

Nutrient Management to Protect Water Quality

UC Cooperative Extension

San Diego County



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Plant Nutrients

- Plants Need Many Basic Elements for Growth and Reproduction

Nitrogen (N)
Phosphorus (P)
Potassium (K)
Calcium (Ca)
Sulfur (S)
Magnesium (Mg)
Iron (Fe)
Zinc (Zn)
Nickel (Ni)
Manganese (Mn)
Boron (B)
Chlorine (Cl)
Copper (Cu)
Molybdenum (Mo)
Oxygen (O)



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FERTILIZERS

- Supply supplemental elements where deficient or unavailable to the plant
- The most common element supplied by fertilizers to trees and vines is nitrogen



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Is Use of Fertilizer Materials Something That You Need to Report?

- Not yet, at least not in California!
- In other states and locations it is required.
- Specific programs may require some limitations, such as a nutrient-based TMDL



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Types of Nutrient Application:

- Fertilizer materials
 - Petroleum-based materials
 - Time-released materials
 - Organic materials such as manures, compost materials etc.



Nutrient Mobility

- Different Nutrients behave differently in water.
- Some move wherever water moves.
- Some are held strongly by the soil.



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Nutrients in Waterways are of Great Concern Worldwide.

- Nitrogen is the biggest issue, especially locally
 - Will concentrate mostly on Nitrogen issues.
- Phosphorous is generally lumped in with Nitrogen, regulated together.
- Potassium is also of concern, but far less so than Nitrogen.



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SOURCES OF NITROGEN

- NITRATES

(Calcium

Nitrate, etc.)



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- NO₃ N

SOURCES OF NITROGEN



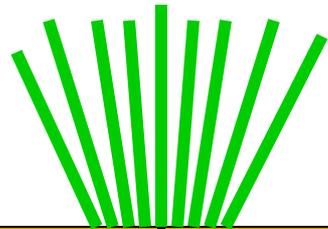
AMMONIUM



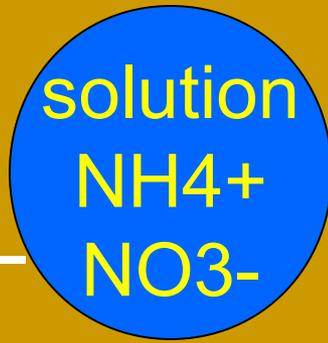
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Nitrogen cycle

