# Developing Bermudagrass Cultivars with Improved Winter-Hardiness

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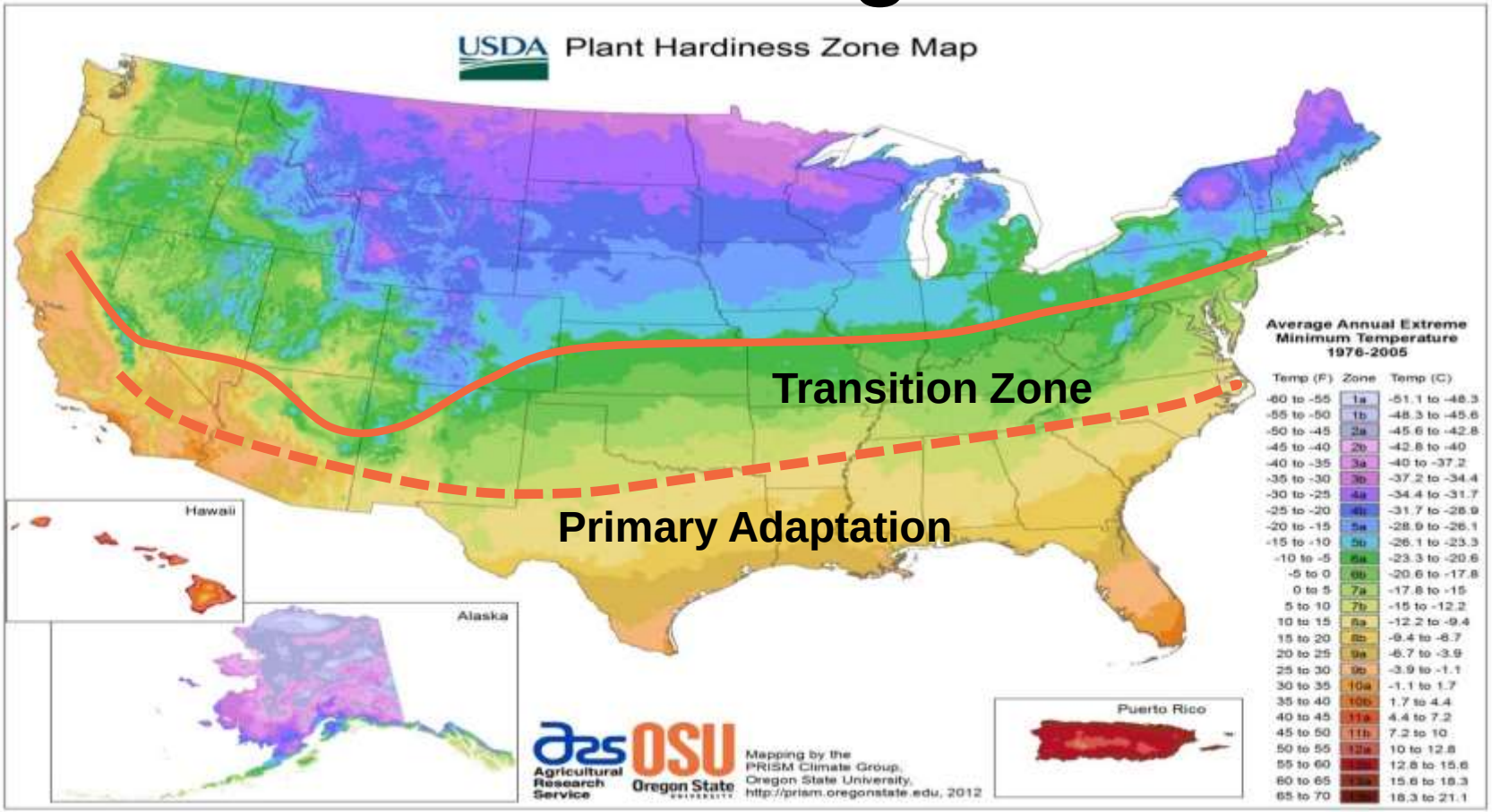
# Bermudagrass Zones



