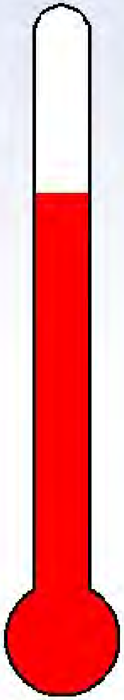


Importance of Identification

- *Plumatella vaihiriae*
- *Plumatella casmiana*
- *Plumatella fungosa*
- *Plumatella emarginata*
- *Plumatella reticulata*
- *Plumatella bushnelli*

- *Seasonal, very fast growing.*
- *Some statoblasts have no dormancy.*
- *Grows massive, dense colonies.*
- *Prefers flowing water.*
- *Hardy throughout the year.*
- *Rare, devastating, but sensitive.*

Optimal temperatures

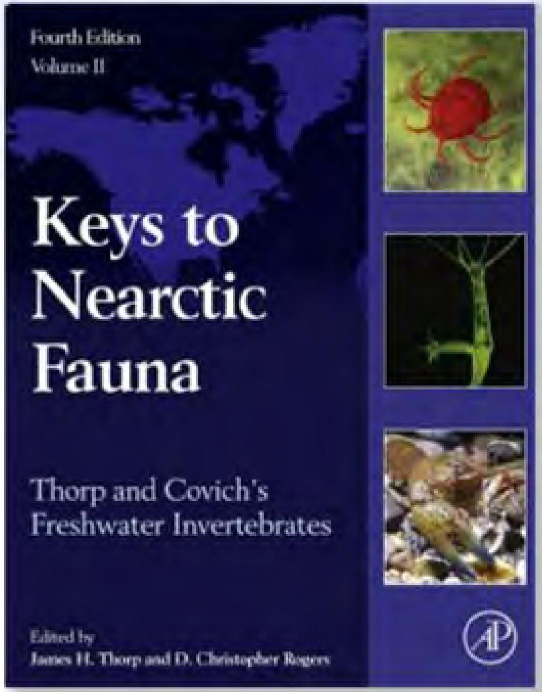


Warm: *Plumatella vaihiriae*

Moderate: *Plumatella casmiana, P. fungosa, P. emarginata, P. rugosa, P. nitens, P. reticulata*

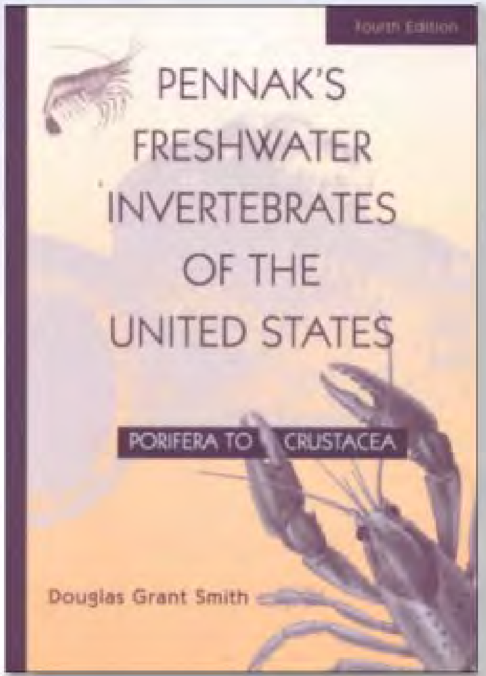
Cool: *Plumatella fruticosa, Fredericella sultana, Paludicella articulata*

Good Identification guides



Thorp & Covich

Pennak



Timing Chemical Treatments

How much time between treatments?

- Varies by species, climate, individual system.
- In general: Run first two treatments within 4-6 weeks of each other. Reason: first treatment can stimulate sessoblast germination in some spp.
- Cool climates: First annual treatment after water temp hits 65°.

