

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>

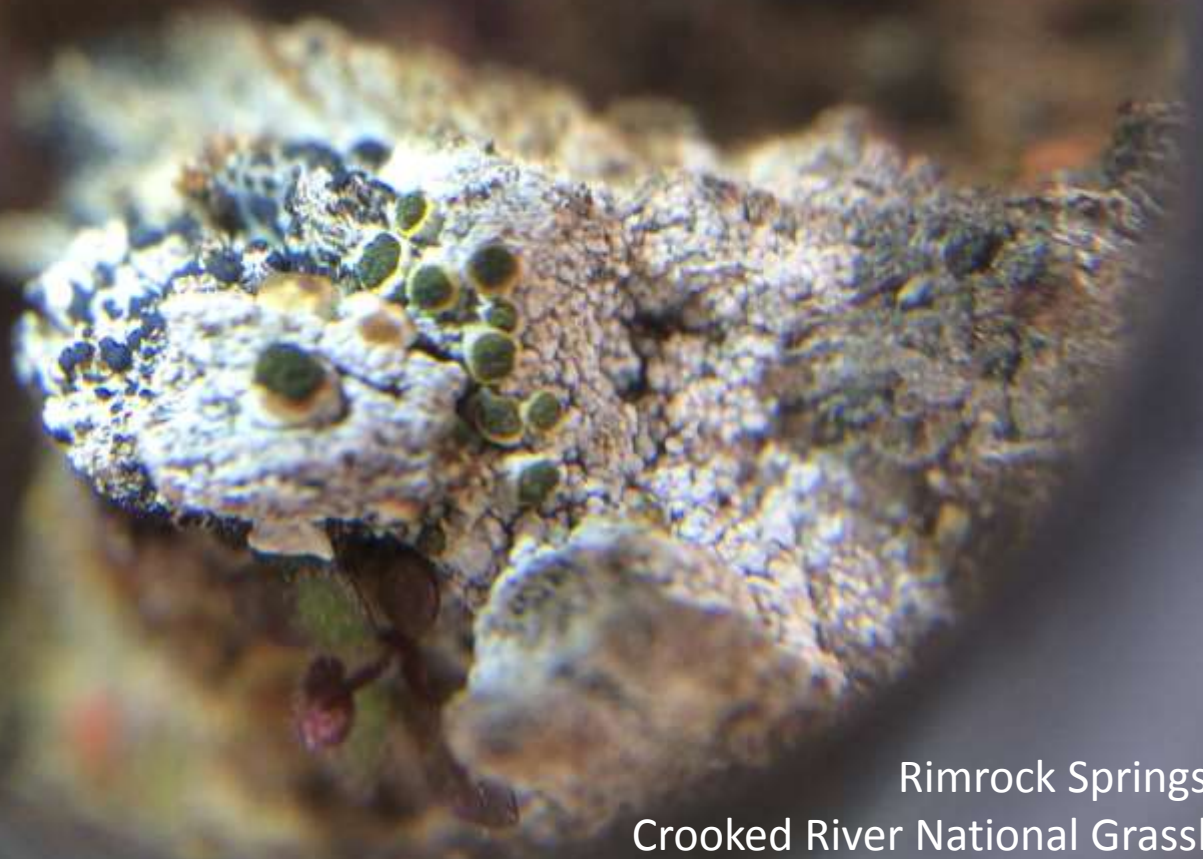
Typical Coulee, WA
Daphne Stone, 2013



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

Few BSC in this lowland
Gutierrezia sarothrae
shrub community.

Among the basalt
rocks, several
species of biotic
crust survive

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.

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

From Belnap et al., 2001
BLM Tech Ref 1730-2

**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

ISSSSP

- 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 columbianum



North American Fungi



Volume 7, Number 7, Pages 1-21
Published June 13, 2012

Surveying for biotic soil crust lichens of shrub steppe habitats in the Columbia Basin

Heather T. Root^{1,2} and Bruce McCune¹

¹Department of Botany and Plant Pathology, 2082 Cordley Hall, Oregon State University, Corvallis, OR 97331.

²Current Address: USDA Forest Service Air Program, Siuslaw National Forest, 3200 SW Jefferson Way, Corvallis, OR 97331.

