Soil Savvy for Successful Native Plantings in the Landscape

Jean Reeder
Landscaping with Colorado Native Plants
February 10, 2018

Handouts
- Soil Testing FAQs
- How to Collect Soil Samples
- List of Colorado Extension GardenNotes and Fact Sheets on soil properties – get to know as much about your soil as you do your plants!

Handout of presentation slides to be made available after the conference

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Presentation Outline
- The ecological relationship between soil properties and native plant communities
- Soil concerns for growing natives in your landscape
  - Developing soil savvy: what do you need to know about your soil's properties before making decisions on plant selection and management strategy (irrigation, fertilizer, amendments)
  - Where to find information on soil preferences of various native plants

Soils are naturally highly variable
>20,000 different kinds of soil classified in the U.S. alone!

Variability in soil properties is a function of parent material, climate, topography, plant community and time

Soil properties and plant community co-evolve over the millennia

Soils are naturally highly variable
>20,000 different kinds of soil classified in the U.S. alone!

Stages of soil development are linked with plant succession

Parent Material
- What soil will be made from:
  - sand dune
  - mud flat
  - broken up granite
  - etc.

Climax plant community

Developed soil profile

Thousands of years

Plants help to modify/improve chemical, physical and biological properties of the soil, allowing new plant species to come in

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Stages of soil development are linked with plant succession

- **Pioneer Species**
  - Annual Plants
  - Soil microbes

- Climax plant community (mixed prairie, S. Dakota)

- Sediments
- Developed soil profile

Thousands of years

Presentation Outline

- The ecological relationship between soil properties and the native plant community
- **Soil concerns for growing natives in your landscape**
  - The soil on your property probably is not going to be like the native soil that formed on site over thousands of years.

Construction activities drastically alter native soils

Construction turns native soils into urban/landscape soils

Live on an acreage?

The soil near buildings has been disturbed and is an urban soil

Can I grow particular native plants in my landscape? Any major issues?

- Cultural requirements of the desired native plants
  - Exposure to sun
  - Moisture
  - Hardiness zone: Zone 3 through 7 (range of coldest expected winter temperatures)
  - Deer/rabbit resistant, attracts pollinators, etc.

Undisturbed
Native Soil

A living, self-sustaining system, thousands of years to develop

Like going back in time to parent material again! No longer a developed soil

Compacted, Unamended
Urban “soil”

- Mixed horizons
- Loss of OM
- Compaction/loss of structure, porosity
- Poor aeration & water infiltration
- Few active organisms

Can I grow particular native plants in my soil?

- Cultural requirements of the desired native plant
  - Exposure to sun
  - Moisture
  - Hardiness zone
  - Deer/rabbit resistant, attracts pollinators, etc.
  - What kind of soil properties does this plant prefer?
    - Picky?
    - Tolerate a range of conditions?
    - Any major issues?

Soil info is less available
- Where to find it?
- How to interpret it?
Some Basic Soils 101 (Soil Savvy)

What do you need to know about your soil in order to make good decisions on:

- plant selection (both native and introduced)
- management practices (irrigation, amendments, fertilizer, mulch)

Know these properties of your soil

- **pH** influences nutrient availability for plant use
- Free lime (CaCO₃)
- Electrical Conductivity (E.C.) salt level
- Texture estimate (sand, silt, clay)
- Organic matter content
- Plant-available nutrient concentrations

Incorporate knowledge into plant selection and developing your management strategy

Get your soil analyzed!

- **pH**
- Lime Estimate (CaCO₃)
- Electrical Conductivity (E.C.) salt level
- Texture estimate (sand, silt, clay)
- Organic matter content
- Plant-available nutrient concentrations

Soil Test: pH

<table>
<thead>
<tr>
<th>pH scale</th>
<th>Salinity Level</th>
<th>Effect on Plant Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred by most plants (pH 6 - 7.2)</td>
<td>Slightly saline</td>
<td>Sensitive plants inhibited (many introduced landscape plants)</td>
</tr>
<tr>
<td>Many of our soils (pH 7.1 - 8.3)</td>
<td>Moderately saline</td>
<td>Most landscape plants inhibited</td>
</tr>
<tr>
<td>Soils in arid/semi-arid regions</td>
<td>Strongly saline</td>
<td>Most plants will not survive</td>
</tr>
</tbody>
</table>

Soil Test: Salinity

<table>
<thead>
<tr>
<th>E. C.</th>
<th>Salinity Level</th>
<th>Effect on Plant Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 (c1 is better)</td>
<td>Non-saline</td>
<td>None</td>
</tr>
<tr>
<td>2 – 4</td>
<td>Slightly saline</td>
<td>Sensitive plants inhibited (many introduced landscape plants)</td>
</tr>
<tr>
<td>4 – 8</td>
<td>Moderately saline (many natives/xerics tolerate)</td>
<td>Most landscape plants inhibited</td>
</tr>
<tr>
<td>&gt;8</td>
<td>Strongly saline</td>
<td>Most plants will not survive</td>
</tr>
</tbody>
</table>
Soil Test: Salinity

Front Range soils are rarely naturally saline

Management Factors Contribute to Soil Salinity (especially in clayey soils)
- Excessive/Unnecessary Fertilizer Applications
- Soil amendments
  Manure, biosolids (sewage sludge), and composts made with manure or biosolids are often very salty. Even plant-based composts have some excess salts in them.
  - Use sparingly, and routinely monitor salt levels

See CSU GardenNotes 241 Organic Amendments
See CSU GardenNotes 224 Saline Soils

Soil Texture: a major determinant of plant selection and management strategy

- Water movement
- Water retention
- Gas exchange
  - roots need O₂ as much as they need H₂O
- Soil temperature
- Erosion potential
- Fertility

Influences of Texture on Soil H₂O Dynamics

- Clayey soils
  - Water moves into/through the soil very slowly
  - Mainly small pores, can be poorly aerated
  - Have high water-holding capacity
    - hold lots of water available for plants
- Sandy soils
  - Water moves into/through the soil very fast
  - Mainly large pores, generally well aerated
  - Have low water-holding capacity
    - Less water available for plants

Example: Looking for a native shrub?