Problems Without Good Solutions

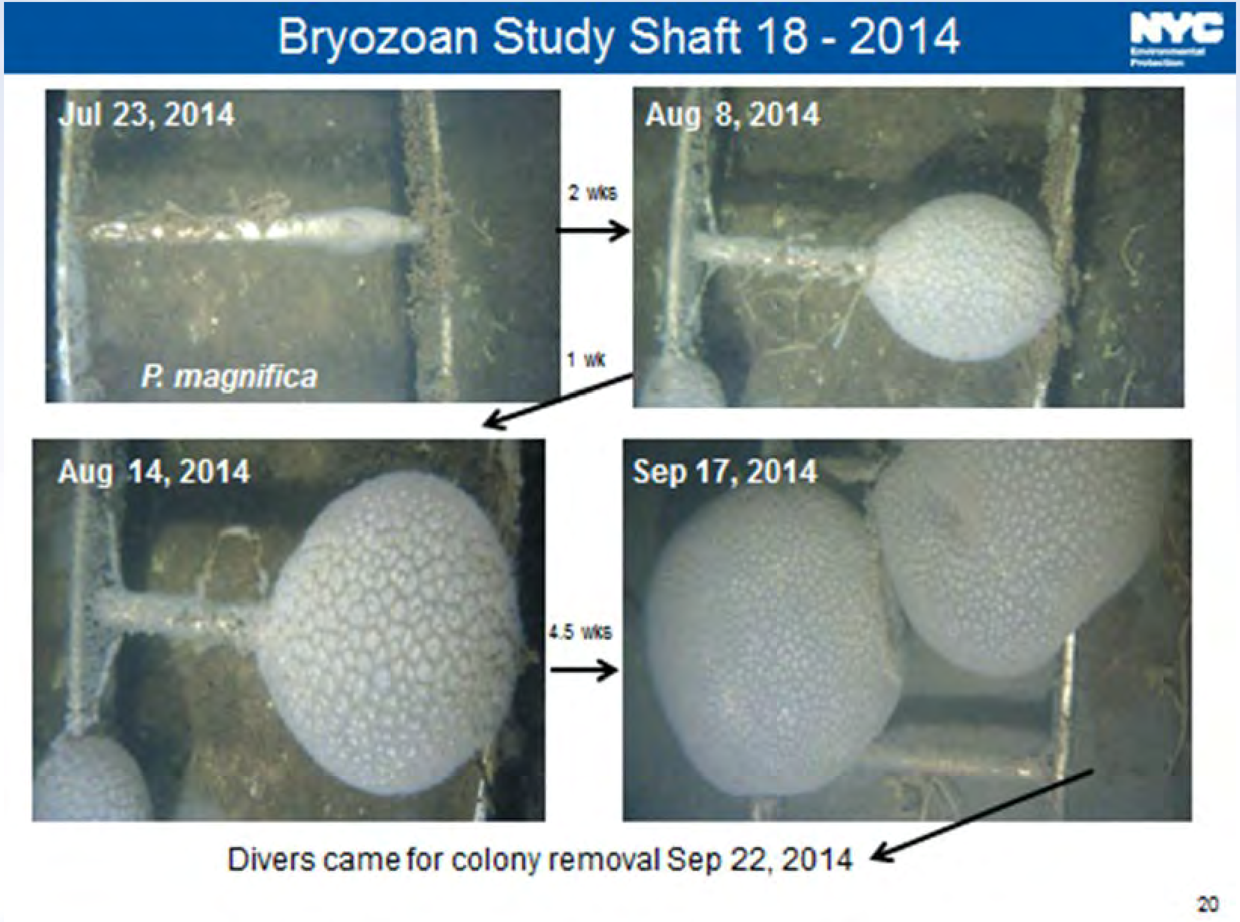
- Bryozoan: *Pectinatella magnifica*
- Hydroid: *Cordylophora* spp.
- Sponge: *Ephydatia* spp.

Pectinatella magnifica

- Native to eastern North America;
- Now in western US, Canada;
- Also spreading in Europe and Asia;
- Clogs water intake structures;
- Seldom grows inside pipelines.
- Becoming larger, more common

Even small colonies can cause considerable damage.


Starting to see
unprecedented
size.



Monitoring *Pectinatella* growth with remote cameras.

NYC Environmental Protection

Cordylophora hydroids

- Resembles many bryozoans;
- Occurs worldwide;
- Can grow thickly in flowing water;
- Requires live food;
- Very hard to kill, rapid regrowth.

Controlling Cordylophora

- Very situation specific;
- Do not try home remedies (bleach, etc.);
- Limited success with copper products;
- Contact Bryo Technologies.

Quick Fixes

Peritrichs: Try very dilute formalin (1:35,000 = 1 drop per gallon) for 1 hour or more.

Insects: Try *Bacillus thuringiensis* ("BT"), following instructions on package.

Summarizing

- No universal solutions. All options are situation specific.
- Species identification is essential.
- With chemicals: concentration, exposure, and timing are critical factors.
- Some problems have no satisfactory solutions currently available.
- BUT we are working on them!

Thank you!

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