Biosolids Nutrients and Agronomic Rate Calculation
Soil is full of nutrients, but most are not available to plants

Mineral

- Insoluble, unavailable
- \( \text{Ca}^{++}, \text{K}^+ \)

Organic

- Soluble, available
- \( \text{NH}_4^+, \text{SO}_4^{--} \)
• Describe the difference between total nutrient content and plant-available nutrient content of biosolids.

• What do you need to know to estimate the fertilizer N replacement value of biosolids?
Agronomic Rate Goals

• **Environmental:**
  Balance crop N demand with plant-available N to prevent nitrate leaching.

• **Economic:**
  Provide enough N for near maximum yield and quality of crop.
Agronomic Rate Calculation
Agronomic Rate Calculation

- Soil and crop information
- Biosolids data
- Other sources of plant-available N
- Estimate plant available N needed from biosolids
- Estimate plant available N per dry ton of biosolids
- Calculate agronomic rate
- Convert to “as-is” basis
Example 1: Grass Hay, West of Cascades

- **Soil:** Jory silty clay loam
- **Crop:** grass hay
- **Yield goal:** 2-3 dt/a
- **Plant-available N needed:** 150 lb/acre
  Guidance from OSU Fertilizer Guide 63
- **Plant available N from other sources:** none
Example 1: Grass Hay, West of Cascades

- **Biosolids form:** dewatered (21% solids)
- **Biosolids processing:** anaerobic
- **Method of application:** surface
- **Days before incorporation:** never
- **Expected application season:** April-May
Example 1: Biosolids Analysis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Concentration (mg/kg dry weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N</td>
<td>50,000</td>
</tr>
<tr>
<td>Ammonium N</td>
<td>5,000</td>
</tr>
<tr>
<td>Total P</td>
<td>22,000</td>
</tr>
<tr>
<td>Total K</td>
<td>6,000</td>
</tr>
</tbody>
</table>
Example 2: Dryland Wheat, Columbia Plateau

- **Soil:** Walla Walla silt loam
- **Crop:** Wheat-fallow
- **Yield goal:** 60 bushels/acre (soft white wheat)
- **Plant-available N needed:** 140 lb/acre
  Guidance from WSU EB 1987, Dryland Winter Wheat
- **Plant available N from other sources:**
  Preplant N in root zone - 85 lb/acre
  Previous biosolids application, 3 dt/acre, 2 years ago
Example 2:
Dryland Wheat, Columbia Plateau

- Biosolids form: *dewatered (22% solids)*
- Biosolids processing: *anaerobic*
- Method of application: *incorporated*
- Days before incorporation: *1*
- Expected application season: *Sept.-Oct.*
### Example 2: Biosolids Analysis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Concentration (% dry weight)</th>
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</thead>
<tbody>
<tr>
<td>Total N</td>
<td>6</td>
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<tr>
<td>Ammonium N</td>
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<tr>
<td>Total P</td>
<td>2.8</td>
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<tr>
<td>Total K</td>
<td>0.7</td>
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</table>
Example 2: Biosolids Analysis

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Concentration (mg/kg dry weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N</td>
<td>60,000</td>
</tr>
<tr>
<td>Ammonium N</td>
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</tr>
<tr>
<td>Total P</td>
<td>28,000</td>
</tr>
<tr>
<td>Total K</td>
<td>7,000</td>
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</tbody>
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On The Web

Biosolids publications and links:
http://www.soils1.org “Biosolids” page

Soil Testing: