



Southern Bedrock Outcrop

Dry, open lichen-dominated plant communities on areas of exposed bedrock. Woody vegetation is sparse, and vascular plants are restricted to crevices, shallow soil deposits, and rainwater pools.

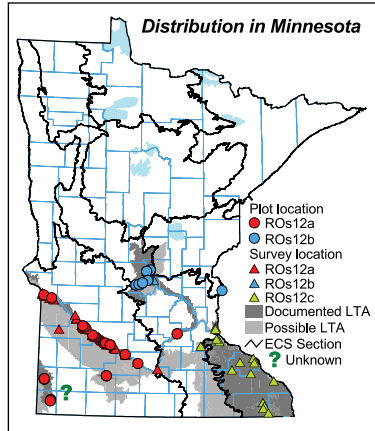
Vegetation Structure & Composition

Description is based on summary of vegetation plot data (relevés), plant species lists, and field notes from surveys of approximately 50 bedrock outcrops.

- Lichen and bryophyte** cover is high. On exposed bedrock, crustose and foliose lichens predominate. Species include *Candelariella vitellina*, *Lecanora muralis*, *Rhizocarpon dispersum*, *Dimelaena oreina*, *Xanthoparmelia cumberlandia*, *Xanthoparmelia plittii*, *Acarospora americana*, *Physcia subtilis*, and *Dermatocarpon miniatum*. On bedrock margins and along crevices, fruticose species such as *Cladonia pyxidata* are present with the more abundant crustose and foliose species. Common bryophytes on exposed rock include *Schistidium* and *Grimmia* species, and, along crevices, *Ceratodon purpureus*, *Weissia controversa*, and *Tortula* species. Mosses often form carpets in shallow rainwater-collecting bedrock hollows.

- Herbaceous plant** cover is sparse to patchy (5–50%); characteristic species in crevices and areas with shallow soil (< 1 in [3cm] deep), where plant biomass is low, include small-flowered fameflower (*Talinum parviflorum*), brittle prickly pear (*Opuntia fragilis*), rock spikemoss (*Selaginella rupestris*), rusty woodsia (*Woodsia ilvensis*), false pennyroyal (*Isanthus brachiatus*), slender knotweed (*Polygonum tenue*), green-flowered peppergrass (*Lepidium densiflorum*), mock pennyroyal (*Hedeoma hispida*), western ragweed (*Ambrosia psilostachya*), bluets (*Hedyotis longifolia*), hairy panic grass (*Panicum lanuginosum*), and bracted spiderwort (*Tradescantia bracteata*). Areas with deeper soil between bedrock exposures have greater plant biomass and typically support many prairie species, including blue grama (*Bouteloua gracilis*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*), harebell (*Campanula rotundifolia*), arrow-leaved violet (*Viola sagittata*), blood milkwort (*Polygala sanguinea*), round-headed bush clover (*Lespedeza capitata*), and prairie wild onion (*Allium stellatum*). Wet prairie species such as field sedge (*Carex conoidea*) may occur in areas of deeper soil kept moist by water perched above areas of unfractured bedrock. Temporary rainwater pools in small depressions may contain Carolina foxtail (*Alopecurus carolinianus*), ovoid spikerush (*Eleocharis ovata*), water hyssop (*Bacopa rotundifolia*), or disk hyssop (*Gratiola neglecta*). Deeper, more persistent rainwater pools may support submergent aquatic plants, such as water starworts (*Callitriche* spp.), mudwort (*Limosella aquatica*), and pondweeds (*Potamogeton* spp.), as well as emergent aquatic plants such as pointed broom sedge (*Carex scoparia*), water plantains (*Alisma* spp.), and smartweeds (*Polygonum* spp.).