Root, H. T., and B. McCune. 2012. Surveying for biotic soil crust lichens of shrub steppe habitats in the Columbia Basin. *North American Fungi* 7(7): 1-21. doi: <http://dx.doi.org/10.2509/naf2012.007.007>

BIOLOGICAL SOIL CRUSTS: ECOLOGY AND MANAGEMENT



Technical Reference 1730-2
2001

U.S. Department of the Interior

Bureau of Land Management



U.S. Geological Survey





biological soil crusts



[Textbook
Corrections](#)



[Level of
Development Index](#)

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]



USGS Canyonlands Research Station
Southwest Biological Science Center
2290 S West Resource Blvd
Moab, UT 84532
(435)719-2331
info@soilcrust.org

Available through the
Northwest
Lichenologists

BIOTIC SOIL CRUST LICHENS
OF THE COLUMBIA BASIN

Bruce McCune & Roger Rosentreter



MONOGRAPHS IN NORTH AMERICAN LICHENOLOGY VOL. 1

LICHENS OF OREGON

Texasporium sancti-jacobi

on soil

Gentle ridge with bunchgrasses, on silty soil, with patches of exposed caliche, summit of low ridge

Above Eightmile Canyon, N of Eightmile Road, BLM land

Elevation: 230 m 45.6631° N 120.0819° W

USA: OREGON: GILLIAM COUNTY

Coll. B. McCune No. 29992 May 2009
with Rick Deamter, Heather Koot, and Christina Wasseler



Bruce McCune

Collection & Processing

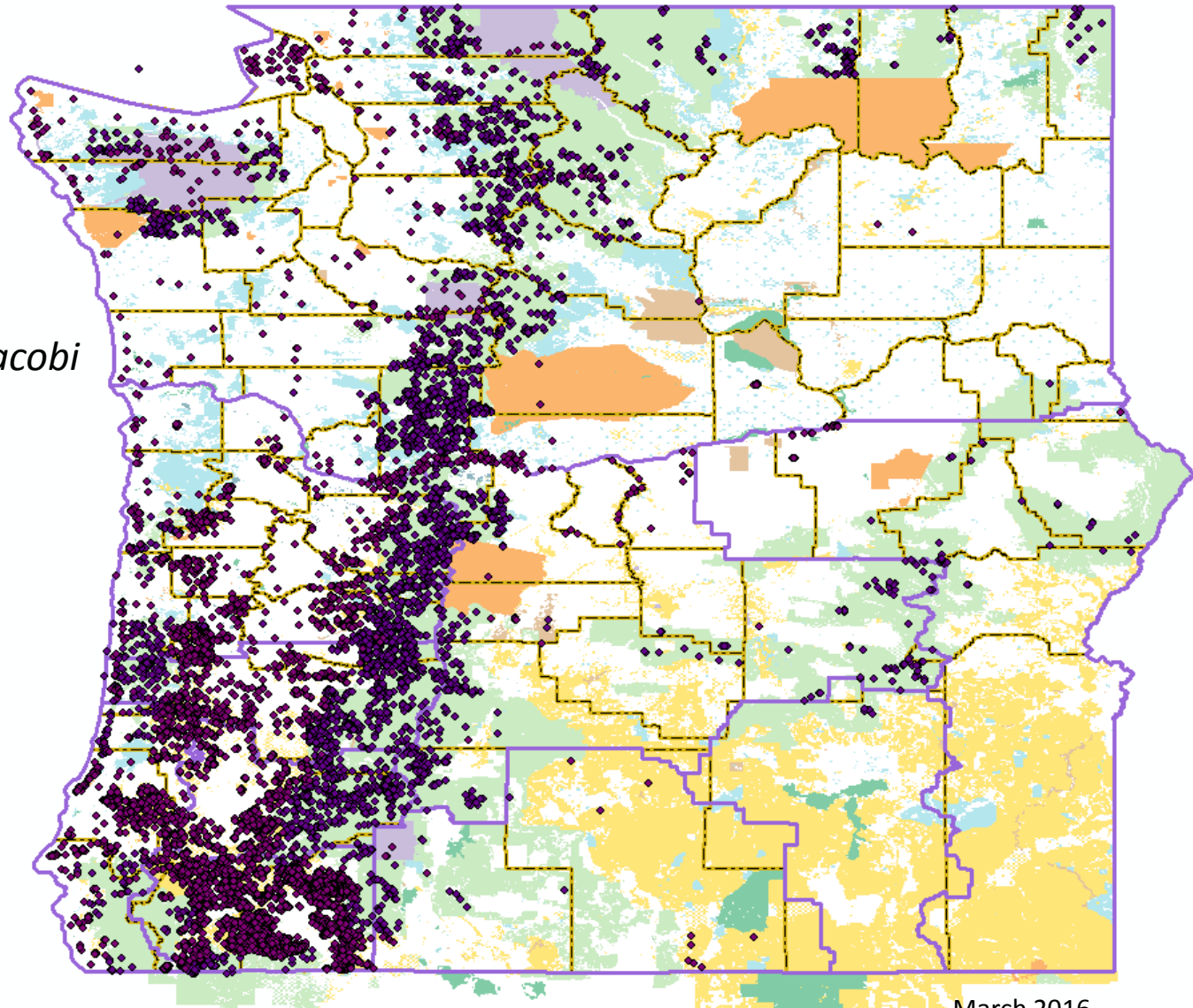
- Collection is necessary
- Glue is your friend
- Use boxes and foam “bumpers”
- Include notes:
 - thin layer chromatography results,
 - spore or cell structure observations,
 - chemical tests, etc.
- See Rosentreter, R., A. DeBolt and C. C. Bratt. 1988. Curation of soil lichens. *Evansia* 5(2): 23-25.