# Bermudagrass Winter-kill in the transition zone

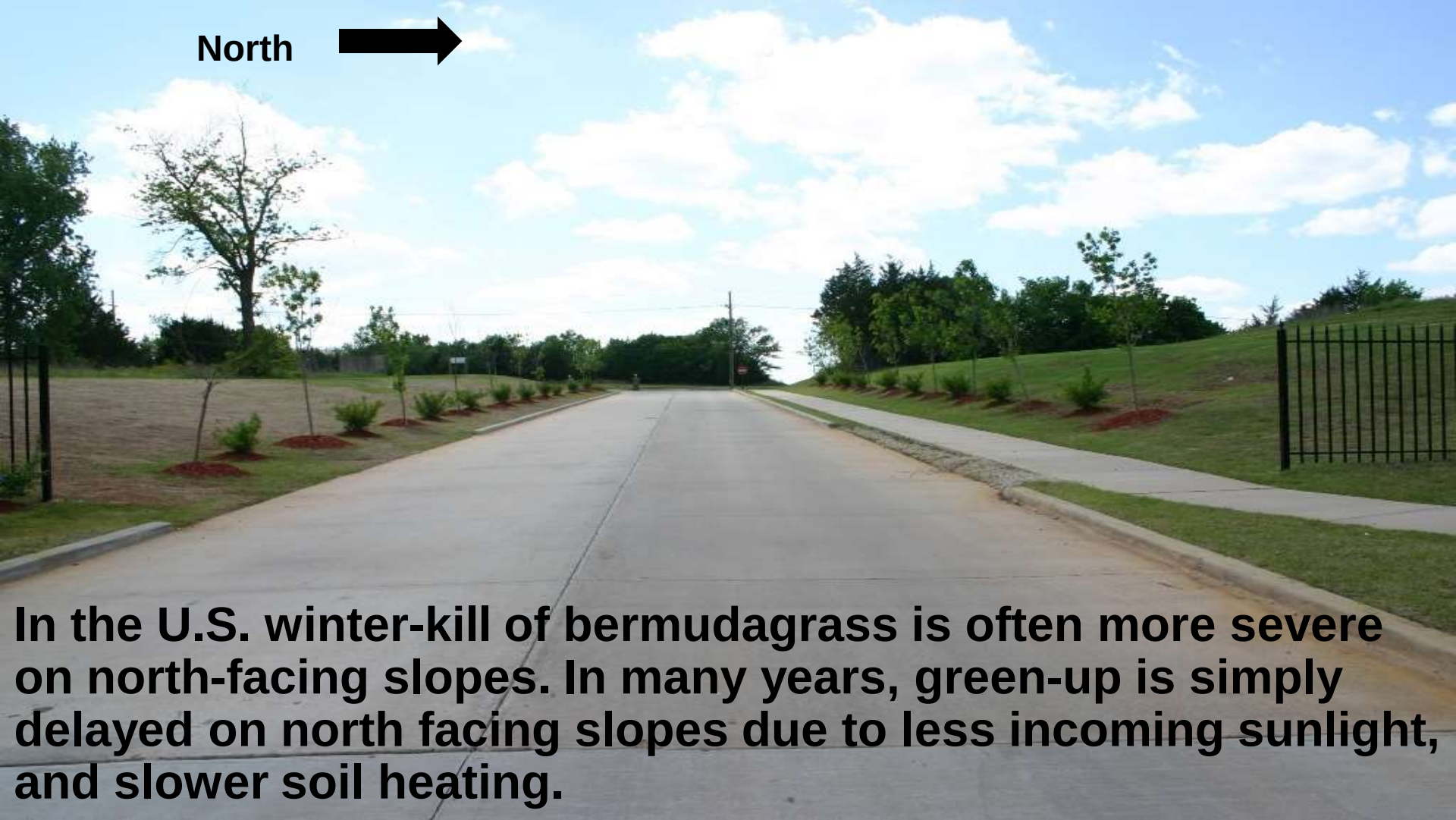
Stillwater Country Club, April 15, 2010

# Winter-kill, NTEP Trial at Stillwater – May 2010

# Cold-hardiness sometimes confused with winter color retention

# What is winter-kill?

- **Winter-kill – part or all of a grass plant or turfgrass stand dies during the winter.**
- **It's a relative term, can apply to just a single plant, portions of plants or to the grass at the stand level.**
- **Includes damage from drought during winter, low temperature injury, soil saturation, ice encasement or any combination of these stresses during the winter.**




In the U.S. winter-kill of bermudagrass is often more severe on north-facing slopes. In many years, green-up is simply delayed on north facing slopes due to less incoming sunlight, and slower soil heating.