- Tree and shrub** cover is absent to sparse (0–25%); characteristic shrub species include sand cherry (*Prunus pumila*) and blackberries (*Rubus* spp.). Open-grown oak trees, especially bur oak, are often present on bedrock outcrop complexes. On outcrops affected by grazing and fire suppression, woody species such as eastern red cedar, smooth sumac (*Rhus glabra*), staghorn sumac (*R. hirta*), and the exotic species pretty honeysuckle (*Lonicera x bella*) and Tartarian honeysuckle (*L. tatarica*) often increase in abundance, sometimes dramatically.





Landscape Setting & Soils

ROs12 occurs on small, level to sloping exposures of Precambrian and Paleozoic bedrock. Soil development is minimal, with soil mostly restricted to crevices or shallow bedrock depressions and largely consisting of decomposing plants and invertebrates. The amount of fracturing in the bedrock varies, depending on cleavage properties and resistance to weathering of various rock types; vascular plant cover tends to increase with degree of fracturing of bedrock exposures.

Natural History

Species in bedrock outcrop communities are subjected to greater environmental extremes than species in surrounding terrestrial communities, including more rapid fluctuations in substrate temperature, higher desiccation rates because of low substrate moisture-holding capacity and exposure to direct sunlight, and more limited nutrient availability. The absence of soil over most of the community limits colonization by vascular plants, which are restricted to small patches of soil in crevices or shallow depressions. Most of the landscapes where bedrock outcrops occur are prone to periodic fires, which keep bedrock outcrops open by killing woody species and consuming organic soils. Many typical bedrock outcrop plants are adapted to drought, which, like fire, can prevent succession of open outcrop communities to shrub- or tree-dominated communities by periodically killing desiccation-intolerant trees and shrubs.

Similar Native Plant Community Classes

● **UPs13 Southern Dry Prairie** and **UPs14 Southern Dry Savanna**

UPs13 and UPs14 share a number of species with and sometimes surround occurrences of ROs12. ROs12 is differentiated from these two classes by the presence of exposed bedrock and rock outcrop specialists such as small-flowered farnetower, brittle prickly pear, devil's tongue, false pennyroyal, pale corydalis (*Corydalis sempervirens*), rusty woodsia, Carolina foxtail, and water hyssop. Where obligate rock outcrop specialists are absent, separating ROs12 from UPs13 and UPs14 is often largely a matter of scale. As a general guideline, outcrops without obligate outcrop specialists are treated as inclusions in the prairie or savanna community. This is most commonly the case with limestone-dolomite and sandstone outcrops (ROs12c) that are surrounded by dry bedrock bluff prairies (UPs13c).

● **UPs23 Southern Mesic Prairie**

UPs23 often surrounds occurrences of ROs12, and areas of deeper soil in ROs12 are often dominated by prairie species such as big bluestem, Indian grass, prairie dropseed, prairie wild onion, and round-headed bush clover. ROs12 is differentiated from UPs23 by the presence of exposed bedrock and rock outcrop specialists such as small-flowered farnetower, brittle prickly pear, devil's tongue, false pennyroyal, pale corydalis, rusty woodsia, Carolina foxtail, and water hyssop. Where rock outcrop specialists are absent, separating ROs12 from UPs23 is based on scale, but most often in these cases ROs12 is treated as an inclusion within UPs23.

● **CTs12 Southern Dry Cliff**

CTs12 and ROs12 share a number of species and the difference between the two is largely a matter of scale. The taller a vertical bedrock exposure is, the more likely it is to have distinctive cliff species. By convention, vertical exposures greater than 6ft (2m) tall are classified as cliffs, although the floristic differences between a 6-foot cliff (especially a dry cliff) and a 4-foot outcrop are often insignificant.

● **ROn12 Northern Bedrock Outcrop**

ROn12 can be similar to ROs12 in central and east-central Minnesota, where the flora of bedrock outcrops is often composed of a mix of northern and southern species. ROn12 is more likely to have species common in the northern forest regions of Minnesota, including bearberry (*Arctostaphylos uva-ursi*), bristly sarsaparilla (*Aralia hispida*), three-toothed cinquefoil (*Potentilla tridentata*), fringed false buckwheat (*Polygonum ciliinode*), Douglas' knotweed (*P. douglasii*), pines, spruces, and balsam fir. ROs12 is more likely to have species common in the prairie regions such as big bluestem, little bluestem, small-flowered farnetower, brittle or plains prickly pear (*Opuntia fragilis* or



O. macrorrhiza), slender knotweed, ragweeds (*Ambrosia* spp.), prairie wild onion, blood milkwort, false pennyroyal, bulbostylis (*Bulbostylis capillaris*), and eastern red cedar.

