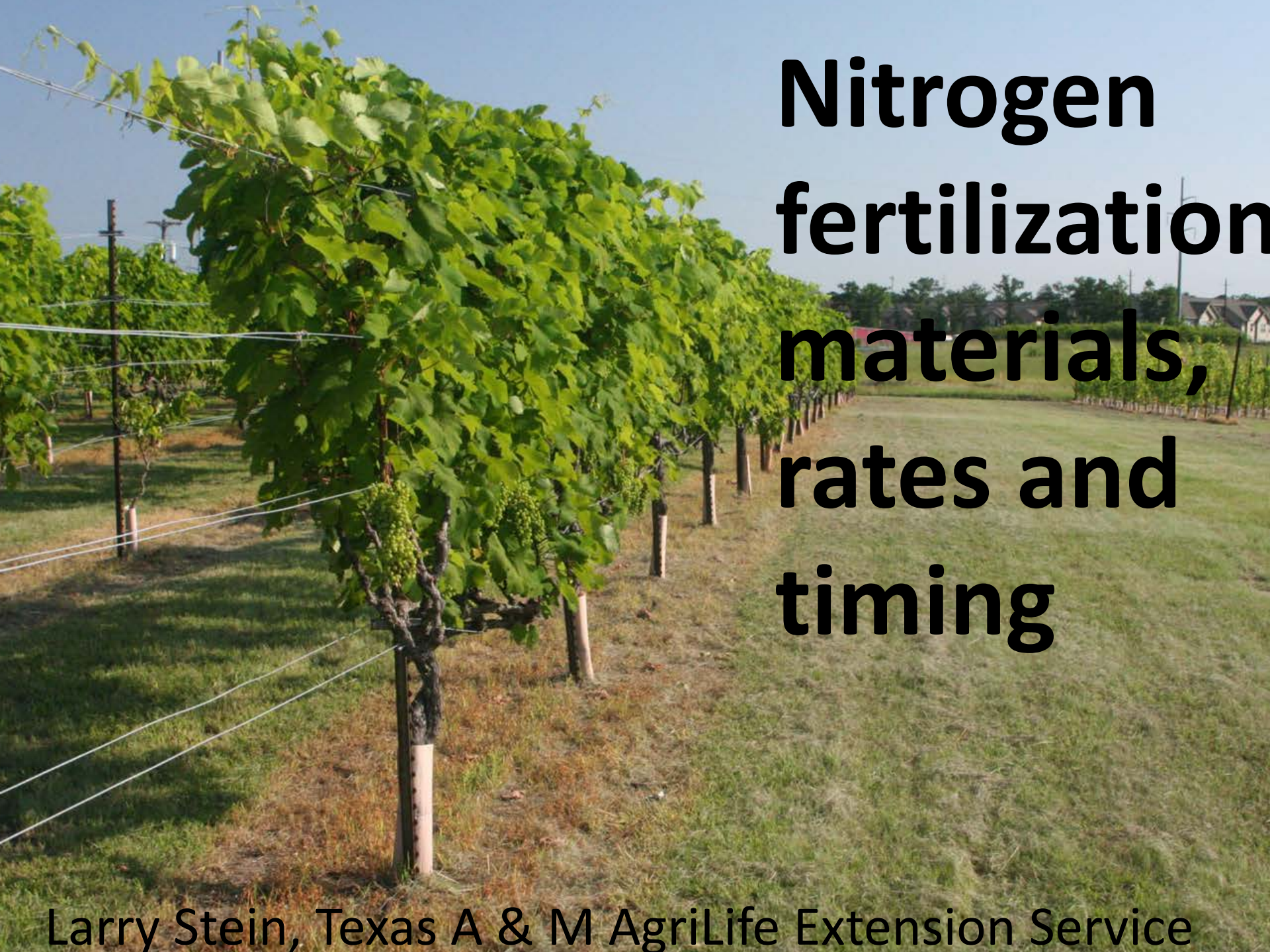
