

## Zoysiagrass: Nutrient and Cultural Management Practices

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## Establishment

- **Slow**
  - Limiting factor for use of zoysiagrass
- **Site Preparation**
  - Clean and rough grade soil
  - Soil Analysis / Amend soil
    - pH
    - Organic matter
  - Finish grade
  - Irrigation Installation
- **Seed, sod, sprigs or plugs**

## Establishment of Zoysiagrass Seed

- **Do not rake in seed!**
  - Zoysiagrass seed requires light
- **Use of a cover is acceptable**
  - Prevents bird feeding and washing of seed
- **Patton et al., (2004) - 'Zenith'**
  - Indiana and Kentucky
    - Planting 15 May - 15 June > 95% coverage by the first frost (early Oct.)
    - Recommended Seeding Rates: 1 – 2 lbs per 1000 ft<sup>2</sup>
    - Fertilization – Do Not Exceed
      - 1 lb N per 1000 ft<sup>2</sup> per establishment month.



## Vegetative Establishment of Zoysiagrass

- **Sod, plugs & sprigs**
- **Homeowners**
  - Sod and plugs
- **Sod Fields**
  - Sprigs and plugs
- **Golf Courses**
  - Sod and sprigs
- **2" Plugs**
  - 324 per yd<sup>2</sup>
  - 36 per ft<sup>2</sup>
- **Plugs per 1000 ft<sup>2</sup>**
  - 6" spacing
    - 4,000 plugs = 12+ yds
  - 8" spacing
    - 2,250 plugs = 7 yds
  - 12" spacing
    - 1,000 = 3+ yds
- **Sprigs**
  - 1 yd<sup>2</sup> of sod = 1 bushel
  - 200 to 400 bushels/acre

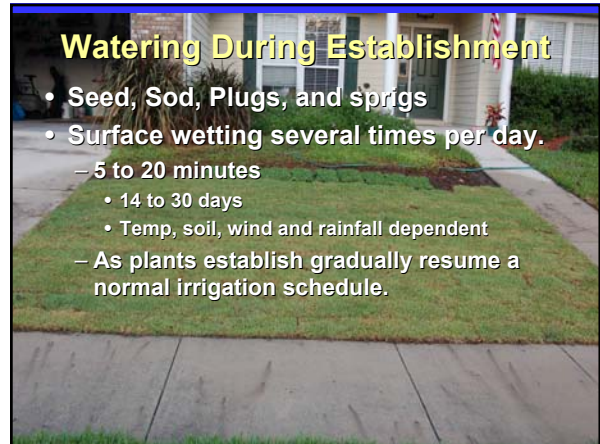


## Timing of Vegetative Establishment

- **Sod** – any time of year
- **Plugs and sprigs**
  - May and June for fastest establishment
  - Fertilization: Do Not Exceed
    - 1 lb N per 1000 ft<sup>2</sup> per establishment month.
- **Rapid establishment is critical for sod growers and golf courses**
  - Not all cultivars are equal (Patten et al., 2007)
    - Coarse textured > fine textured
    - Coarse: El Toro, Palisades > Empire, Meyer
    - Fine: Zorro > Emerald, Zeon
  - Fast cultivars → stem production
  - Slow Cultivars → leaf production

## Watering During Establishment

- **Seed, Sod, Plugs, and sprigs**
- **Surface wetting several times per day.**
  - 5 to 20 minutes
    - 14 to 30 days
    - Temp, soil, wind and rainfall dependent
  - As plants establish gradually resume a normal irrigation schedule.



## Mowing and Zoysia

- Proper mowing
  - Enhances plant growth and development
  - Never remove more than 1/3 of top growth
  - Stimulates lateral growth (tillers and stolons)
- Cut too close → result in scalping or removal of growing point
- Cut too infrequent → result in scalping as the growing point may be too high.



## Scalped Turf

- Removal of growing point/crown
  - Unsightly
  - Poorly adjusted equipment
  - Seasonal response
  - Detrimental to plant health
- Recovery: from crown of plant
  - Slow
  - Species dependent

## Scalping

- Plant response
  - Loss of Photosynthetic activity
  - Requires a metabolic change in the plant
    - Consumption of CHO
    - Recovery is species dependent

## Mowing

- Reel and Rotary mowers
- Broad range: 0.25 to 2.5 inches
  - Includes all cultivars
- Cultivar and Species Specific
  - *Zoysia matrella* (fine textured)
    - 0.5 to 1.5 inches
    - Exceptions: Diamond, Pristine, Cashmere
      - 0.25 inch
  - *Zoysia japonica* (coarse textured)
    - 1 to 2.5 inches