N
2↓



Fixation



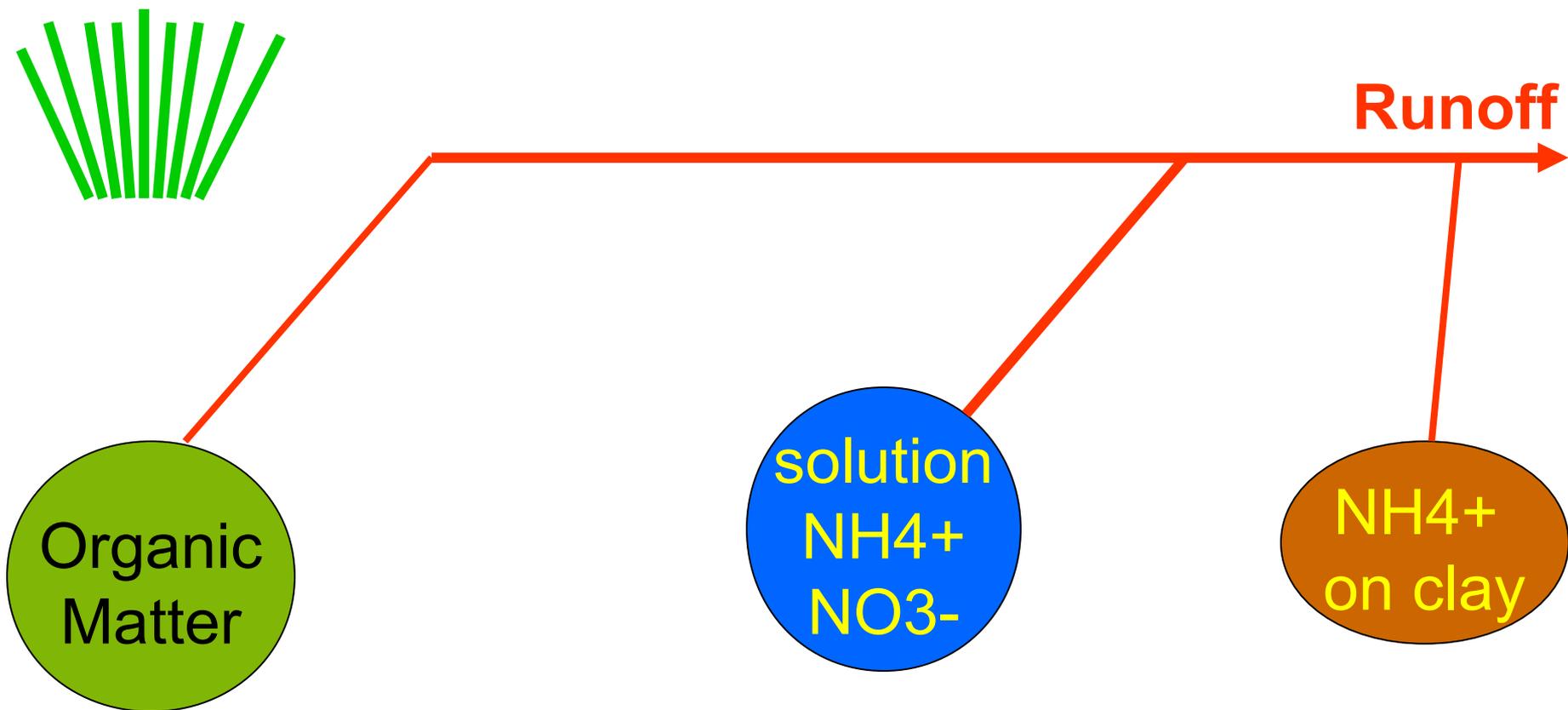
Microbes

What Is The Problem With Nitrogen?

- It is really soluble!!
- It is generally over-applied.
- It is applied at the wrong time, or all at once.



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Nitrogen and Too much Water

- Excessive rainfall can leach winter-applied nitrogen.
- Also, in-season irrigation greater than the needs of the crop can leach nitrogen out of the root zone and into groundwater.



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Human and Environmental Effects:

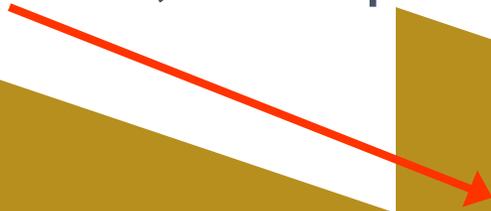
- Methemoglobinemia” or blue baby syndrome”.
- Ecosystem Imbalance.



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Problem: Contamination Of Surrounding Water Bodies

Nitrates, Phosphorus



Eutrophication

Lake



Nitrates



Groundwater



Nutrient Management

- Nitrogen Standards
 - For drinking water
 - <45 parts per million for nitrates (NO₃-)
 - <10 parts per million for nitrogen from nitrates (NO₃--N)
 - Coastal groundwater supplies frequently exceed these levels



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Nutrient Management

- Phosphorus Standards

- For drinking water

- No specific standards for freshwater

- To prevent algal blooms due to phosphate

- <25 parts per billion (ppb) in lakes



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- <50 ppb in streams flowing into lakes

How can you fix this?