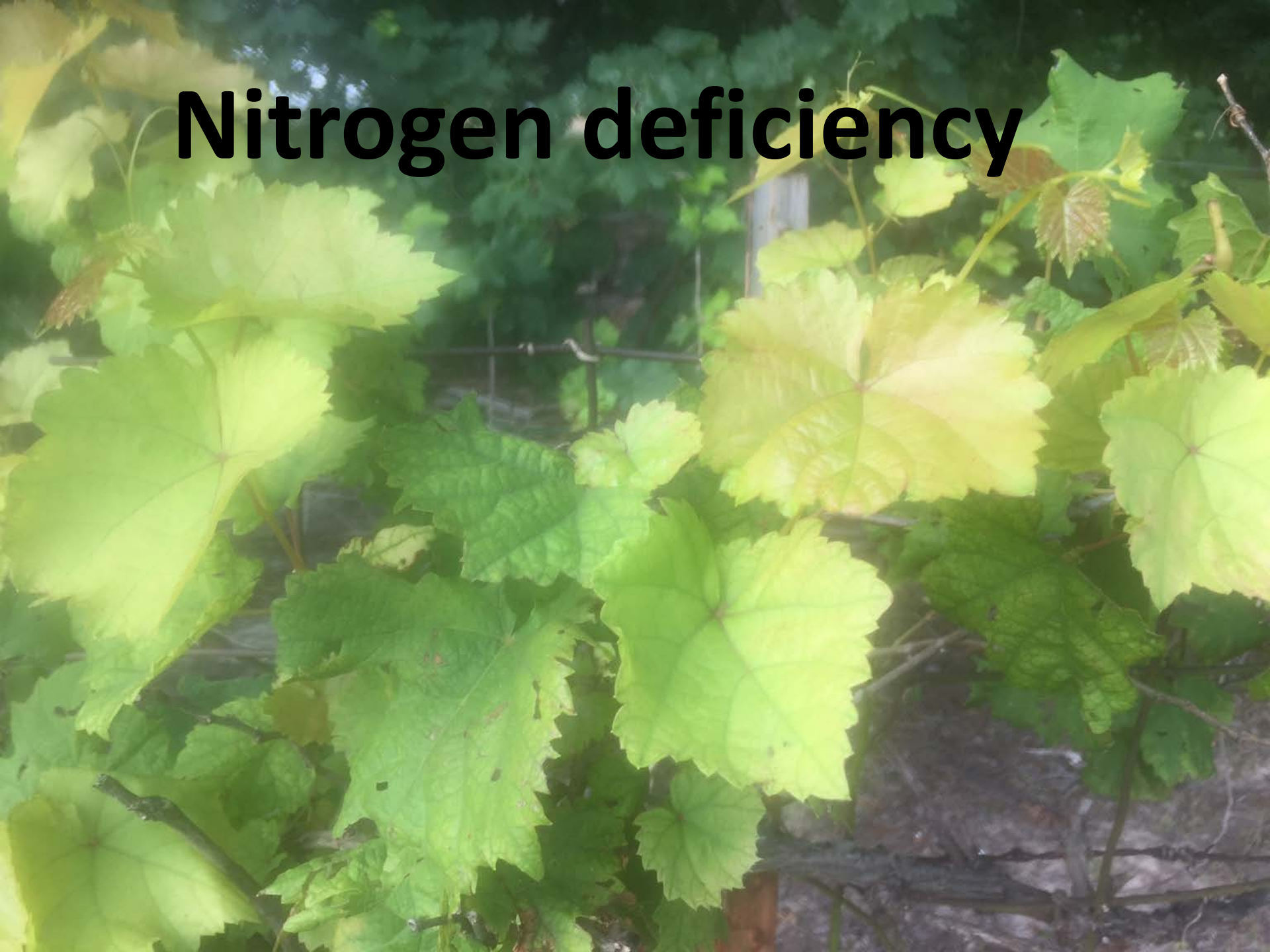