## Mowing

- Frequency
  - < 0.75 inch: 2 x per week
    - 3 x with increased N
  - 1 inch: once per week
  - > 1.5: once every 10 to 14 days
    - Increase frequency with increased N

## Thatch

- Intermingled layer of dead and living shoots, stems, and roots that develops between the zone of green vegetation and the soil surface.
- Friend or Foe?
  - Moderation → Friend
    - ¼ to ½ inch
      - Retain moisture, protect turfgrass crowns from temperature extremes and physical damage.
      - Provides a cushion for athletic activity
  - Excess → Foe



## Thatch

- Why thatch forms?
  - Growth rate of turf > decomposition of dead tissues
  - Result → spongy, unhealthy turf
- Problems
  - Mower sinks into turf and scalp results
  - Hydrophobic thatch prevents wetting and increases runoff → drought stress
  - Wet thatch → ideal environment for disease
  - Increase insect populations
  - Growth of turf (crowns, lateral stems, & roots) is elevated above the soil surface → increases temperature and moisture sensitivity

## Thatch and Zoysia

- Zoysia spreads through the production of lateral stems (rhizomes and stolons).
- Lateral stems are resistant to decay
- Easily result in excess thatch
  - Associated with too much lateral stem production.
    - Influenced by:
      - Nitrogen management
      - Mowing off of more than 1/3 of shoot growth

## Thatch and Zoysia

- Management
  - Zoysia in full sun = thatch
    - Don't fertilize for excess color
    - Frequent light applications of nitrogen
      - decomposition rates = growth rates
  - Home lawns
    - De-thatch (power rake) or scalp each spring
      - Timing → Grass is actively growing
      - Turf will recover with minimum weed encroachment



## Thatch and Zoysia

- Management
    - Golf Courses
      1. Aggressive vertical mowing 1 to 2 times per year
      2. Replacement of one normal mowing per week with light vertical mowing
      3. Use of groomers in combination with reel mowers
- Encourage new shoots to emerge with upright growth



## Verticutting vs Grooming

- Vertical blade thickness
  - Verticutter > 1/8"
  - Groomer < 1/8"
- Rotational Speed
  - Reels 2300 rpm
  - Groomers 2900 rpm
  - Verticutter 1800 rpm

## Verticutting vs Grooming

- Verticutting (Remedial)
  - Reactive to thatch accumulation/scalping
  - Effort to re-establish the growing point near the soil surface
  - Topdress – raises the growing point
- Grooming (Proactive)
  - Consider as normal management
  - Maintains the growing point near the soil surface

## Grooming

- Reduces the need for vertical mowing
- Enhances recovery from injury
- Decreases incidence of disease
- Improves water infiltration
- Earlier spring green up
- Better fall overseeding transition
- Better spring overseeding transition
- Improved winter survival due to increase in stored Carbohydrates.

## Shade and Zoysia

### Cultivar and Species Specific

<ul style="list-style-type: none"> <li>• <i>Zoysia matrella</i> <ul style="list-style-type: none"> <li>– Good to excellent shade tolerance</li> <li>• Diamond → excellent</li> <li>• Cavalier → Very good</li> <li>• Emerald → Good</li> <li>• Royal → Good</li> <li>• Zorro → Good</li> <li>• Zeon → ?</li> <li>• Pristine → ?</li> <li>• Cashmere → ?</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <i>Zoysia japonica</i> <ul style="list-style-type: none"> <li>– Poor to Very good</li> <li>• Palisades → Very Good</li> <li>• Jamur → Very Good</li> <li>• El Toro → Fair</li> <li>• Crowne → Fair</li> <li>• Empire → Poor</li> <li>• Meyer → Poor</li> <li>• Ultimate → ?</li> </ul> </li> </ul>
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## Shade and Zoysia

- Problems
  - Decreased photosynthesis
    - ↓ carbohydrate reserves
    - ↓ root, rhizome and stolon growth
  - Increased production of gibberellic acid (GA)
    - Plant hormone → cell elongation and division
  - Result: Thin elongated leaves that will not stand up to traffic and secondary stress.