- Apply the correct amount of Nitrogen to begin with
- Learn the needs of your plants
 - There is good literature/Farm Advisors who can help with this
- If there is not available literature for your specific crop, try to use something that is similar in size and growth pattern as a baseline



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Other recommended activities:

- Utilize lab testing for your plants needs:
 - Avocados utilize leaf analysis to help determine plants needs. Highly recommended.
- Other crops can utilize soil and plant analysis to determine the amount of nitrogen and other nutrients available
- Check your water to see if it already contains nitrogen- especially if you are using well or recycled water. Subtract that amount from what you should apply.



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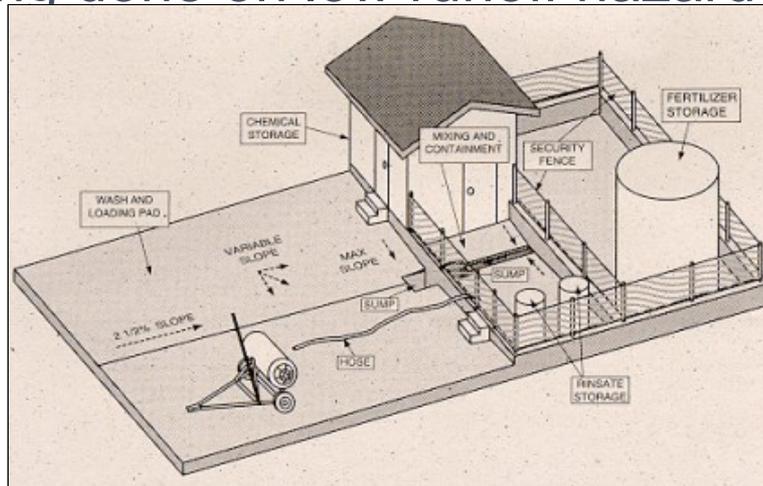
Other recommended activities cont.

- Use a time-released fertilizer material.
- Make sure you fertilize at the correct time of year or at the proper time of the plant's growth cycle.
- Make sure you fertilize for the size of your plant.
 - Topped or smaller trees will use less fertilizer than large, full canopy trees
- Make sure your fertilizer system is operating correctly- calibrate it and check for leaks.



Other recommended activities cont.

- Design facilities appropriately
 - The fertilizer storage area should have a concrete pad and curb
 - Mixing done on low runoff hazard site



Other recommended activities cont.

DO NOT OVERWATER!

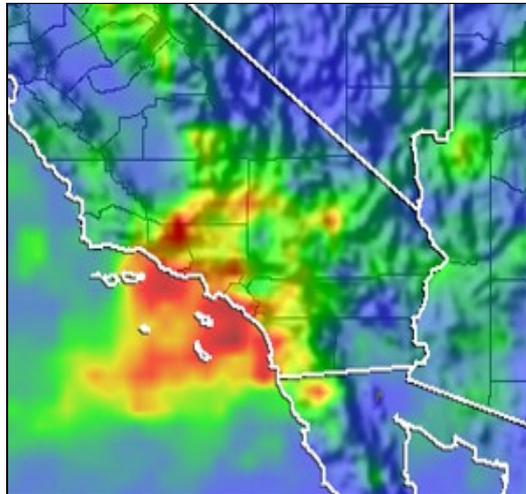
- If you do not over-apply water, there will be less runoff.
 - Single most effective method of minimizing water quality problems associated with Nitrogen
- Make sure your irrigation system is working effectively or you may accidentally cause excess runoff and nutrient problems.
- Manage irrigations to avoid nutrient loss below the root zone.



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Other recommended activities cont.

- Consider rain events. Don't apply fertilizer before a projected event.



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Remember

- In most cases of excess nitrate concentrations in aquatic systems, the primary source is surface runoff from agricultural or landscaped areas that have received excess nitrate fertilizer. This causes eutrophication which can involve algal blooms; water anoxia and dead zones, and other changes to ecosystem function, favoring some groups of organisms over others. As a consequence, as nitrate forms a component of total dissolved solids in water bodies, they are widely used as an indicator of water quality.



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