Nitrogen fertilization materials, rates and timing

Larry Stein, Texas A & M AgriLife Extension Service

Nitrogen deficiency



Fertilizers

- Not miracle products
- Nutrition is just one of the components of a sound production program

Fruit Nutrition

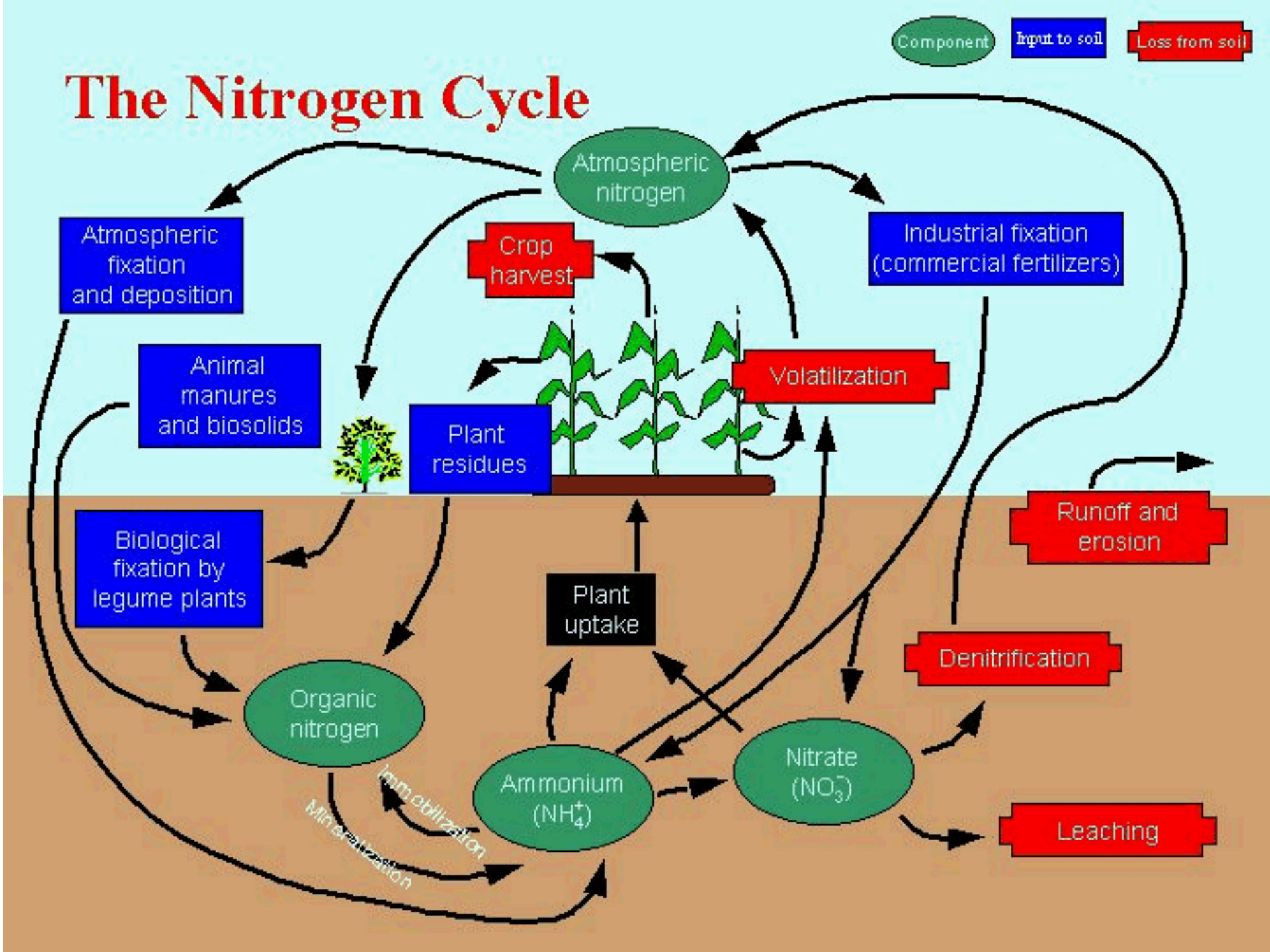
- 20 essential chemical elements
- C, H, O, and N – 95% of plant solids
- Other 16

Other 16 Nutrients

- P
- K
- S
- Ca
- Mg
- Fe

- Mn
- Cu
- Zn
- B
- Cl
- Mo

- **Co**
- **Na**
- **Si**
- **V**


Component
Input to soil
Loss from soil
The Nitrogen Cycle
Atmospheric nitrogen
Atmospheric fixation and deposition
Crop harvest
Industrial fixation (commercial fertilizers)
Animal manures and biosolids
Volatilization
Plant residues
Biological fixation by legume plants
Runoff and erosion
Plant uptake
Denitrification
Organic nitrogen
Ammonium (NH_4^+)
Nitrate (NO_3^-)
Immobilization
Mineralization
Leaching

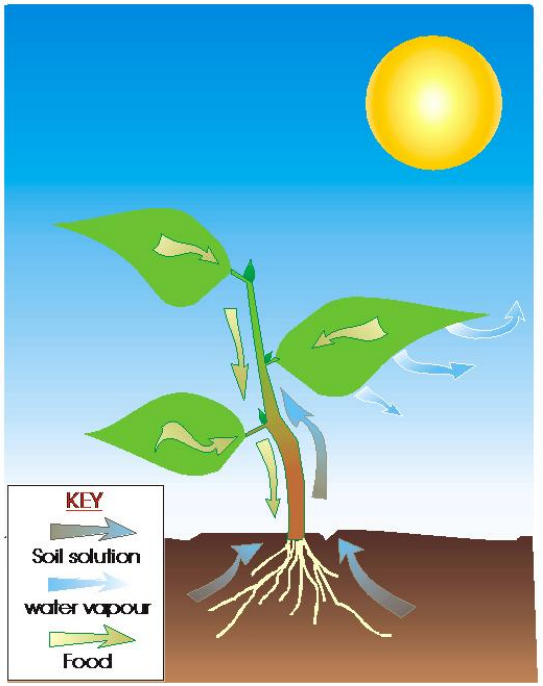
Nitrogen- The Key Element in Striking the Fruiting/Vegetative Balance