List of ISSSSP-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 columbianum*



March 2016



Birch Creek
Malheur County, Vale BLM
Ann DeBolt, 2008

Modified Forest Health Monitoring Protocol
35m radius plots
Minimum of 30 minutes
Maximum of 2 hours

47 lichen, bryophyte, and cyanobacteria BSC
species collected. None uncommon or rare.

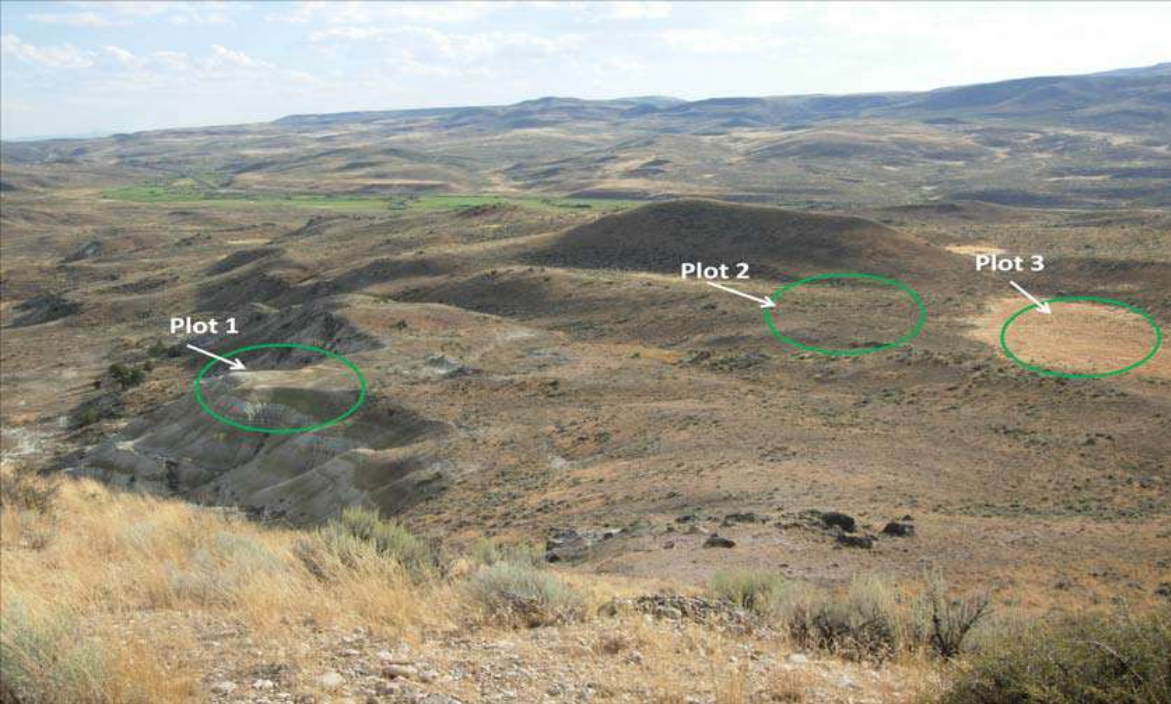


Rome Cliffs Area, plot #1

- 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

Black Hills RNA
Lake County, Lakeview BLM
Stone EcoSurveys, 2010



Diploschistes muscorum

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 right: grass clump with soil crust of *Cladonia* squamules and mosses on the northwest side

