Soil Chemical Enrichment and Water Quality

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Earth’s Water Resources

- “Soil and water are part of a pedosphere and are connected.”

- Globally, more than $1 \times 10^{16}$ kg or 0.01% of water is contained in the soil moisture in the upper 15 cm.

- Polluted soil pollutes water
Interface (air, water, organic, rock)
The four major components of mineral soils and their densities (g/cm\(^3\))

- **Air** (20–30%) (d~0)
- **Water** (20–30%) (d=1.0)
- **Mineral** (45%) (d=2.65)
- **Organic** (5%) (d~0.5)
The sources and compartments of the Earth’s water

- Oceans (97.25%)
- Ice (2%)
- Groundwater (0.7%)
- Soil moisture (33%)
- Atmosphere (6%)
- Lakes (60%)
- Rivers (1%)

All other water (<0.05%)
Relationship of the water table and groundwater to water movement in the soil
Percent of Phosphorus Taken Up and Removed that Could be Supplied by Phosphorus from Manure

- Greater than 100%
- 50% to 100%
- 50% or less
## Alabama Soil Test Ratings for Phosphorus for all Samples Tested (2004-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>VL</th>
<th>L</th>
<th>M</th>
<th>H</th>
<th>VH</th>
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<td>2010</td>
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<td>16.9</td>
<td>22.8</td>
<td>22.8</td>
<td>18.1</td>
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<tr>
<td>Average</td>
<td>14.3</td>
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<td>21.5</td>
<td>24.7</td>
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<td>SD</td>
<td>0.71</td>
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Relationship between total N and P found in stream water
P in soil and environmental loss of P to waters

Environmental interpretation categories:
- Low
- Medium
- Optimum
- Excessive
- Highly excessive

Plant nutrient supplying capacity:
- Low
- Medium
- High
- Very high

Phosphorus concentration in water

Soil test P level, percentage of optimum:
- 0
- 25
- 75
- 100
- 200

Plant growth:
- Runoff threshold
- Surface runoff water
- Leaching threshold
- Drainage to groundwater

Graph showing the relationship between soil test P level and plant growth, runoff, and leaching.
Relationships among the rate of fertilizer addition, crop yield, fertilizer cost, and profit from adding fertilizer.
A multispecies riparian buffer strip designed to protect the stream from nutrients and sediment runoff while also providing wildlife habitat benefits.
Cover crops can reduce nitrate-N in winter drainage water by soaking up excess mineral nitrogen left in the soil after the summer crop is harvested.
Environmental Quality Protection (five specific practices)

- Field, farm, and regional scale nutrient budgeting
- Cover crops
- Riparian buffer strips (10 to 100 m width)
- Limit soil disturbance during forest harvest (leave vegetative cover)
- Practice conservation tillage
- To avoid pollution from point and nonpoint sources, apply Best Management Practices (BMPs) for all nutrients and use N and P indices
Modern Analytical instruments
Soil Testing (AU)

I. Routine Soil Test Reported:
   - pH, P, K, Ca, Mg (lbs/A)

II. Recommendations made for:
   - Limestone (t/A), N, P₂O₅, K₂O (lbs/A)
   - For special crops or situations
   - Ca, Mg, Fe, B, Zn, Mo, S
   - Cost $7.00 per sample
   - Turnaround time 24 hours
Why it is important to get your soil tested?

- An ounce of prevention is worth a pound of cure applies to soil and water management.
- “Very high” or “Extremely high” soil tests rates for P may result in environmental damage and eutrophication.
- Get your soil tested often and “do not guess”.
- Proactively address potential sources of environmental damage that may result from over application of fertilizers.
- Get involved to increase awareness about soil health and water quality by advocating at community, regional and national levels.
“If we take the time to learn the language of the land, the soil will speak to us.”

“How Dare we Call it Dirt”

For in the end we will conserve only what we love. We will love only what we understand. We will understand what we are taught.

Baba Diouhm, African conservationist