Needed for amino acids and proteins

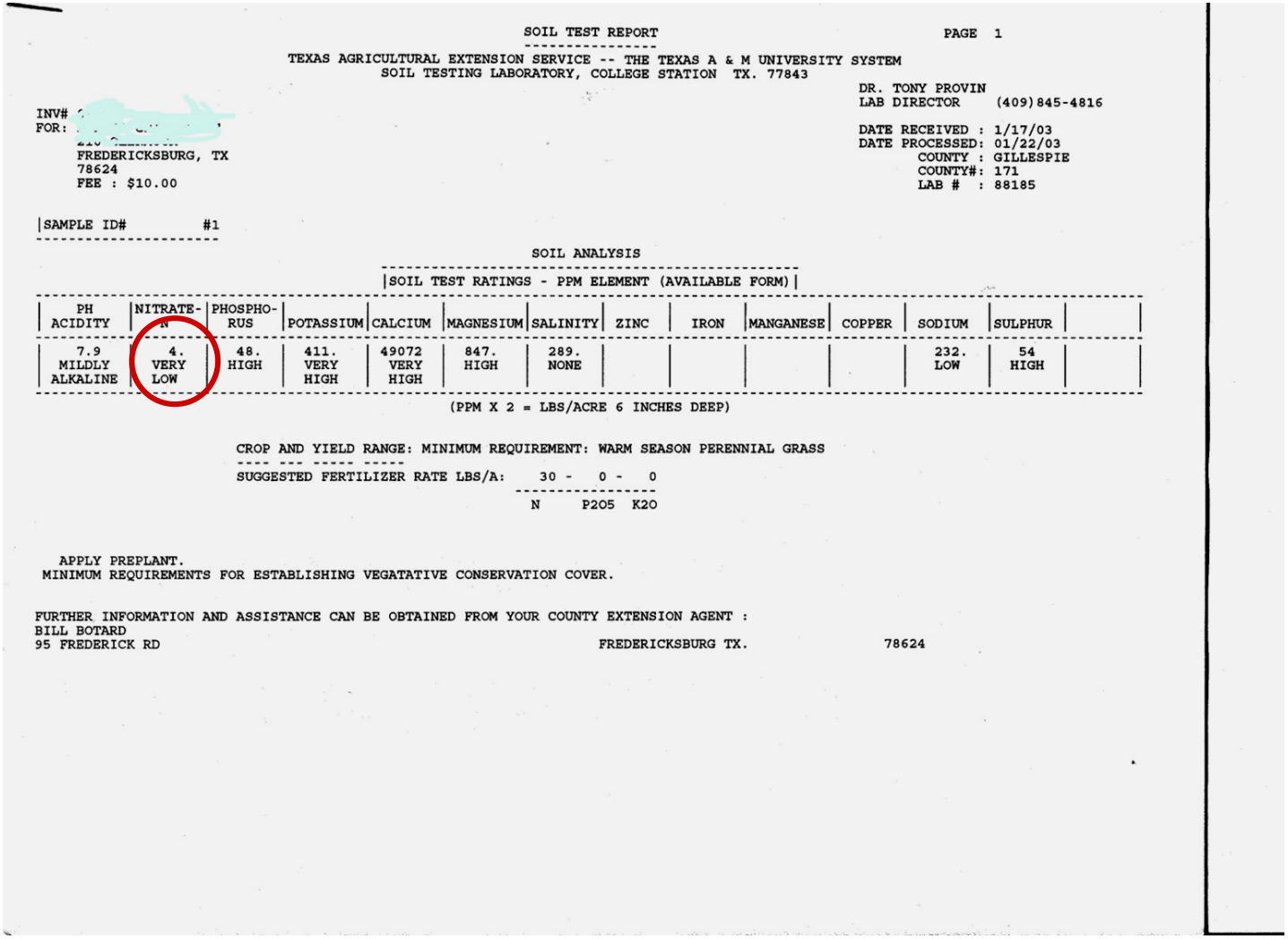
Essential for Chlorophyll

Critical Characteristics of Nitrogen

- **Very Mobile in Soils (neg. charge)**
- **Very Mobile in Plants**
- **Soils Typically Very Low in Nitrogen**
- **Native Nitrogen in Soils Consists of:**
  - **Complex, Insoluble Unavailable Organic Compounds**
  - **Simple, More Soluble, Available Compounds in Soil Solution**



