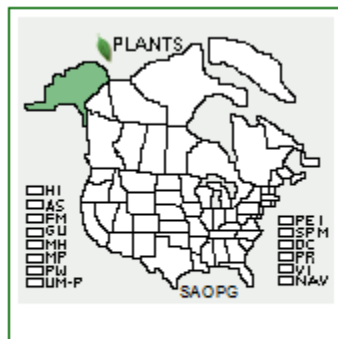
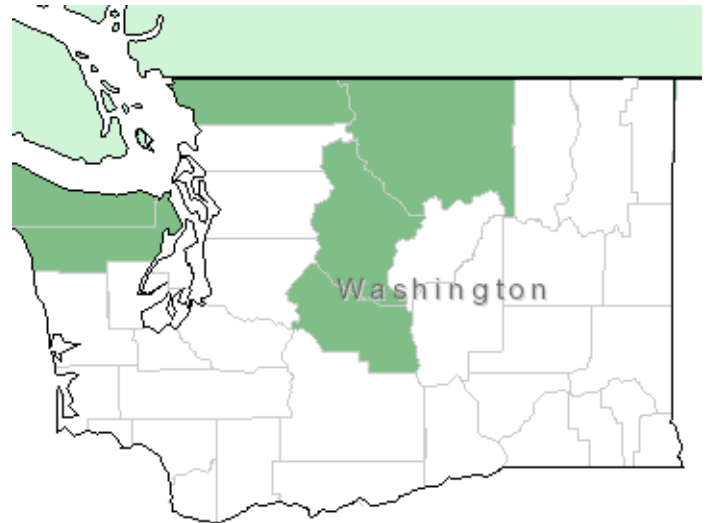
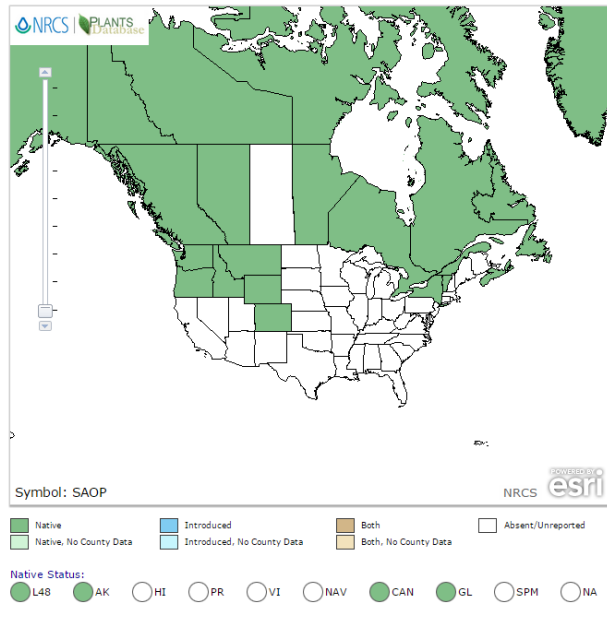


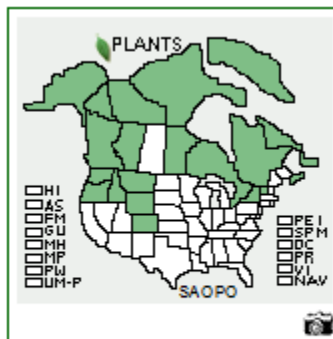
Plant Propagation Protocol for *Saxifraga oppositifolia*

ESRM 412 – Native Plant Production

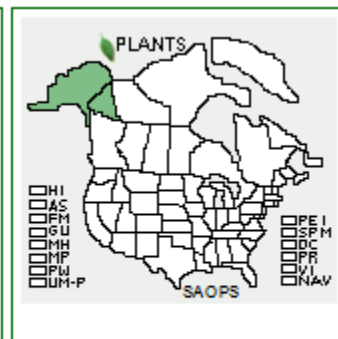
Protocol URL: <https://courses.washington.edu/esrm412/protocols/SAOP>



Saxifraga oppositifolia
subsp. *glandulisejala*
purple mountain saxifrage



Saxifraga oppositifolia
subsp. *oppositifolia*
purple mountain saxifrage



Saxifraga oppositifolia
subsp. *smalliana*
purple mountain saxifrage

TAXONOMY

Plant Family	
Scientific Name	Saxifragaceae
Common Name	Saxifrage
Species Scientific Name	
Scientific Name	<i>Saxifraga oppositifolia</i> L.
Varieties	<i>Saxifraga oppositifolia</i> L. var. <i>nathorstii</i> Dusén,
Sub-species	<i>Saxifraga oppositifolia</i> L. spp. <i>glandulisejala</i> Hultén,