## Shade and Zoysia

- Management
  - Trees
    - Removal
    - Prune limbs below 10 feet.
    - Thin tree canopy
  - Irrigation
    - Monitor moisture status of turf
      - Trees compete for moisture
      - Shade prevents surface drying of turf leaves → disease

## Shade and Zoysia

- Management
  - Nitrogen
    - Increases elongation of leaves
      - Excess growth depletes carbohydrates and weakens root system.
    - Limit nitrogen to maintain acceptable color
  - Divert Traffic
  - Increase mowing heights
    - Accounts for elongated leaves
    - ↑ leaf area available for photosynthesis

## Shade and Zoysia

- Management
  - Plant Growth Regulators: Trinexapac-Ethyl (TE)
    - Inhibits GA production
    - Conserves carbohydrate levels
    - Prevents excessive leaf elongation
    - Improves shade tolerance
    - Examples:
      - Ervin (2002): Monthly 1x TE applications on Meyer under 75% shade maintained acceptable quality longer than without TE.
        - » The authors speculate that with thinning of trees and better distribution of traffic that Meyer could be maintained for multiple years using TE.

## Shade and Zoysia

- Management
  - Plant Growth Regulators: Trinexapac-Ethyl (TE)
    - Examples:
      - Qian and Engelke (1999) reported that monthly or bimonthly application of TE greatly enhanced the shade tolerance of Diamond zoysiagrass up to 88% shade levels
      - Documented:
        - » ↓ shoot elongation
        - » ↑ tiller density
        - » ↑ carbohydrate reserve
        - » ↑ root system
        - » ↑ canopy photosynthesis
        - » ↑ turf quality

## Irrigation/Drought Resistance and Zoysia

- Yes, zoysiagrass is drought resistant
- MEANING?
- Mechanisms of Drought Resistance:
  1. Avoidance
    - Deeper roots
    - Dormancy
  2. Tolerance
    - Osmotic adjustment
    - Withstand low water potential

## Irrigation/Drought Resistance and Zoysia

- Zoysiagrass will persist through long-term drought.
  - Wilts Quickly
  - Enters Dormancy (avoid)
  - Texas A&M research
    - 60 day drought
      - 7 zoysia cultivars < 1.5% green
      - Floratam – 20% green
      - Tifway – 50% green
      - Celebration – 71% green

## Irrigation/Drought Resistance and Zoysia

- Irrigation is required for zoysiagrass to remain green during dry periods.

## Austin Golf Club



## Nutrient Management

- Studies
  - Texas (3)
    1. Nitrogen rates of 0.25, 0.75, & 1.5 lb N/1000 ft<sup>2</sup> applied across four dates (totals were 1, 3, & 6 lb)
      - 1 lb rate had better winter color and spring greenup
      - Higher rates resulted in better summer quality
      - Engelke et al., (1992)
    2. Nitrogen rates of 0.25, 0.5, & 1.0 lb N/1000 ft<sup>2</sup> per growing month
      - 1 lb per month produced the highest quality
      - Hall et al., (1998)
    3. Nitrogen rates of 1, 2, and 4 lb N/1000 ft<sup>2</sup> per season
      - 2 to 4 lb rates produced the highest quality
      - Kenworthy and Engelke (1999)

## Nutrient Management

- Studies
  - South Carolina (Hale, 2006)
    - Nitrogen rates of 0, 0.25, 0.5, 0.75, & 1.0 lb N/1000 ft<sup>2</sup>/month
      - 4 applications = 0, 1.0, 2.0, 3.0, & 4 lb N/1000 ft<sup>2</sup>/year
      - Fine textured
        - » Increased thatch with > 2 lbs N per year
        - » Reduced spring greenup with > 2 lbs N per year
        - » Scalp damage with > 2 lbs N per year
      - Coarse textured
        - » Increased thatch with > 2 lbs N per year
        - » Reduced spring greenup with > 2 lbs N per year
      - Overall
        - » 1 to 2 lbs resulted in the best overall cultivar performance.

## Nutrient Management

- Recommendations for Florida (Unruh et al., <http://edis.ifas.ufl.edu/LHO11>)
  - 3 to 6 applications of 1 lb N per 1000 ft<sup>2</sup>
    - Desired level of management
    - location

## Nutrient Management

- Frequent light applications are best
  - Prevents thatch accumulation
  - Enhances spring greenup
  - Prevents disease
  - Improves wear tolerance
  - Improves playability
- Do Not promote excessive green color
  - Encourages thatch
  - Slows spring greenup
  - Promotes disease development
- Early Spring fertilization
  - Late frost can damage and delay greenup
  - Promote large patch development

## Nutrient Management

- Late Fall fertilization
  - Delay spring greenup
  - Promote large patch development
- Enhancing Spring Greenup
  - Apply fertilizer after the turf has become fully green and actively growing.
  - Apply iron
- Potassium
  - Apply at rates equal to nitrogen
  - Improves stress tolerance