Lake County, Lakeview BLM
Stone EcoSurveys, 2010

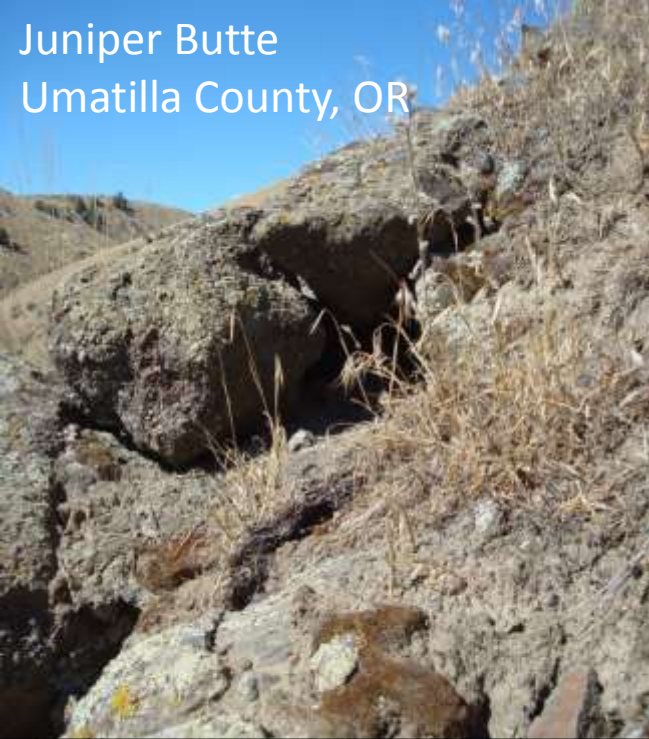
Juniper Canyon
Umatilla County, OR
Vale BLM
Dave Kofranek, 2013