# Low cutting height, traffic, soil compaction and shade interacted to pre-dispose this bermudagrass teebox to winter-kill.

**Tifway winter-killed in what perhaps was the outer freeze/thaw zone of a snow drift over several days. The area in the center was protected by a large snow drift.**

**Truckster drove over slush pile, traffic triggered mechanical/freeze injury to bermudagrass. A single event.**

# Traffic on path interacted with snow/ice to cause winter-kill

# In this case it is dead.

**No live aerial shoots, stolons or rhizomes present**

# Heavy traffic and compaction likely pre-disposed this sports field to winter-kill

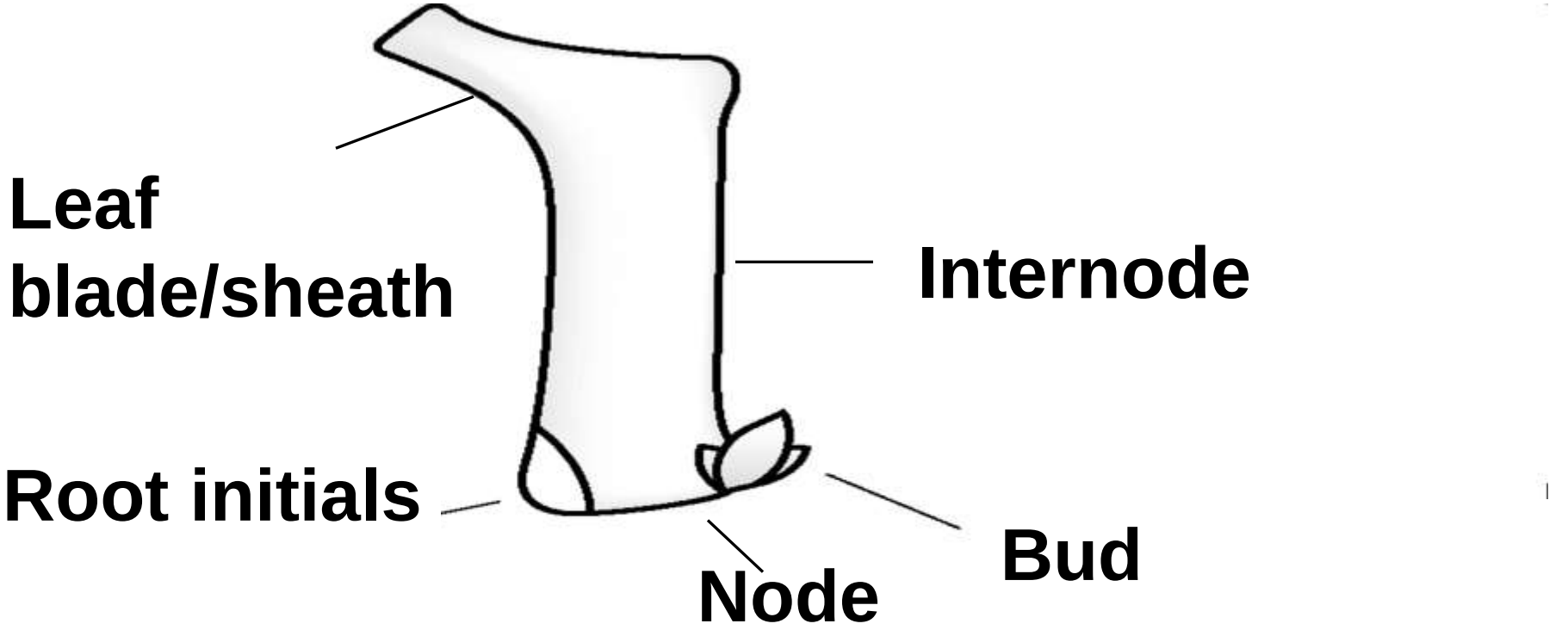
**Although dead, the grass in this plug had responded to aeration the previous year as evidenced by roots in the aerification holes.**