Look for information on plant preference of soil properties
- “well-drained soil” probably won’t do well in a tight clay
  - ex. Apache Plume (Fallugia paradoxa)
  - Red Berry Mahonia (Mahonia haematocarpa)
- “most soil types including clay”
  - ex. Butterfly Bush (Buddleia alternifolia)
  - Rabbit Brush (Chrysothamnus nauseosus)
  - New Mexican Privet (Forestiera neomexicana)

source: High Country Gardens

Soil Test: Organic Matter Content

5% = High
Vegetables, fruits, many flowers, some natives

3% = Moderate
Adequate for most landscape plants

<2% = Low*
Many natives/xerics prefer

* Semi-arid native soils: <2%

Match type of plant you want to grow...
With the soil O.M. content the plant prefers

Do some research on plant preferences

- “low fertility, well-drained soil” don’t add compost
  - ex. Gaura lindheimeri
  - Red Buckwheat (Eriogonum)
- “most soils, including clay”
  - ex. Poppy mallow (Callirhoe involucrata)
  - Evening primrose (Oenothera)
- “does best in compost-enriched garden soil”
  - ex. Columbine (Aquilegia)
  - Western Mock Orange (Philadelphus lewisii)

source: High Country Gardens
Soil Test: Organic Matter Content

Do some research on plant preferences

- “low fertility, well-drained soil”
  - don’t add compost
  - ex. Gaura lindheimeri (Eriogonum)
  - Red Buckwheat

- How to improve drainage/aeration of a clay soil?
  - Not compost (adds fertility)
  - Not sand (could form adobe)
  - Expanded shale? (light weight, porous, inert; improves water infiltration/drainage improves aeration)

Get your soil analyzed!

Know these properties of your soil

- pH
- Lime estimate (CaCO₃)
- Electrical Conductivity (E.C.) salt level
- Texture estimate
- % Organic matter content

- Plant-available nutrients: is the level of available nutrient in my soil deficient, sufficient, or excessive for good plant growth?

Develop Some Soil Savvy

You risk making bad decisions on plant selection if you don’t know anything about the properties of your soil.

- Know the basic properties of your soil
  - Chemical composition (nutrient supply, pH, OM, texture)
  - get these data from a soil test
  - Physical condition: compaction
  - (poor drainage & aeration shallow & small root volumes)

- Different source don’t always agree completely on soil preferences

Soil preference/tolerance information for native plants

Books
  - Native Plant Master Manual, CSU Extension
  - Xeriscape Plant Guide, Denver Water
  - Pretty Tough Plants, Plant Select

Websites
  - Plant Select (CSU, DBG, Green Industries)
  - High Country Gardens

Different source don’t always agree completely on soil preferences

Check out more than one source

Source: High Country Gardens
Soil preference/tolerance information for native plants


- *Blue flax* (*Linum perenne*) “prefers well drained, but tolerates clay”
- *Gayfeather* (*Liatris punctata*)
  - “Prefers infertile, dry, gravelly, shallow soil; grows compactly under these conditions. In richer, moist soil, may become more rangy.”
- *Winterfat* (*Ceratoides lanata*) “grows in a wide variety of soil textures including clay, sandy and rocky. Does well in alkaline soil”

**Pretty Tough Plants** Plant Select, 2017

- *Engelmann’s daisy* (*Engelmannia peristenia*) “clay, loam or sandy soil”
- *Black-eyed Susan* (*Rudbeckia hirta*) “clay or loam; performs best in good garden soil” *(good water-holding capacity, higher OM)*
- *Sunset hyssop* (*Agastache rupestris*) “well-drained loam or sandy soil”

**Plant Select** (CSU, DBG, Green Industries)

- [www.plantselect.org](http://www.plantselect.org)
  - “Search the Plant Database”
  - Plant: type, size, flower color & season, zone hardiness
  - Sun/water needs, deer resistant, attracts pollinators
  - N. American native y/n
  - SOIL: clay, loam, sandy, gravelly

**High Country Gardens** [www.highcountrygardens.com](http://www.highcountrygardens.com)

- *Plant Finder*
  - Enter the plant name
  - Zip code/region/zone
  - Sun/water needs
  - Flower color, bloom season
  - Plant size, planting time
  - Advantages: deer/rabbit resistant, attracts birds/butterflies/pollinators
  - SOIL: clay, sandy, average, compost-enriched garden loam
  - low fertility, well-drained, drought/dry

Soil preference/tolerance information for native plants

**Soil information is not as well developed as requirements for sun/moisture/zone**

- for either native or introduced plants
- soil info available: focus generally on texture & OM
- little info on tolerance to pH or salinity, nutrient requirements, etc.

**Going to have to make some inferences**

- ex. columbine evolved at higher elevations
  - may be more sensitive to high pH and salinity
- ex. common juniper, found over whole N. hemisphere
  - less sensitive to soil conditions

Plants also can be too aggressive

- Example: my yard (fine sandy loam soil)
  - Little bluestem (*Schizachyrium scoparium*)
    - Took over! Had to completely remove
  - May Night Salvia (*Sylvestris*)
    - Took over! Had to completely remove

- Neither of these were a problem in my former Fort Collins landscape (clayey)
- This info may not show up in references