Nitrogen is Universally Low in Our Soils



SOIL TEST REPORT PAGE 1

TEXAS AGRICULTURAL EXTENSION SERVICE -- THE TEXAS A & M UNIVERSITY SYSTEM
SOIL TESTING LABORATORY, COLLEGE STATION TX. 77843

DR. TONY PROVIN
LAB DIRECTOR (409)845-4816

INV#
FOR:
FREDERICKSBURG, TX
78624
FEE : $10.00

DATE RECEIVED : 1/17/03
DATE PROCESSED: 01/22/03
COUNTY : GILLESPIE
COUNTY#: 171
LAB # : 88185

SAMPLE ID# #1

SOIL ANALYSIS

SOIL TEST RATINGS - PPM ELEMENT (AVAILABLE FORM)

PH ACIDITY	NITRATE-N	PHOSPHORUS	POTASSIUM	CALCIUM	MAGNESIUM	SALINITY	ZINC	IRON	MANGANESE	COPPER	SODIUM	SULPHUR	
7.9 MILDLY ALKALINE	4. VERY LOW	48. HIGH	411. VERY HIGH	49072 VERY HIGH	847. HIGH	289. NONE					232. LOW	54 HIGH	

(PPM X 2 = LBS/ACRE 6 INCHES DEEP)

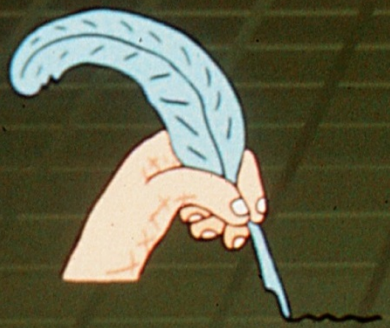
CROP AND YIELD RANGE: MINIMUM REQUIREMENT: WARM SEASON PERENNIAL GRASS

SUGGESTED FERTILIZER RATE LBS/A: 30 - 0 - 0
N P205 K20

APPLY PREPLANT.
MINIMUM REQUIREMENTS FOR ESTABLISHING VEGATATIVE CONSERVATION COVER.

FURTHER INFORMATION AND ASSISTANCE CAN BE OBTAINED FROM YOUR COUNTY EXTENSION AGENT :
BILL BOTARD
95 FREDERICK RD FREDERICKSBURG TX. 78624

General rule of thumb – usually just need N



- Poorer soils – K, Mg, Mn, Fe, Zn and B may develop
  - P, Ca, S and Cu deficiencies are rare

N Deficiency

- Pale green to yellow leaves
- Red to brown spots
- Restricted shoot growth

Practical Nitrogen Sources

Material	%N	Salt Index*	Comments
Anhydrous Ammonia (NH_3)	82	47	Very volatile Liquid/Gas
Urea (NH_2-CO-NH_2)	46	75	Volatile Dry Material
Ammonium Nitrate (NH_4NO_3)	34	105	Dry Material Less Volatile
Nitrogen Solutions (UAN) Urea +NH_4NO_3 + water	28-32	74	Volatile, Usually Injected in Drip
Ammonium Sulfate $(NH_4)_2SO_4$	21	69	Volatile on High pH soils

* Compared to Sodium Nitrate (=100)

Manures - Be Cautious

- **Little Control on Nitrogen Availability to the trees**
- **Weed Seed Contamination?**
- **Potential High Salt Content**

Keys to Nitrogen Management

- **Promote Growth Early in the Season**
- **Maintain Healthy Canopy Until First Frost**
- **Small, Frequent Applications Most Economical**
- **Use Caution on Young Vines**
- **Foliar Applications May Have Value Post-Harvest**

Nitrogen Fertilizer Timing & Placement

- **Broadcast First Application in Spring? (Rainfall Dependent)**

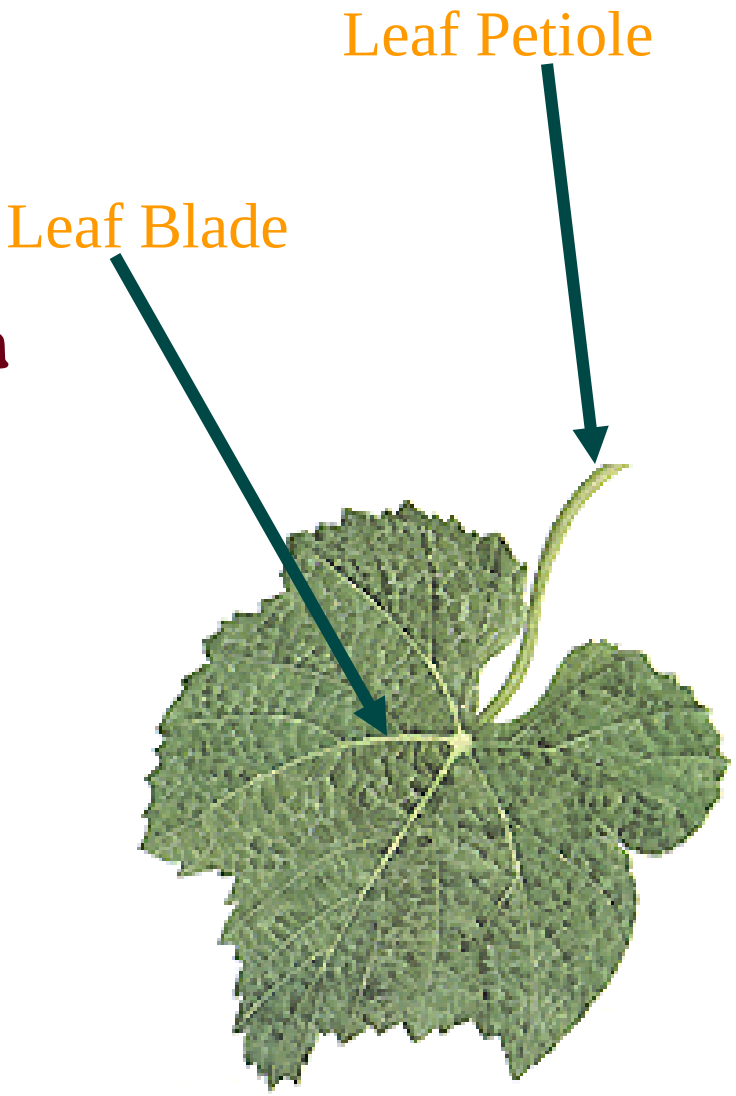
- **Make Nutrients Available to As Many Roots As Possible**

Determining Nitrogen Needs

- Petiole Sampling at Bloom
- Sample Correctly
  - 50-100% Bloom
  - Subtending Leaf of Medial Cluster; opposite the cluster

Tissue & Timing?

- **Yields Are Usually Suppressed Even Before Nitrogen Deficiency Symptoms are Evident**
- **Nitrogen Levels Between Bloom and Veraison Fluctuate Greatly Between Sites, Varieties and Between Vines**
- **N Levels in Leaf Blade Varies More Greatly than That in Leaf Petioles**



Best Guide For Analyzing Nitrogen Program in Bearing Vines?

1.) Trellis Fill

2.) Leaf Color

3.) Leaf Retention Post-Harvest

Nitrogen Deficiency

Nitrogen Fertilizer Timing & Placement

- **Summer Applications May Be Best Applied Through Drip System**
- **Small, Frequent Doses are Most Cost Effective**

Foliar Nitrogen Fertilization

- **Remember, Nitrogen is a MACRO Nutrient**
- **May Make Sense in the Fall to Simply Maintain a Healthy Canopy**
- **Feed Grade Urea**
  - **5 lbs. per 100 gallons**

What Tools Do We Have to Manage Grapevine Vigor?

