TURFGRASS FERTILIZATION
ACLP TURFGRASS TRAINING

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I. Essential Elements/Nutrients

- ✓ Needed for plant to complete its life cycle
- ✓ Needed for the turfgrass manager to produce a turf of predetermined quality level
- ✓ Macronutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulfur
- ✓ Micronutrients: iron, manganese, zinc, boron, copper, chlorine, molybdenum, cobalt, nickel

II. Tracking Turfgrass Nutrient Status

- ✓ Color/appearance
- ✓ Growth (clipping yield, recovery from injury)
- ✓ Soil testing
- ✓ Tissue testing

III. Fertilization Programming

- ✓ Soil nutrient levels
- ✓ Species/cultivar differences
- ✓ Desired quality level and intended use of area
- ✓ Growth rate desired
- ✓ Soil physical conditions
- ✓ Other management practices (irrigation, mowing)
- ✓ Budgetary constraints
- ✓ Climatic and environmental conditions

IV. Nitrogen Fertilization

A. Major input – FERTILIZERS

B. Secondary inputs

- ✓ Organic matter decomposition
- ✓ Effluent (can be high in N)

C. Losses (WHY N IS USED MORE OFTEN AND IN LARGER AMOUNTS THAN OTHER NUTRIENTS)

- ✓ Leaching of nitrates
- ✓ Volatilization of ammonia
- ✓ Denitrification losses
- ✓ Microbial immobilization
- ✓ Clipping removal

D. Effects of N fertilization on the turfgrass plant

- ✓ Positive effects
  - ❖ Darker green color
  - ❖ Increased shoot growth rate (recuperation from injury)
  - ❖ Increased resistance to certain diseases (dollarspot, anthracnose, rust)
- ✓ Negative effects
  - ❖ Increased growth rate (higher mowing requirement)
  - ❖ Decreased levels of carbohydrates (energy) in the plant
  - ❖ Lower root growth rates and/or root die-back
  - ❖ Greater irrigation requirement

E. Species N requirements

		FERTILIZER APPLICATION SCHEDULE FOR SOUTHERN ARIZONA LAWNS						
Turfgrass Species	Lbs. N/year per 1000 sq.ft.	April	May	June	July	August	Sept	early Oct.-early Nov.
Low-Maintenance bermuda	4	0.25	0.25	0.50	0.50 1.0 if aerify	0.50	0.50 none if overseeding	0.50 if not overseeding
High Maintenance bermuda	6				1		1	
Buffalograss/Blue grama	½-2				½-1	½-1		
Turf-Type Tall Fescue	2-3				1		1	(1)*

* Last fall N application is made while grass is still green, and at least 2-3 weeks before ground begins to freeze.
Optional N applications are in ( ); use where a higher quality turf is desired.

F. Quickly-available N sources

- ✓ Advantages
  - ❖ low cost per unit of nitrogen (less expensive)
  - ❖ quick greening effect (rapid response)
  - ❖ high water solubility
  - ❖ not dependent on temperature for N release
- ✓ Disadvantages
  - ❖ peak and valley feeding
  - ❖ shorter residual effect (4-8 weeks)
  - ❖ greater burn potential
  - ❖ increased potential for leaching and volatilization losses
  - ❖ increased labor costs for more frequent application

G. Slowly-available N sources

- ✓ Advantages
  - ❖ longer residual effect (N release controlled by coating, solubility, microbial activity, temperature, pH)
  - ❖ low/non-existent burn potential
  - ❖ avoid peak and valley feeding
  - ❖ lower labor costs to provide long term feeding
  - ❖ decreased leaching and volatilization potential
- ✓ Disadvantages
  - ❖ higher cost per unit of nitrogen (more expensive)
  - ❖ initial response is often slow
  - ❖ some need high soil temperatures to release N

Characteristics of some nitrogen fertilizers. As stolen from T. Koski

Fertilizer Name	Analysis	Source of N	Moisture Dependence	Low Temperature Response	Residual N Activity	Salt Index (per N unit)	Leaching Potential
QUICKLY-AVAILABLE N FERTILIZERS							
Ammonium nitrate	33-0-0	ammonium nitrate	minimal	rapid	4-6 weeks	3.2	high
Ammonium sulfate	21-0-0	ammonium sulfate	minimal	rapid	4-6 weeks	3.3	high
Ammonium phosphate	18-46-0	diammonium phosphate	minimal	rapid	4-6 weeks	1.6	high
Urea	46-0-0	urea	minimal	rapid	4-6 weeks	1.6	moderate
SLOWLY-AVAILABLE N FERTILIZERS							
Slow-Release Sources							
Sulfur-coated urea	22-38% N	urea	moderate	mod. rapid	10-15 weeks	NA	low
Resin/plastic-coated	24-35% N	urea, nitrate, ammon.N	moderate	mod. rapid	15-36 weeks	NA	low
Slowly-Soluble Sources							
IBDU	31-0-0	isobutylidine diurea	high	mod. rapid	10-16 weeks	0.2	moderate-low
Ureaform reaction fertilizers							
Nitroform	38-0-0	ureaformaldehyde	high	slow	10-30 weeks+	0.3	very low
FLUF	18-0-0	urea/ureaformaldehyde	moderate	medium	6-10 weeks	NA	low
Nutralene	40-0-0	methylene ureas	moderate	medium	7-9 weeks	NA	low
Methylene urea	39-0-0	methylene ureas	moderate	medium	7-9 weeks	0.7	low
Coron	28-0-0	urea/methylene ureas	minimal	mod. rapid	7-9 weeks	NA	moderate
N-Sure	28-0-0	triazone/urea sol.	minimal	mod. rapid	6-9 weeks	NA	moderate
Natural organic fertilizers							
Ringers	6-1-3	blood,bone,seed meals	high	medium	10-12 weeks	0.7	low
Sustane	5-2-4	composted turkey waste	high	medium	10-12 weeks	0.7	low
Richlawn	6-3-2	DPW,blood,bone meals	moderate-high	med./mod. rapid	8-12 weeks	0.7	low
Milorganite	6-2-0	activated sludge	high	slow	10-12 weeks	0.7	low