	<i>Saxifraga oppositifolia</i> L. spp. <i>oppositifolia</i> , <i>Saxifraga oppositifolia</i> L. spp. <i>smalliana</i> (Engl. & Irmsch.) Hultén
	<i>Saxifraga oppositifolia</i> cult. Theoden ⁴
Common Synonym(s)	<i>Antiphylla oppositifolia</i> (L.) Fourreau ¹² , <i>Saxifraga caerulea</i> Persoon ¹² , <i>Saxifraga rudolphiana</i> Hornschuch ¹² , <i>Saxifraga murithiana</i> Tissiere ¹² , <i>Saxifraga meridionalis</i> Terracciano ¹² , <i>Saxifraga pulvinata</i> Small ¹² , <i>Antiphylla pulvinata</i> (Small) Small ¹² , <i>Saxifraga blepharophylla</i> Kerner ex Hayek ¹² , <i>Saxifraga speciosa</i> Dorfler & Hayek ¹² .
Common Name(s)	Purple mountain saxifrage, purple saxifrage
Species Code (as per USDA Plants database)	SAOP
GENERAL INFORMATION	
Geographical range	See above
Ecological distribution	Often found in gravelly tundra – can commonly be found in both open and closed communities. Further south, it can be found in moraines, bare rock and semi-open grasslands. <i>Saxifraga oppositifolia</i> can grow on almost all rock types besides quartzites and very poor sandstones ¹² . Is found in areas with nitrogen-deficient soils ¹¹ . Locally, the plant is found in the highest mountains of the Olympic and Cascade ranges, and those tall mountains of Vancouver and the Queen Charlotte Islands ⁷ .
Climate and elevation range	Dry and cold climates – generally considered an arctic and alpine species, and is found in Europe, North America and Asia at high altitudes. Found at sea level in Northern Ireland, although is most common between 1600 and 2500 m altitude. In the Swiss Alps, it has been found as high as 3800 m ¹² .
Local habitat and abundance	Often found on north-facing rock cliffs. Prefers shady, moist conditions, especially during midday heat. Does not do well in snowy conditions. Grows in loose mats; tends to grow laterally close the ground ¹⁰ . Is successful only in areas with rapidly-draining soils ¹¹ .
Plant strategy type / successional stage	Stress tolerator – <i>Saxifraga oppositifolia</i> can withstand very rocky, very cold and nitrogen-deficient conditions ¹¹ that most other plants would perish in. <i>Saxifraga oppositifolia</i> is considered a pioneer species (early successional/seral) ¹² ; it is usually the first plant

	<p>to bloom in the Arctic⁸.</p> <p>In southern mountain ranges, the plant is used as a monitoring species to help guide studies in climate change and global warming⁶, including the International Tundra Experiment¹¹.</p>
Plant characteristics	<p>General: Evergreen³ perennial herb⁶. Grows 3- 5 cm tall with woody branches¹⁰. Forb plant. Distinct from many other saxifrages as it has opposite leaves¹². There are two known “morphs,” or forms, of the species, called prostrate and cushion. The prostrate form has distant leaves, marginal cilia and flowers with narrow-non-overlapping petals; the cushion form has dense, overlapping leaves without cilia and broad, urn-shaped petals that overlap¹.</p> <p>Leaves: Variable; often between 2 -5 mm by 1.5-2 mm, but it can go up to 8 x 3 mm; oblong or obovate in shape; sometimes narrowed at the base to an ill-defined petiole. Often have bristly hairs at the margin, keeled beneath¹². Opposite – oppositifolia means opposite-leaved⁷; dull green in color¹². Can grow very close together, or can be more spread out across the stem – leaf distance appears to be a trait of the plant adapting to the micro-climate it resides in⁸.</p> <p>Flowers: Sepals are 2-4 mm marginal hairs, Petals are 5-12 mm by 2-7 mm, obovate to elliptic, deep purple to pink in color. Flowers usually occur from March to August, although this can vary greatly based on altitude and latitude. Most flowers appear within three weeks of the snow melting¹².</p> <p>Seeds: brown, oblong, several papillae, usually 1.2 mm by 0.65 mm¹².</p> <p>Stems: Woody, freely branched. Flowering stems 1-2 cm., only holding one flower¹².</p> <p>Ethnobotany: Saxifrages were often ground up and fed to patients with gallstones, as the plants were thought to break up the rocks in which they often grew. Another former belief was that eating the fresh roots could both lessen toothaches and help remove freckles from the skin⁷.</p>
<p>Propagation of <i>Saxifraga oppositifolia</i> by cutting by D. Hagen for purposes of assessing species restoration potential³</p>	
Ecotype	<p>Cuttings (N= 644) of <i>Saxifraga oppositifolia</i> were collected from the Svalbard archipelago (arctic, permafrost, about 1 km from Longyearbyen) in Norway. Cuttings were all taken from unstable gravel</p>