Tortula protobryoides



Tortula protobryoides



Juniper Butte
Umatilla County, OR



Dave Kofranek
2013-2016



Silusi Butte
Benton County, WA



Aloina bifrons



Silusi Butte
Benton County, WA



*Bryoerythrophyllum
columbianum*



Madison-Saylor Rd.
Umatilla Co, OR

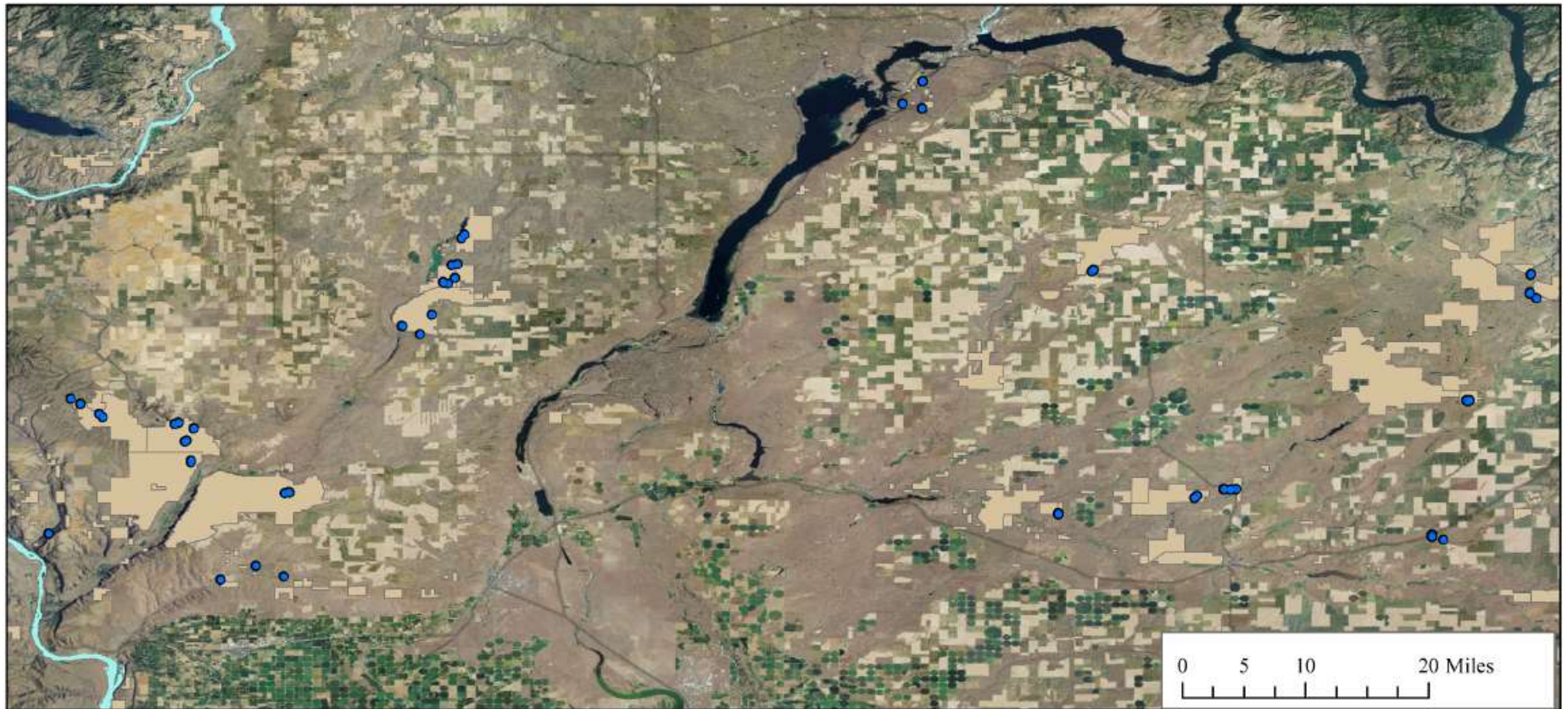


Power City Wildlife Area
Umatilla Co, OR

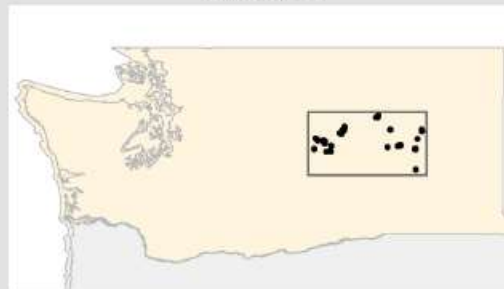


Silusi Butte
Benton County, WA

Spokane District BLM Biological Soil Crust Survey Plot Locations
Northwest Lichenologists 2013-2014



Project Area within
Washington



Map created February 2016
by A. Hardman



*Texosporium
sancti-jacobi*

Most of the work happens back at the "lab"

Photos by Daphne Stone

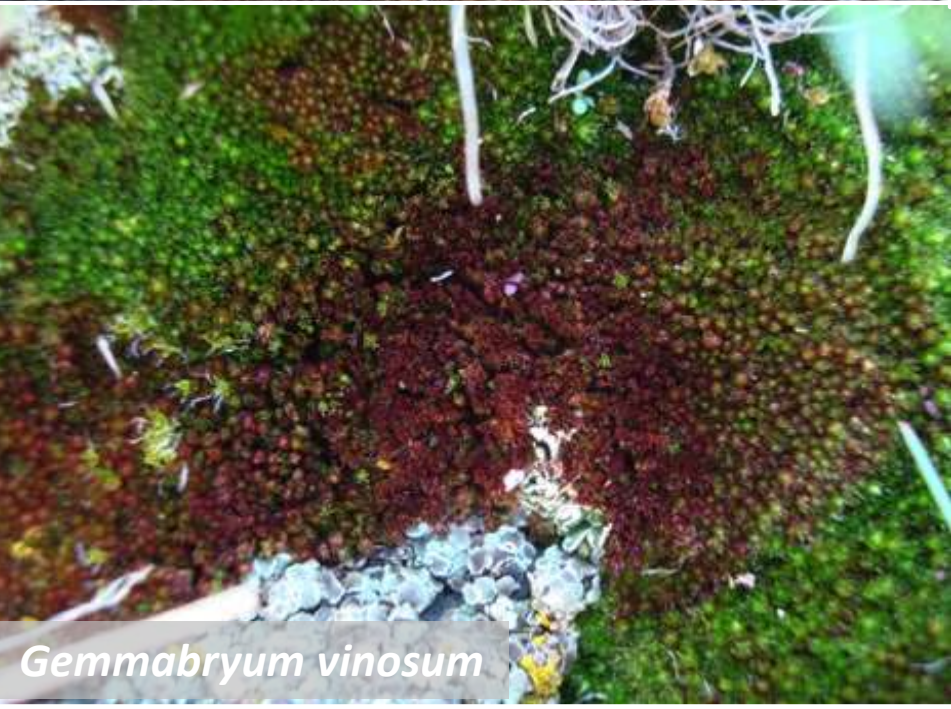
B4-17 Lecanora
Strongly POLT epi hymenium. ^{extends into hymenium in places} dissolves in K
POLT margin, but not a d
Sp 4, and doesn't become t
Sp 10x5, 12.5x5.5
Possibly thallophyla



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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