V. PHOSPHORUS FERTILIZATION

A. Important functions
- ✓ Component of ATP (adenosine triphosphate)
- ✓ Seedling growth and development
- ✓ Root formation

B. Factors affecting availability
- ✓ Soil type – clays fix more P; organic matter holds P
- ✓ pH – forms insoluble precipitates with iron at low pH; with Ca at high pH
- ✓ Aeration/root health

C. Deficiency symptoms
- ✓ Purpling of leaves
- ✓ Deep greening
- ✓ Lack of growth
- ✓ Soil test level of less than 5 ppm P (10 lbs P/acre)

D. Phosphorus fertilizer sources
- ✓ Superphosphate (0-18-0)
- ✓ Triple superphosphate (0-45-0)
- ✓ Monoammonium phosphate (11-48-0)
- ✓ Diammonium phosphate (18-46-0)

VI. POTASSIUM FERTILIZATION

A. Importance
- ✓ Enhances root growth
- ✓ Better heat tolerance
- ✓ Better drought resistance
- ✓ Increased cold tolerance
- ✓ Enhanced resistance to disease

B. Factors influencing availability
- ✓ Soil type (clays fix more K than do sands)
- ✓ Ca and Mg levels in soil (can compete with K for CEC sites)
- ✓ Compaction/root health

C. K fertilizer sources
- ✓ Potassium chloride (0-0-60) – less expensive and has higher salt index
- ✓ Potassium sulfate (0-0-50) – more expensive, with lower salt index

VII. IRON FERTILIZATION

A. Value of iron
- ✓ An essential element
- ✓ Promotes greening of turf without stimulating shoot growth (allows reduced N use)
- ✓ May reduce winter desiccation
- ✓ Increases shoot density and enhances root growth

B. Causes of iron deficiency
- ✓ High soil pH
- ✓ Excessively cold/warm, wet, and/or poorly-aerated soils
- ✓ Unhealthy/damaged roots
- ✓ High levels of nitrate, phosphorus, micronutrients (zinc, copper, manganese)

C. Diagnosis of iron deficiency

- ✓ Yellowing of *youngest* leaves in shoot (immobile element)
- ✓ Interveinal chlorosis
- ✓ Patchy yellowing of turf
- ✓ Severity increases with nitrogen applications
- ✓ Soil test level less than 5 ppm Fe

D. Correction of deficiency

- ✓ Foliar iron applications often most effective (especially on high pH soils)
  - ❖ 2% solution (0.33 lb. iron sulfate in 2 gallons of water) at a rate of 0.5 gal./1000 sq. ft.)
  - ❖ Apply iron chelates at a rate of 0.1-0.3 lb. actual iron per 1000 sq. ft. FOLLOW LABEL INSTRUCTIONS!!!
  - ❖ Do NOT water following application; allow leaves to absorb iron.
- ✓ Soil applications
  - ❖ If applying iron chelates to SOIL with pH greater than 7.2, use ONLY Fe EDDHA (Sequestrene 138)

VIII. Sulfur

- ✓ Functions and importance of sulfur
  - ❖ Essential nutrient
  - ❖ Soil acidifier
  - ❖ Aid in reclamation of sodic soils

- ✓ Sources of sulfur
  - ❖ Organic matter
  - ❖ Atmospheric pollution
  - ❖ Sulfur-containing fertilizers

- ✓ Deficiency symptoms include: chlorosis (yellowing) which intensifies with N fertilization; stunted growth
- ✓ Annual S requirements of turf: 10-20 lbs./acre/year (4-8 oz. S/1000 sq. feet/year)
- ✓ Sulfur-containing fertilizers
  - ❖ Ammonium sulfate
  - ❖ Superphosphate
  - ❖ Gypsum
  - ❖ Potassium sulfate
  - ❖ Iron sulfate

VIII. Sampling procedures for plant analysis

- ✓ Hand clip grass at normal mowing height, if feasible. Mower clippings are acceptable if mower and collection basket are free of soil
- ✓ Sample randomly to obtain a representative sample, but avoid mixing samples from areas that are "different"
- ✓ Avoid sampling diseased, dying, or dead turf
- ✓ Sample actively growing turf, but avoid flush periods that occur after recent fertilization
- ✓ Air-dry samples before sending in mail. Fresh samples can be brought directly to a nearby lab
- ✓ Submit soil samples from same area which was the source of plant samples.