The Micro-world Under Our Feet: Biotic Soil Crusts

Kelli Van Norman, Inventory Coordinator
First Washington Botanical Symposium, March 15, 2017
Interagency Special Status/Sensitive Species Program OR/WA
Oregon/Washington BLM & R6 Forest Service
http://www.fs.fed.us/r6/sfpnw/issssp

Typical Coulee, WA
Daphne Stone, 2013
What is a biotic soil crust?
Why do we care?
Survey methods
Resources
Washington & Oregon studies & species

Crooked River National Grasslands
Kelli Van Norman, 2016
Texosporium sancti-jacobi

Rimrock Springs Trail
Crooked River National Grasslands
Crook County, OR
Kelli Van Norman, 2016
This calcareous soil patch has little vascular plant cover and several uncommon biotic soil crust lichens.

Well-developed soil crust on bunchgrass site.
Soils and Topography

Among the basalt rocks, several species of biotic crust survive.

Few BSC in this lowland Gutierrezia sarothrae shrub community.

Gilliam County, OR
Heather Root
Moisture

John Day River
Sherman County, OR
Heather Root
Table 2.5  *Relative cover of biological soil crusts in sagebrush (Artemisia) vegetation types.*

<table>
<thead>
<tr>
<th>HIGH biological crust cover</th>
<th>LOW biological crust cover</th>
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</thead>
<tbody>
<tr>
<td><strong>Tall Sagebrush</strong></td>
<td></td>
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<tr>
<td>Wyoming big sagebrush <em>(A. tridentata ssp. wyomingensis)</em></td>
<td>subalpine big sagebrush <em>(A. tridentata ssp. spiciformis)</em></td>
</tr>
<tr>
<td>basin big sagebrush <em>(A. tridentata ssp. tridentata)</em></td>
<td>xeric big sagebrush <em>(A. tridentata ssp. xericensis)</em></td>
</tr>
<tr>
<td>mountain big sagebrush** <em>(A. tridentata ssp. vaseyana)</em></td>
<td>mountain big sagebrush** <em>(A. tridentata ssp. vaseyana)</em></td>
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<tr>
<td></td>
<td>silver sagebrush <em>(A. cana)</em></td>
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<td></td>
<td>three-tip sagebrush <em>(A. tripartita)</em></td>
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<tr>
<td><strong>Short Sagebrush</strong></td>
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<tr>
<td>low sagebrush <em>(A. arbuscula)</em></td>
<td>alkali sagebrush <em>(A. longilobia)</em></td>
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<td>black sagebrush <em>(A. nova)</em></td>
<td>fuzzy sagebrush <em>(A. papposa)</em></td>
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<td>stiff sagebrush <em>(A. rigida)</em></td>
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<td>Bigelow sagebrush <em>(A. bigelowii)</em></td>
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<tr>
<td>fringed sage <em>(A. frigida)</em></td>
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</tbody>
</table>

**Biological crust cover high or low depending on site characteristics.
Ecological Roles

• Nutrient cycling processes
• Soil surface stability
  – Reduce soil splash and wind erosion
• Improve water infiltration
• Slow moisture evaporation from soil
• Effects on vascular plant germination and growth
Disturbance

Hermiston Off-Road Vehicle Trail System, BLM Parcel, Umatilla Co, OR
• Natural Heritage Program species ranks,
• Update Special Status Species lists ~3 years,
• 1473 species as Sensitive or Strategic in Oregon and Washington
  – Lichens: 22 Sensitive, 53 Strategic
  – Bryophytes: 57 Sensitive, 81 Strategic
• Biotic Soil Crust species: 3
  – Lichen: *Texosporium sancti-jacobi*
  – Mosses: *Aloina bifrons*
    *Bryoerythrophyllum columbia*
Surveying for biotic soil crust lichens of shrub steppe habitats in the Columbia Basin

Heather T. Root¹ ² and Bruce McCune¹
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²Current Address: USDA Forest Service Air Program, Siuslaw National Forest, 3200 SW Jefferson Way, Corvallis, OR 97331.

Biological soil crusts are the community of organisms living at the surface of desert soils. Major components are cyanobacteria, green algae, microfungi, mosses, liverworts and lichens.

A Field Guide to Biological Soil Crusts of Western U.S. Drylands: Common Lichens and Bryophytes
By Roger Rosentreter, Ph.D., Matthew Bowker, Ph.D., Jayne Belnap, Ph.D.
[16mb PDF file]
Available through the Northwest Lichenologists
Collection & Processing

• Collection is necessary
• Glue is your friend
• Use boxes and foam “bumpers”
• Include notes:
  – thin layer chromatography results,
  – spore or cell structure observations,
  – chemical tests, etc.

List of ISSSSSP-Sponsored BSC Studies in WA & OR

• Ann DeBolt,
  – Malheur Co, OR (2008-2010)
• Heather Root (PhD dissertation)
  – Central & north central OR (2009-2010)
• Daphne Stone
  – Lake Co, OR (2010-2012)
  – Central WA (2013-2014)
• Dave Kofranek
  – Umatilla Co, OR & S Benton Co, WA (2013-2016)
  – Steens Mountain, OR (2017)
All Lichen & Bryophyte Records in R6 USFS & OR/WA BLM Databases

44  Texosporium sancti-jacobi
22  Aloina bifrons
146 Bryoerythrophyllum columbiaum
47 lichen, bryophyte, and cyanobacteria BSC species collected. None uncommon or rare.
Rome Cliffs Area, plot #1

- high biological soil crust cover of what superficially looks like barren ground within this swale zone
- lower right: biological soil crusts are reduced by fire and dense non-native annual plant litter

Malheur Co., Vale BLM
Ann DeBolt, 2009
Coal Mine Basin ACEC

- 161 lichen and bryophyte collections representing 81 species
- 56 species of BSC
- 25 species grew on rock or wood
- 16 taxa not identified to species

Ann DeBolt, 2010
18 species found at this site. The small flat terraces support *Aspicilia reptans* and large thalli of *Diploschistes muscorum*.
The Devil’s Garden

- above left: looking north or northwest across The Devil’s Garden from the lava on the southwest corner
- below left: old grass clump with unburnt, dead center; perfect crust habitat but unoccupied
- above left: grass clump with soil crust of Cladonia squamules and mosses on the northwest side

Lake County, Lakeview BLM
Stone EcoSurveys, 2010
Bryoerythrophyllum columbianum

Silusi Butte
Benton County, WA

Power City Wildlife Area
Umatilla Co, OR

Silusi Butte
Benton County, WA

Madison-Saylor Rd.
Umatilla Co, OR
Texosporium sancti-jacobi
Most of the work happens back at the “lab”

Photos by Daphne Stone

B4-17 Lecanora

Strongly P<sup>+</sup> epi hymenium, dissolves in K

P<sup>+</sup> margin, but not a deep Sp 4, and doesn’t become to Sp 10×5, 12.5×5.5

Possibly thallophila
Acarospora schleicheri
Dave Kofranek

Candelariella vitellina (yellow),
Lecidea atrobrunnea (brown),
Lecanora muralis (cream)

Gemmabryum vinosum

Rhizocarpon melanconianum
Thanks to...

- Heather Root
- Ann DeBolt
- Roger Rosentreter
- Dave Kofranek
- Daphne Stone
- Bruce McCune
- Jeanne Ponzetti
- Amanda Hardman
- Scot Loring

and more...

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