Native Plant Community Types in Class

Plant species composition has not been systematically sampled across the range of ROs12, but appears to vary with geography, pH, and nutrient availability. Community types in ROs12 at present are based on geography and broad bedrock categories reflecting pH and nutrient properties.

• ROs12a Crystalline Bedrock Outcrop (Prairie)

ROs12a is uncommon; it has been documented on dry exposures of igneous or metamorphic bedrock in southwestern Minnesota. Typical vascular species include small-flowered fameflower, brittle prickly pear, rock spikemoss, rusty woodsia, false pennyroyal, devil's tongue, desert parsley (*Lomatium orientale*), and little barley (*Hordeum pusillum*). Characteristic lichens include *Aspicilia cinerea*, *Rhizocarpon subgeminatum*, *Physcia dakotensis*, and *Pleopsidium chlorophanum*. Rainwater pools are often present and support specialized aquatic plants such as water hyssop, mouse-tail (*Myosurus minimus*), spring forget-me-not (*Myosotis verna*), and Carolina foxtail. ROs12a is divided into two subtypes based on floristic differences that appear to be most strongly correlated with geography.

O ROs12a1 Minnesota River Subtype

ROs12a1 is occasional on granite, gneiss, or diorite along the Minnesota River valley between Ortonville and New Ulm, and locally present downstream on sandstone between Mankato and the Twin Cities metropolitan area. Rainwater pools are present on many occurrences, with many of these remaining wet for several weeks or longer following rain. Deeper pools often support submergent aquatic plants, such as mudwort and pondweeds (*Potamogeton* spp.).

O ROs12a2 Sioux Quartzite Subtype

ROs12a2 is rare; it has been documented on quartzite at scattered locations in Rock, Pipestone, and Cottonwood counties. Vascular plants useful for distinguishing this subtype from ROs12a1 include buffalo grass (*Buchloe dactyloides*), tumble grass (*Schedonnardus paniculatus*), popcorn flower (*Plagiobothrys scouleri*), slender plantain (*Plantago elongata*), prairie quillwort (*Isoetes melanopoda*), and hairy waterclover (*Marsilea vestita*). Rainwater pools may be present but tend to be small and temporary and do not persist nearly as long as those in ROs12a1.

• ROs12b Crystalline Bedrock Outcrop (Transition)

ROs12b is uncommon; it has been recorded on dry exposures of igneous or metamorphic bedrock (most commonly granite but also gabbro and gneiss) in the greater St. Cloud area and locally on basalt near Taylors Falls in the St. Croix River valley. Species typical of the Laurentian Mixed Forest Province, such as pale corydalis, lowbush blueberry (*Vaccinium angustifolium*), and poverty grass (*Danthonia spicata*), are often present on occurrences of ROs12b, although much of the flora consists of species characteristic of the prairie region. Fruitful dewberry (*Rubus multiflorus*) and several species of blackberry (*Rubus* spp.) are typical shrubs. Characteristic lichens include *Cladonia gracilis* and *Cladonia rangiferina*. Although rainwater pools occur in ROs12b, they are shallow and evaporate within days after rain and do not support the aquatic plants characteristic of ROs12a.

• ROs12c Sedimentary Bedrock Outcrop (Southeast)

ROs12c is occasional; it has been documented on dry exposures of limestone, dolomite, or sandstone bedrock in the PPL, and locally along the Mississippi and lower St. Croix rivers in the Twin Cities area. ROs12c typically occurs on bluffs vegetated by dry bedrock bluff prairie, overgrown dry savanna, or woodland. Although not common, when present, rock sandwort distinguishes ROs12c from the other two types in the class. ROs12c is divided into two subtypes based on differences in bedrock substrates.