**Lack of surviving nodes/lateral buds on either aerial shoots, stolons or rhizomes.**

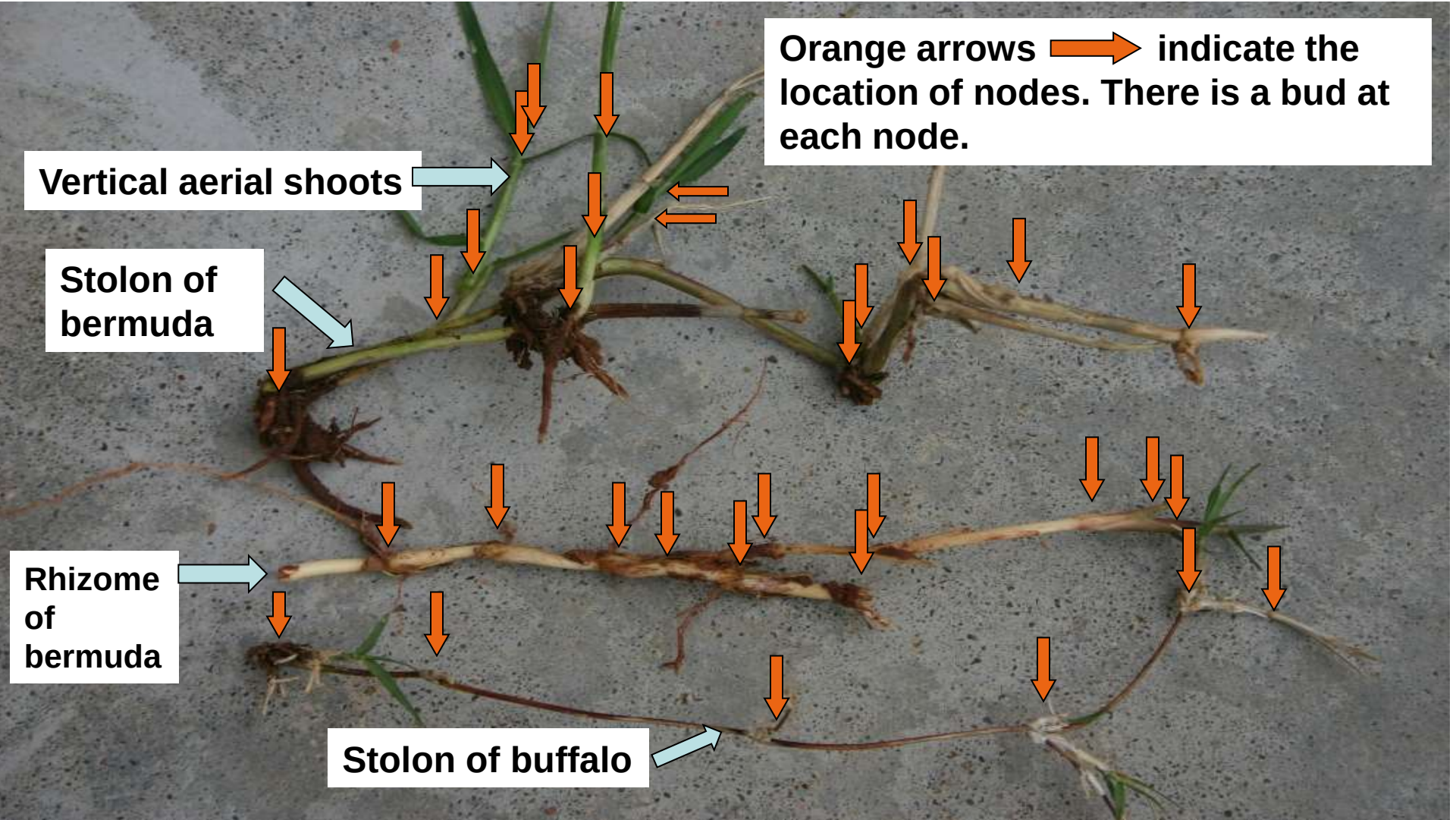
**In an area of less traffic just a few feet away, 100% live green cover. Note rhizomes.**