	locations near a riverbed. All cuttings were done in August 1998.
Propagation Goal	Plants with sturdy, visible roots.
Propagation Method	Vegetative
Product Type	All cuttings were planted in 4 by 4 cm peat pots, one cutting per pot.
Stock Type	Native cuttings from Svalbard archipelago.
Time to Grow	Eight months.
Target Specifications	Cuttings were examined for rooting abilities after an 8-month period.
Propagule Collection Instructions	Plants were collected in mid August. All cuttings were cut to about 5 cm in length, and were taken from the outermost 10 cm of the lateral branches. Plant material was taken from 10 different <i>Saxifraga oppositifolia</i> mother plants.
Propagule Processing/Propagule Characteristics	No processing was done for these cuttings.
Pre-Planting Propagule Treatments	Cuttings were wrapped in moist moss and plastic bags while being transported from the Svalbard archipelago to Trondheim, Norway, where greenhouse experiment took place. Cuttings were kept in moist moss bags until they were planted a few days after being collected.
Growing Area Preparation / Annual Practices for Perennial Crops	After being cut to 5 cm from the original 10 cm cutting, each propagule was put into 4 by 4 cm peat pots in a peat soil mixed with perlite at a 2:1 ratio by volume.
Establishment Phase Details	<p>Cuttings were placed into one of two moisture regimes: half were placed under a fog system that supplied a near-constant supply of water. The other half was placed into a saturated moist air system in an enclosure tent made from polyethylene.</p> <p>All cuttings were kept in temperatures between 0 – 4 deg. C from August to February to mimic winter conditions. Temperatures were gradually increased to 22 deg. C from February – March to mimic spring conditions.</p> <p>Between August – March, no artificial light was supplied to the cuttings. Normal day-length fluctuated between 8 and 11 hours.</p> <p>Between March – April, cuttings were kept at a steady 22 deg. C and were given 18 hours of light per day.</p> <p>At the end of April, all cuttings were studied for evidence of visible roots.</p>

Length of Establishment Phase	Eight (8) months.
Active Growth Phase	Not examined in this study.
Length of Active Growth Phase	Not examined in this study.
Hardening Phase	Not examined in this study. Although cuttings did go through cold winter conditions, they were still in a juvenile state at this time.
Length of Hardening Phase	Not examined in this study.
Harvesting, Storage and Shipping	Not examined in this study.
Length of Storage	Not examined in this study.
Guidelines for Outplanting / Performance on Typical Sites	<p>Ninety percent of cuttings that were placed in fog conditions had visible roots at the end of the experiment, while 18% of cuttings placed in the saturated moist air conditions were successful. The two conditions were chosen to see if propagation of <i>Saxifraga oppositifolia</i> could be successful with a monetarily cheaper moisture regime (which was the saturated air condition). Results from this experiment demonstrate a need for these stable moisture conditions when propagating cuttings.</p> <p>This study did not look at how the two morphs (prostrate and cushion) affected rooting success – the researcher noted that this affect should have been taken into account when collecting the cuttings and likely influenced these results. A 1999 study from Kume et al found that the prostrate form performed better in vegetative propagation, while the cushion morph was more successful in methods utilizing sexual reproduction⁵.</p> <p>Researchers concluded that this study demonstrated <i>Saxifraga oppositifolia</i> is an easy plant to propagate in fog conditions and with prostrate morph (even though morphs of the species were not specifically studied) for further restoration-aimed research and projects.</p>
Other Comments	None at this time.
Propagation of <i>Saxifraga oppositifolia</i> by seed by E.J. Cooper et al. assessing plant propagation viability after disturbance²	
Ecotype	Seeds were collected from a polar heath environment on the Brogger-halvoya and Sarsoyra peninsulas in Norway in areas where disturbance occurred less than 20 years ago in the form of organic surface layer removal. Vegetation here is dominated by mosses as well as species in the Saxifragacea, Poaceae and Ranunculaceae families. All samples were expected to have had some more recent (less than 1 year) grazing