O ROs12c1 Sandstone Subtype

O ROs12c2 Limestone-Dolomite Subtype



photo by R.P. Dana MN DNR

Big Stone County, MN



ROs12 Southern Bedrock Outcrop — Species Frequency & Cover

	freq % cover	freq % cover
Forbs, Ferns & Fern Allies		
Common ragweed (<i>Ambrosia artemisiifolia</i>)	93	•
Rock spikemoss (<i>Selaginella rupestris</i>)	89	•••
Prairie wild onion (<i>Allium stellatum</i>)	75	•
Blueits (<i>Hedyotis longifolia</i>)	64	•
Small-flowered farnetlower (<i>Tairnum parviflorum</i>)	61	•
Mock pennyroyal (<i>Hedeoma hispidium</i>)	57	•
Western androsace (<i>Androsace occidentalis</i>)	54	•
Brittle prickly pear (<i>Opuntia fragilis</i>)	39	•
Field chickweed (<i>Cerastium arvense</i>)	36	•
Gray goldenrod (<i>Solidago nemoralis</i>)	29	•
Slender knotweed (<i>Polygonum tenue</i>)	29	•
Fusty woodasia (<i>Woodasia livensis</i>)	25	•
Bastard toadflax (<i>Comandra umbellata</i>)	21	•
Yarrow (<i>Achillea millefolium</i>)	21	•
Fed sorrel (<i>Rumex acetosella</i>)	21	•
Sleepy catchfly (<i>Silene antirrhina</i>)	18	•
Arrow-leaved violet (<i>Viola sagittata</i>)	18	•
Harebell (<i>Campanula rotundifolia</i>)	14	•
Tall wormwood (<i>Artemisia campestris</i>)	14	•
Pursh's plantain (<i>Plantago patagonica</i>)	14	•
Green-flowered peppergass (<i>Lepidium densiflorum</i>)	14	•
Nodding chickweed (<i>Cerastium nutans</i>)	11	•
Pale corydalis (<i>Corydalis sempervirens</i>)	11	•
Yellow whitlow grass (<i>Draba nemoralis</i>)	11	•
Daisy fleabane (<i>Erigeron strigosus</i>)	11	•
Northern bedstraw (<i>Gallium boreale</i>)	11	•
Round-headed bush clover (<i>Lespedeza capitata</i>)	11	•
Hoary frostweed (<i>Helianthemum bicknellii</i>)	11	•
Grasses & Sedges		
Hairy panic grass (<i>Panicum lanuginosum</i>)	57	•
Poverty grass (<i>Darlingtonia spicata</i>)	54	•
Short sedge (<i>Carex brevior</i>)	46	•
Big bluestem (<i>Andropogon gerardii</i>)	46	•
Junegrass (<i>Koeleria pyramidata</i>)	32	•
Bicknell's sedge (<i>Carex bicknellii</i>)	29	•
Twin bentgrass (<i>Agrostis hymenalis</i>)	29	•
Prairie dropseed (<i>Sporobolus heterolepis</i>)	21	••
Indian grass (<i>Sorghastrum nutans</i>)	14	••
Spike rush sedge (<i>Carex stenophylla</i>)	14	•
Hairy grama (<i>Bouteloua hirsuta</i>)	11	••
Schuber's panic grass (<i>Panicum oligosanthes</i>)	11	•
Low Shrubs		
Tall blackberries (<i>Rubus allegheniensis</i> and similar <i>Rubus</i> spp.)	18	•
Fed raspberry (<i>Rubus idaeus</i>)	11	••
Tall Shrubs		
Smooth sumac (<i>Rhus glabra</i>)	39	••
Tree Seedlings and Saplings (< 6ft)		
Bur oak	14	•
Eastern red cedar	14	•
Northern red oak	14	•