**Green shoots in spring are produced from lateral buds that were dormant at nodal areas that survived the winter**

# A Grass Phytomer - a phytomer is the basic repeating building block of the grass plant.




(Adapted from an originally diagram in: B. P. Forester and others, Annals of Botany 2007 100(4):725-733)


Orange arrows indicate the location of nodes. There is a bud at each node.
Vertical aerial shoots
Stolon of bermuda
Rhizome of bermuda
Stolon of buffalo

# In winter, can you tell if the aerial shoots, stolons and rhizomes of warm-season grasses are alive or dead? Yes you can!

# Example: Jan 25, 2010 canopy brushing reveals high number of green aerial shoots in American buffalograss

**Firm, green, white, red or purple internodes are alive at this time!**
**Soft, mushy, brown or straw tan internodes are dead!**

**Canopy brushing and close examination revealed no surviving vertical aerial shoots or stolons in the area of common bermudagrass. If little to no survival of aerial shoots is found, wash soil from plug and look for live white rhizomes**

**Plug of common bermuda extracted, look for live, firm white rhizomes. Washing soil from the plug can be helpful.**

**Several large, firm, white rhizomes have survived (see → arrows). This stand had delayed greenup due to loss of aerial shoots to winter-kill but regenerated rapidly from the rhizomes**

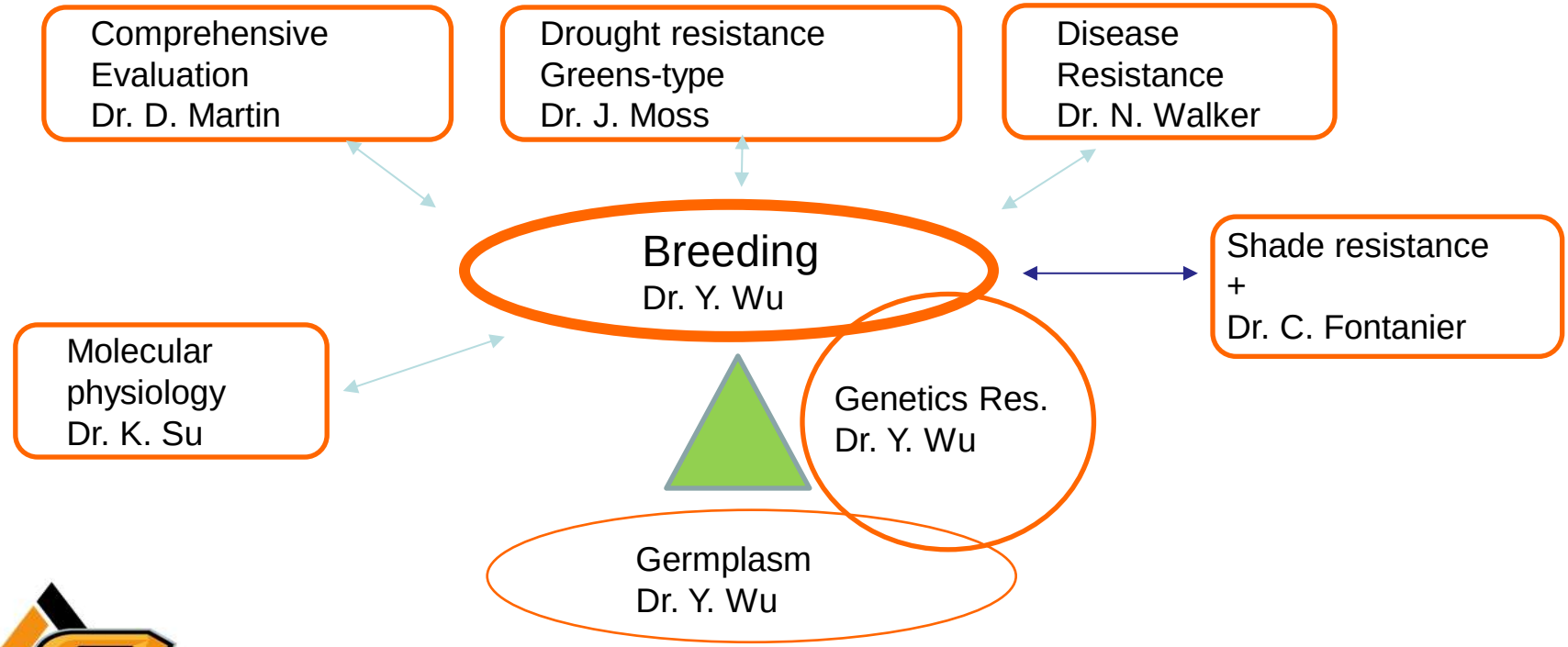
# Window Sill Method of Assessing Damage During Winter