	from local reindeer and geese populations. Thirty-two sites were sampled, with 25 soil samples taken at each site. Plots were 50 m by 50 m.
Propagation Goal	Germinants
Propagation Method	Seed
Product Type	Petri dishes with filter paper (designs, size and type not specified).
Stock Type	Native seed from two main collection areas (see above).
Time to Grow	The study was only conducted for 12 weeks – this was the period assessed from seeding – germination. Since the propagation goal was germinants, outplanting was not specified.
Target Specifications	Successful germination of seeds. Size and further characteristics not specified.
Propagule Collection Instructions	Soil samples were collected between 9 July and 7 August 2000. All soil samples were taken within 10 cm of the <i>Saxifraga oppositifolia</i> plants in hopes of catching some of the recently dispersed seed.
Propagule Processing/Propagule Characteristics	Not completed for this research.
Pre-Planting Propagule Treatments	Soil samples (and seeds) were kept at temperatures between 2 – 6 deg. C in transit between collection sites and the Longyearbyen greenhouse site. Samples were then stored in paper bags for 5 - 7 weeks at 0.5 deg. C. Samples were then cooled further to -5 deg. C for 5 weeks.
Growing Area Preparation / Annual Practices for Perennial Crops	Plastic petri dishes and filter paper (size/type not specified) were set up under artificial heat and light sources.
Establishment Phase Details	<p>Samples were thawed back to 0.5 deg. C for 3 days, then acclimated to 4 deg. C for 4 days. Samples were then spread in a thin layer (soil mass not specified) on filter paper in plastic petri dishes. Samples were then placed in a greenhouse and kept at 18 deg. C with 24 hour artificial lights for 12 weeks. Conditions were chosen to mimic the plants' native summer period. Petri dishes were moistened every other day. Seedling rates were counted weekly.</p> <p>Seedlings grown from native soil samples near <i>Saxifraga oppositifolia</i> samples had a mean density of 39 plants per square meter, with a standard error of 10 plants.</p>
Length of Establishment Phase	12 weeks
Active Growth Phase	Not completed for this study.

Length of Active Growth Phase	Not completed for this study.
Hardening Phase	Not completed for this study.
Length of Hardening Phase	Not completed for this study.
Harvesting, Storage and Shipping	Not completed for this study.
Length of Storage	Not completed for this study.
Guidelines for Outplanting / Performance on Typical Sites	<p>Seeds of <i>Saxifraga oppositifolia</i> collected from sites that have experienced recent disturbance will likely still be extremely viable, and can produce a high quantity of germinants. After collecting seeds in fall, put the seeds in cold storage (going from 0.5 to -5 deg. C for five weeks each) before acclimating the seeds to warmer temperatures. Seeds can easily propagate after being exposed to artificial summer conditions similar to the species' native environment.</p> <p>Seeds from disturbed environments demonstrate high resilience. A smaller field study conducted by E. J. Cooper et al found that both intact and disturbed sample sites (on a different type of heath) had the same density of <i>Saxifraga oppositifolia</i>, further demonstrating the plant's resilience and success in harsh environments².</p>
Other Comments	Not at this time.
INFORMATION SOURCES	
References	See below
Other Sources Consulted	See below
Protocol Author	Ashley Blazina
Date Protocol Created or Updated	May 20, 2015

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Former *Saxifraga oppositifolia* Propagation Protocol, 2006.

Purple Saxifrage - *Saxifraga oppositifolia*



Range: Found from Alaska to Northwestern Oregon. In Washington and Oregon found commonly in the mountains. (Pojar 1994)

Climate, elevation: Low to high elevations in Canada and Alaska. Found in middle to high elevations in Washington and Oregon. (Pojar 1994)

Local occurrence: Common locally in the Cascades and Olympics on rocky outcrops and slopes. It can be found from sea level outcrops to alpine tundra. (Pojar 1994)

Habitat preferences: Rocky slopes, cliffs, ledges, gravelly ridges. Alpine tundra and sea level outcrops. (Pojar 1994)

Plant strategy type/successional stage: Pioneer species (Plants of Western Washington Collection)

Associated species: Not specified.

May be collected as: Seed and cuttings.

Collection restrictions or guidelines: Not specified

Seed germination: Germination occurs at 12 C, seeds are non dormant

Seed life: Not specified.

Recommended seed storage conditions: Not specified.

Propagation recommendations: Collect seeds in the fall. Germinate seeds at 12 C and grow in greenhouse. Plant when it reaches 1 gallon size.

Soil or medium requirements: Not specified.

Installation form: Best if installed as a whole plant. Seeds and cuttings can be killed by late spring freezes.

Recommended planting density: Not specified.

Care requirements after installed: Not specified.

Normal rate of growth or spread: Slow growth

Sources cited:

Pojar, J., MacKinnon, A. (1994). *Plants of the Pacific Northwest Coast*. Lone Pine Publishing Vancouver British Columbia.

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