- Water
- Weed Control
- Pruning/Crop Control
- Rootstocks
- Nitrogen

Situations to Avoid

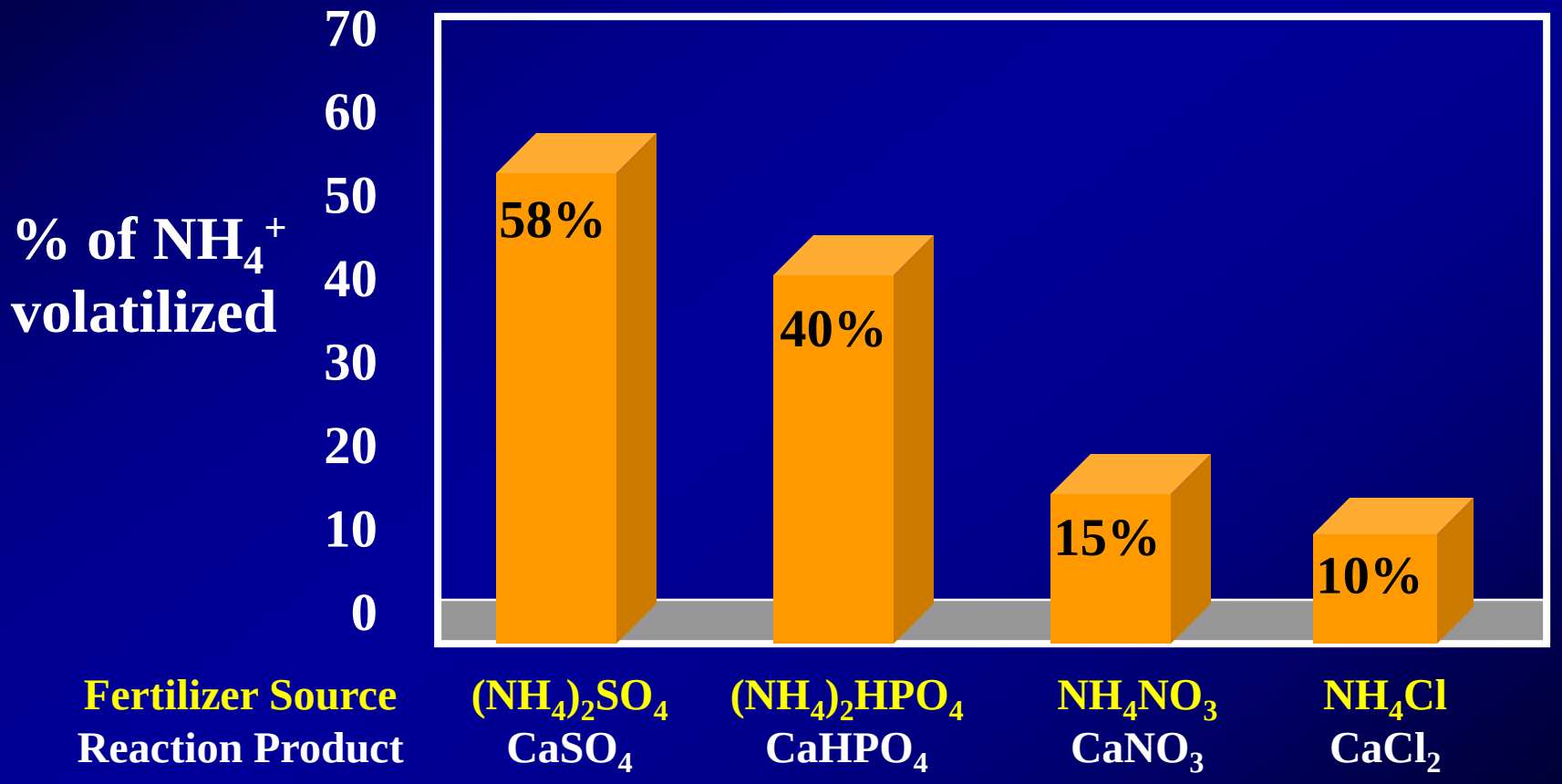
- High Nitrogen Applications in Vineyards Still At Risk From Frost
- Excessive N Status at Bloom
  - Shatter
  - Poor Flower Bud Initiation

Situations to Avoid

- **Over Fertilize Naturally Vigorous Varieties or RS/Variety Combinations**
- **Being Unprepared to Manage Weed Growth**


26
Sur-Spread

Effect of N Source on Ammonia Volatilization



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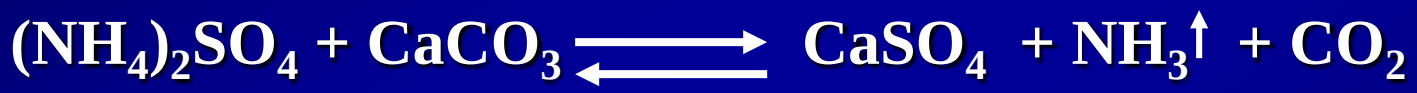
Ammonia Volatilization

Occurs when:

2) Ammonium fertilizer is surface applied to calcareous soils. (e.g., ammonium sulfate)



- Controlled by the solubility of the Ca reaction product.
- Influenced by soil moisture content which promotes reaction.
- Managed by incorporation (≥1 inch sufficient to significantly reduce potential for loss).