# OK State Breeding Program

The turf bermudagrass breeding and genetics research program at OSU was initiated in the 1980s by Dr. Charles M. Taliaferro.

**The goal of the program is to develop high quality, cold-tolerant, seed and vegetatively propagated bermudagrass cultivars for the transition zone. Recently, shade, drought and salinity resistances have been targeted for improvement.**

# OK State Development Team



# Common Bermudagrass

Image credit: Dr. Yanqi Wu

# African Bermudagrass

Image credit: Dr. Charles Taliaferro

# Genetic Lottery in Breeding Clonal Varieties

Image credit: Dr. Yanqi Wu

# Large numbers in the field

Image credit: Dr. Yanqi Wu

# Great material passes the tests

# Testing of putting-green type bermudagrasses

# Winter-kill, NTEP Trial at Stillwater – May 2010

# Latitude 36 and NorthBridge


Image credit: Dr. Yanqi Wu

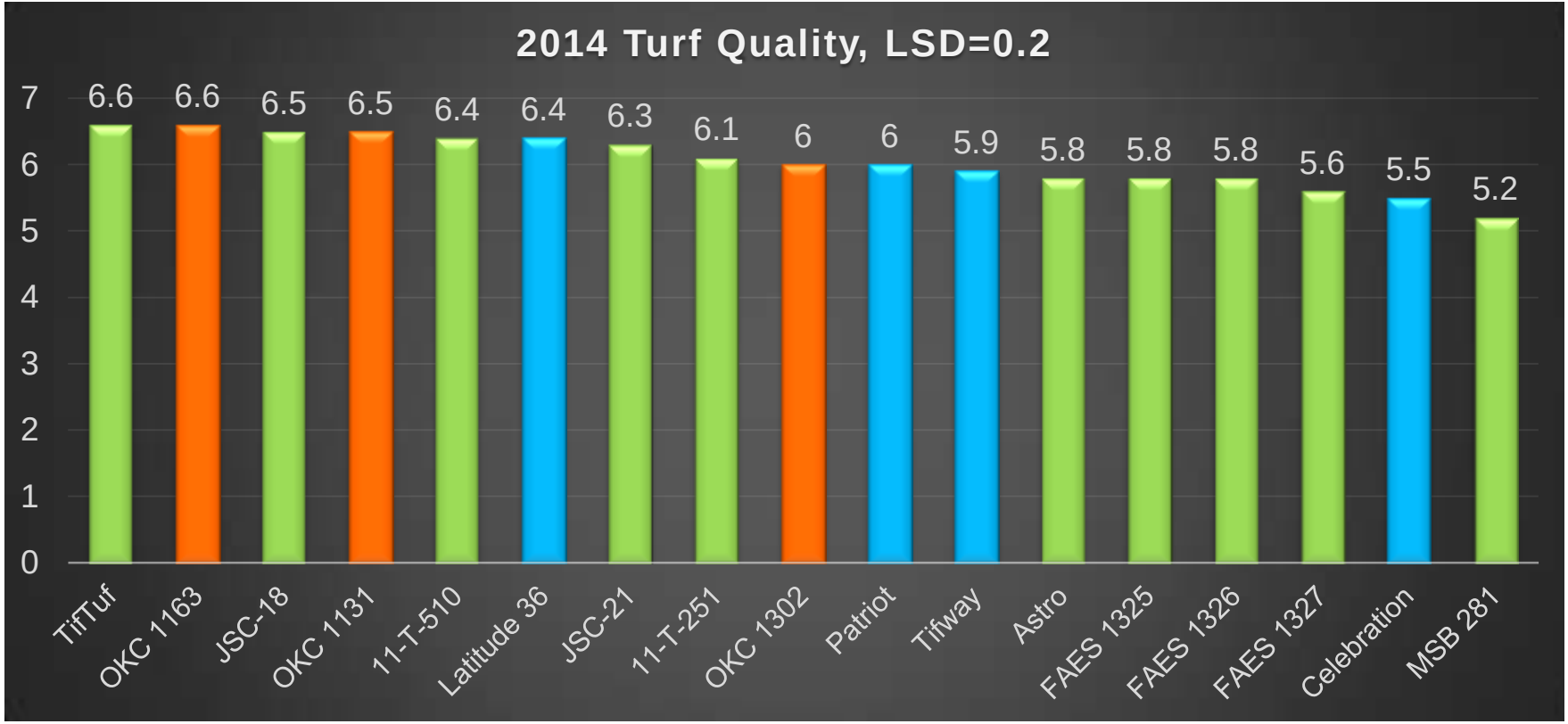
# Cold Chamber Test Findings

| Variety name | Temp (°F) killing 50% of plants |
|---|---|
| Latitude 36 | 16.88 b |
| NorthBridge | 15.98 b |
| Midlawn | 17.06 b |
| Tifway | 18.50 a |
| From J. A. Anderson (2010) | |

