

Sportsfield Maintenance: Agronomic Standards

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Scope: Turf Industry

- Estimated 360,000 hectares of managed turf in the prairies; Alberta, Sask., Manitoba
- Annual expenditure of \$1.6-2.2B/yr
- Prairie turf represents
 - Sod growers
 - Lawn care companies & homeowners
 - Schools
 - Parks & Sports fields
 - Golf Courses

Community Benefits of Turf

1. Physical activity

a. Reduces health care

2. Economic generator

a. Grows communities via Rec. venues

3. Benefits mental health

a. Social service costs



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Environmental Benefits of Turf

- 1. Reduces Runoff
- 2. Prevents Erosion
- 3. Replenishes air
- 4. Promotes safety
- 5. Regulates Temperature
- 6. Sequesters Carbon



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Agronomic Principles For Better Turf

- Plant Available Water
- Soil Health and Nutrition
- Cultural Strategies

Comparing Sand vs Soil

Internal Drainage



Surface Drainage



Organic accumulation, especially in the upper profile, apparent after 11 years in this sand-based football field sample core. © Ross Kurcab, CSFM

Sand or Soil? Variables of Consideration

- Region and Climate
- Soil depth
- Base Drainage
- Hydraulic conductivity
- Irrigation source
 - salinity & availability
- Compaction tolerance
- Cost



Type A - Sand Based, Internal Drainage

Perched table

California Method



Type C+ - Soil Construction w/Surface Drainage



Sand vs Soil: Plant Available Water

• Saturation, Field Capacity, Permanent Wilting point

Maximal water capacity (SW _{max})	Field Cap	acity (FC)	Permanent Wilting Point (PWP)	
Gravitation	Gravitational drainage		Plant available water (PAW)	

Soil Water: <u>Adhesive</u> and <u>Cohesive</u> Water

- Together, <u>adhesion</u> and <u>cohesion</u> create a film of water around soil particles
- Cohesion water is held loosely, can move in the soil, and be absorbed by plants
- The water rises to the point where gravity balances the adhesive and cohesive forces, resulting in field capacity



Soil Moisture & Capillary Rise

- Finer soils are affected
- Upon capillary rise, the soil water climbs to the soil surface
- Image:
 - fine textured soil
 - as capillary water rises, it carries dissolved salts
 - left behind (white salt crust)from evaporation





Shallow soils:

- Low sod strength
- Slow recovery
- Reduced gas exchange slows photosynthesis, growth is inhibited
- Capillaries wick from subsoil
- Surface never dries out



Minimum Soil Depth – 8"

- Common in residential developments
- Plants in shallow soils exhibit symptoms of nutrient deficiency, and will wilt, similarly to effects of water stress
- Carbon dioxide and toxic materials often build up in the soil (black layer)



Image: Black Layer

Movement of Water in Soils 3:34m, 5:34m,8:00m



When Soil Depth is inadequate

- Tendency to overwater
- Water displaces air required for respiration
- wet soils rapidly become oxygen deficient, or ANAEROBIC
- "Wet Wilt" plant suffocates



Image: Wet Wilt

Inadequate subgrade



Soil Health: "Tough Love"

Ensure adequate soil depth
Frequent watering promotes shallow rooting
Water deep, infrequently
Make roots work for it they will be better conditioned for summer stress



Example: Not Promoting "Tough Love"

- Frequent watering & fertilization promotes shallow rooting
- Maintain adequate moisture, apply when wilt is imminent
- Water deep, infrequently -"Tough love"
 - Make roots work for it they will be better conditioned for summer stress



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Motivation: Costs of Overwatering

Costs:

- Water costs
- Power to pump
- Wear and tear on irrigation systems
- reduced playability
- Mind infiltration rates
 - cycle/soak
 - Water for moisture NOT convenience



Soil Nutrition:



- Diagnose soil nutrient availability
- Determine soil pH
- Turf programs are often custom
 - regions and required nutrients are predictable (AB soils)



Buffered soils

- pH = Potential of Hydrogen
- Highly buffered soils must be managed for the unavailable nutrients
- Acid soils can be treated with Lime to increase pH
- We cannot lower pH we manage it



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Product choices



- Filler is added to assist spreading evenly
 - esp. w/low rates
- Particle sizing choices intended to penetrate canopy. Smaller=\$\$
- Consider granular rates and realistic applications



Blended VS Homogeneous





Urea: Pale yellow Phosphorus = White Potassium=Potassium



Organics

- Low N/P/K
 - o **5-4-2**
- Only effective during summer/warm periods
- Require microbial breakdown
- Very safe non burning
- Can be applied anytime
- Solar radiation benefit



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Goals for Nutrition:



- Minimizing losses
- Consistent application
- Avoid flush growth
- No speckling/burning
- Balanced feeding

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 \circ = No Bailing Hay!

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Shade and Energy

- Active chloroplasts (green grass) means turf is photosynthesizing
- Every day, turf builds energy/carbs to survive summer stress & winter
- *in the absence of light* turf utilizes its stored energy.





Carbohydrate and Storage





Spring Green-up

- Fall feed .5N/.5K minimum
- 10'C is minimum temp for germination of new seed
- .5lbs/P/1000ft² bi-weekly until established
- Evergreen tarps can speed recovery
- Seed to soil contact will improve establishment
 - slit seeders are great!