Ammonia Volatilization

Occurs when:

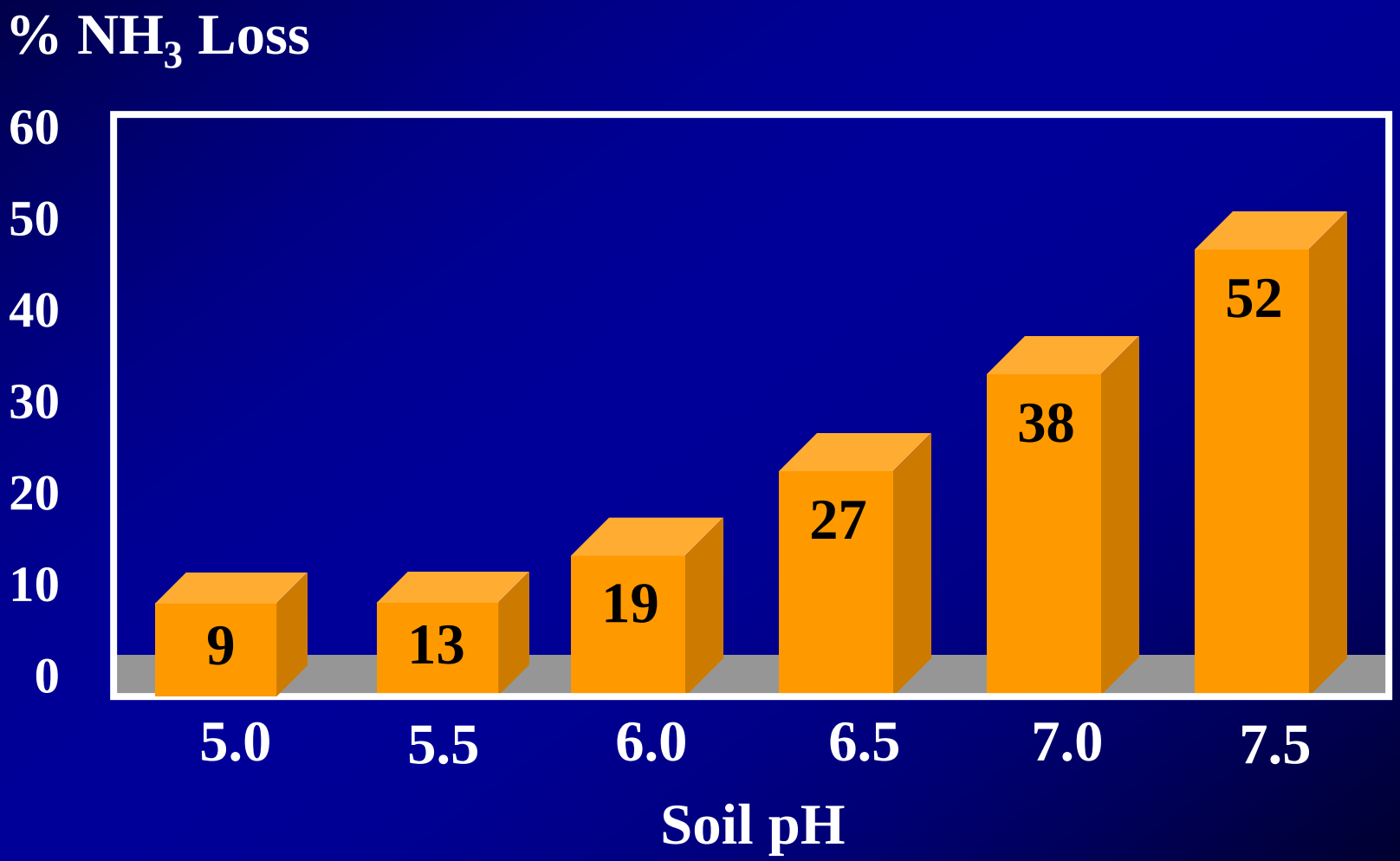
3) Urea is surface applied to any soil.

$$(NH_2)_2CO + H_2O \xrightarrow{\text{Urease}} (NH_4)_2CO_3$$

$$(NH_4)_2CO_3 \rightleftharpoons CO_2 + H_2O + NH_3 \uparrow$$

- Soil moisture conditions important in promoting reaction, losses minimal in dry soils.
- Temperature important in increasing evaporation and microbial activity, loss minimal below 50 F.
- Loss potential greater from high pH soils, due to formation of NH_4 in acid soils.

Effect of pH On Volatilization Loss of NH_3 From Surface Applied Urea



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Precautions for Efficient Use

Volatilization of Ammoniated Fertilizers

$$NH_4^+ \rightarrow NH_3\uparrow$$

	Potential Loss
Urea	**35%**
• surface applied to any soil	
Ammonium sulfate	**25%**
Ammonium nitrate	**7%**
• surface applied to calcareous soil	

Effect of Urea Fertilizer Placement on NH_3 Volatilization

Depth	Nitrogen Loss
"On Surface"	20%
1/4 inch	15%
1/2 inch	12%
1-1/2 inch	6%

***Rainfall/irrigation (≥ 0.25") also can accomplish incorporation.**

McFarland