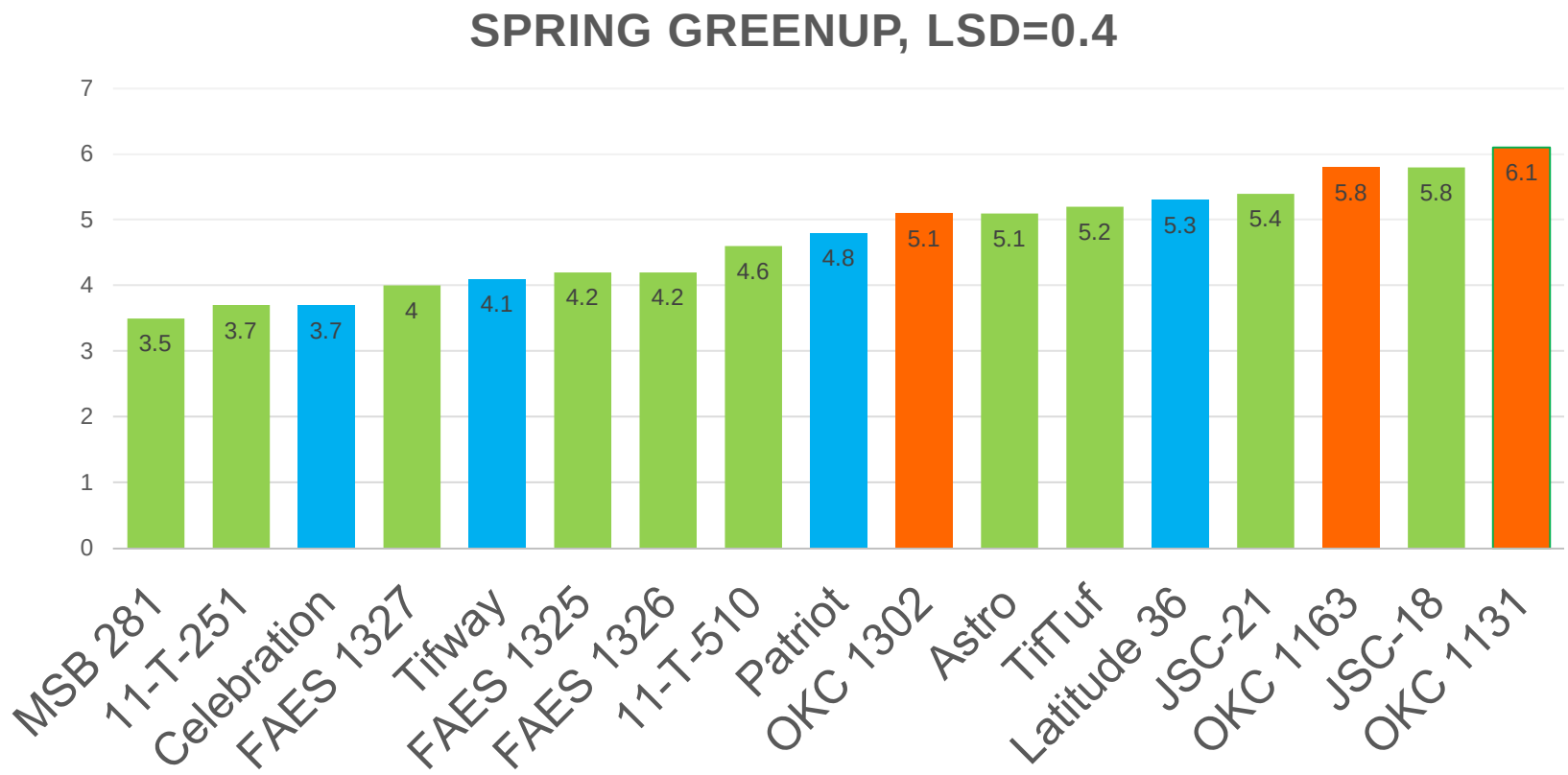
**Turf quality ranking of 31 clonal and seeded bermudagrasses in the 2007-2012 NTEP National Test**

| Entry | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|
| Latitude 36 | 1 | 1 | 2 | 2 | 2 |
| NorthBridge | 3 | 1 | 1 | 1 | 1 |
| Tifway | 2 | 1 | 2 | 3 | 4 |
| NuMex-Sahara | 31 | 31 | 31 | 31 | 31 |

# Quality of Bermudagrass Clonal Entries at 16 locations
# 2013-2018 NTEP Bermudagrass Test



# 2014 Spring NTEP Bermudagrass Test at 10 locations



# Winterkill (%) Measured Spring 2014 – NTEP Trials

| Entry ID | West Lafayette, IN | Lexington, KY | Average |
|---|---|---|---|
| OKC 1131 | 4.0 | 25.0 | 14.5 |
| Patriot | 11.7 | 50.0 | 30.8 - Standard |
| OKC 1163 | 58.0 | 36.7 | 47.3 |
| JSC-18 | 37.3 | 60.0 | 48.7 |
| Latitude 36 | 41.3 | 73.3 | 57.3 - Standard |
| Astro | 40.7 | 83.3 | 62.0 |
| OKC 1302 | 35.7 | 91.0 | 63.3 |
| JSC-21 | 68.3 | 78.3 | 73.3 |
| TifTuf | 82.7 | 94.0 | 88.3 |
| FAES 1326 | 84.7 | 93.0 | 88.8 |
| MSB 281 | 83.0 | 97.7 | 90.3 |
| 11-T-251 | 93.0 | 96.3 | 94.7 |
| 11-T-510 | 99.0 | 95.0 | 97.0 |
| FAES 1325 | 97.3 | 97.7 | 97.5 |
| Celebration | 97.3 | 98.7 | 98.0 - Standard |
| Tifway | 98.0 | 99.0 | 98.5 - Standard |
| FAES 1327 | 99.0 | 98.7 | 98.8 |
| **LSD** | **45.5** | **13.9** | **23.8** |

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# Thank you GCSAA!

# Questions?

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