Minimizing Losses: Nitrogen actual uptake 40-70%

Immobilization - NH4NO3 - 10-40%

Leaching - NO3 - 0-20%

Volatilization - NH3 - 0-30%

Denitrification - NO3 - 35%



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Minimizing losses: Solubles

- Are soil active
- Applied at low rates
 .1-.75lbs/1000ft²
- Last between 10-14 days
 - o additives can extend
- Work well with surfactants drawn to roots
- Ideal when utilized with a granular program to "top up"
- Best for low rates



Minimizing losses: Slow release particles

- Controlled, uniform release
- More durable coating
- N, P and K coatings
- Release specified by manufacturer
- 75% slow release means 25% immediately available for "kick"



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Minimizing Losses:Foliar Feeding

- Uptake through waxy cuticle and stomata
- o ultra low rates (.001lbs/1000ft²)
 - o multiple apps req'd
 - "+" charged particles enter readily
 - Molecular size limitation
 "++"
- 76% absorption
- Circumvent soil problems
- o <2% loss
- Passive Process (Osmosis)
- organic chelated agents help penetrate the waxy cuticle





Minimizing losses: Stabilized Nitrogen

- Slowing nitrate to nitrite conversion
- Ammonium is stable.
 - NH4+ is positively charged, and held by negatively charged soil particles
- Nitrate is prone to leaching
 - (N03-) is negatively charged
- Stabilizing agents <u>slow nitrification:</u>
 - reduce the rate of nitrification in soils, which converts ammonium (+) to nitrate (-), and nitrate to nitrite (unavailable)



Stabilized Nitrogen Additive: Urease inhibitor NBPT (n-butvl thiophosphoric triamide)

- 1. Urea is converted via hydrolysis
 - Urea is transformed into <u>ammonium</u> (NH4+) via urease enzyme
 - Urease inhibitor <u>slows rate of</u> <u>hydrolysis</u>, to reduce volatilization
 - common in high pH








Nitrification Inhibitor: DCD (dicyandiamide)

- 2. Urea is converted via Nitrification
 - Conversion of <u>ammonium</u> (via bacteria) to <u>nitrate</u> (NO3-)
 - DCD inhibits
 denitrification bacteria
 - slows the conversion of ammonium (stable) to nitrite (unstable)





Nitrogen Management Strategies

When should I use Stabilized Nitrogen?

- Soils with high microbial populations will be most affected by stabilizers
- More valuable in warmer, wetter weather and climates (when microbes are active)
- Like organic fertilizers, stabilizers will have greatest effect in high microbe soils
- Fall applications proven to increase available N in the spring
 - (Prairie Turfgrass Research Center @ Olds College)



RCWReportNitrificationInhibitors.pdf

http://www.ipni.net/publication/nss.nsf/0/21B8084A341C98E085257E3C0077595B/\$FILE/ NSS-26%20Nitrification%20Inhibitors.pdf

Alberta's Sodic Soils



Steve (Na+)

John Dalton (Ca++)



Cultural Alternatives



Thatch Management





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Culprits of Thatch Buildup

- Thatchy species
- reduced microbial activity
- suppression of earthworms
 - insecticides, topdressing, compaction
- Excessive fertilization



Thatch removal: Vertical Mowing

- Dead and living layer of organic matter
- Propagative points (stolons, Rhizomes are contributors)
- If thatch is deeper than ⅓ height of cut, aeration will be necessary
- Microorganisms break down thatch - provided soils are healthy



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Thatch: Vertical Mowing

Clippings do not contribute to thatch





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Aeration





Aerification:

- × Relieve soil compaction.
- × Restore soil air and water pore spaces.
- × Enhance water & air movement into the soil.
- × Removes thatch
- × Changes or modifies soil structure.
- × Stimulate root growth.



Coring Alternatives





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Solid Tine Aeration



Alternatives to coring: Slicing and Spiking



TOPDRESSING

- × Coarse over fine
- × Eliminates surface irregularities
- × Modify soil profile
- X ¹/₃ Rule : Don't bury



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Topdressing w/compost

- × Slow release Nitrogen source
- × Safe, non burning
- × Combined with Clay, produces topsoil
- × Improves soil structure
- \times Incorporate with aeration



Topdressing and Rootzones: particle sizes







OVERSEEDING



Cultivar Choices

- New and improved cultivars are produced annually
- Salt tolerant
 - Drought tolerant
- Deep green/low fert
- □ NTEP
 - National Turfgrass
 Evaluation program

Apply the right tool for the job



Overseeding Success

- Seed to soil contact
- Pure Live Seed
- Germination rate
- Frequent LIGHT irrigation until germinated
- Starter (post germination)
 - 12-30-8 (or similar)
 - .5lbsP/1000ft² bi-weekly
 - 4x or until established





Field Improvements



Sharp blades





Aesthetics and striping





Implements







Educate - Proper Equipment





Common Problems

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Surface Drainage?





Fertilization Practices



HOC Setting & Mowing Frequency



Infield Grooming & Safety



Weed Control & Healthy Turf



Carbohydrate Storage?



Hmmm...



Work Smarter NOT Harder






Before your investment - Take a sample





Summary: Improve your fields

- 1. Take a soil test
- 2. Manage compaction & Minimize thatch
- 3. Sharpen your mower blades
- 4. Apply slow release, balanced Fert & Fall feed
- 5. Educate your staff and user groups

Keep your fields Open and Healthy!

Download presentation at http://bit.ly/AARFP2019

Thank you!





- Turf Science Certificate (Online)
- Diploma in Turfgrass Management
- Bachelor in Golf Course Management

