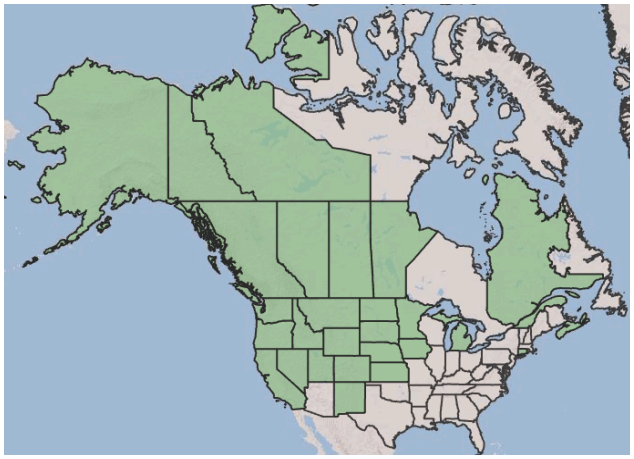
Plant Propagation Protocol for *Salicornia rubra*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/*2026/SARU.pdf*

North America Distribution



Washington Distribution

Source: USDA PLANTS Database

TAXONOMY	
Plant Family	
Scientific Name	Chenopodiaceae
Common Name	Goosefoot family
Species Scientific Name	
Scientific Name	*Salicornia rubra* A. Nelson
Varieties	
Sub-species	
Cultivar	
Common Synonym(s)	*Salicornia europaea* L. var. *prona* (Lunell) B. Boivin *Salicornia europaea* L. ssp. *rubra* (A. Nelson) Breitung
Common Name(s)	red swampfire, red glasswort saltwort, saltwort, western glasswort
Species Code (as per USDA Plants database)	SARU
GENERAL INFORMATION	
Geographical range	Found east of the Cascade Range in Washington, and primarily the western region of the US surrounding the Rocky Mountains and northern Great Plains.[1] Reference North America and Washington maps above.[2]

Ecological distribution	Inland regions that are saline or alkaline, such as prairies and salt flats, that experience seasonal rainfall.[3]
Climate and elevation range	Typically found in elevations ranging from 100 to 1600m.[3] Climate typically is in arid to semi-arid regions with annual precipitation levels around 8-14 inches, with a minimum growth temperature at 52 degrees Fahrenheit.[2]
Local habitat and abundance	*Salicornia rubra* occurs locally in alkaline depressions and salt flats, often abundant along the shores of alkaline lakes and in the saline lowlands of prairies.[5] The species has an extreme tolerance to saline conditions and requires high NaCl levels to survive. Additionally, it thrives in areas with sparse vegetation and full access to sunlight.[5] Some commonly associated species that have extreme tolerances to similar conditions are *Atriplex patula* (spearscale), *Distichlis spicata* var. *stricta* (salt grass), *Hordeum jubatum* (foxtail barley), *Puccinellia nuttalliana* (Nuttall's alkali grass), and *Suaeda calceoliformis* (sea-blite).[5]
Plant strategy type / successional stage	*Salicornia rubra* is classified as a stress-tolerator and pioneer colonizer species due to its ability to withstand extremely high salinity environments where other plant species cannot survive. Communities of the species tend to be denser and shorter in height at higher salinity levels, physical characteristics that reflect the severity of their ecosystem and lack of competition with other plant species.[6]
Plant characteristics	*Salicornia rubra* is an annual forb/herb, subshrub.[2] It is a herbaceous plant that is physically similar to a succulent, appearing skeleton-like, growing up to 10 inches tall.[53] Flowers are embedded within jointed stem segments of the plant. During the growing season, the species is a vibrant, light green, with a drastic transformation in the fall and winter as it dries up to a dark, ruby red.[5]
PROPAGATION DETAILS: FROM SEED	
Ecotype	No experimentally derived seed propagation protocols currently exist for any population of *Salicornia rubra.*
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)

Stock Type	Leach tubes
Time to Grow	There is no documented data specifically detailing the exact growth time from seeding until outplanting. However, based on the species' growing patterns, germinating in early spring[7] and completing its lifecycle in the fall[8], we can estimate the growth process to take between 4-6 months.
Target Specifications	There are no documented target specifications for *Salicornia rubra;* therefore, we will base these on a similar species protocol for *Salicornia virginica.* In this species, root development is the key determining factor of outplanting readiness. Roots established within the Leach tubes should have developed roots[9], stems between 5 and 25cm in height, and no signs of reddening to be considered for outplanting.[3]
Propagule Collection Instructions	Seeds should be collected after the plant has turned completely red, indicating maturity, approximately during late fall or winter.[8] Seeds should be removed from the plant by hand and done so sparingly to avoid depletion, as there are few recorded populations of the species observed in the PNW.[9]
Propagule Processing/Propagule Characteristics	Seeds remain viable under high-salinity conditions.[5] No data recorded on seed density, but seeds are 1-2mm.[11]
Pre-Planting Propagule Treatments	Seeds should undergo a 60-day cold stratification period[10] at 4 degrees Celsius.[6] Under nonsaline laboratory conditions, seeds have primary partial dormancy.[6]
Growing Area Preparation / Annual Practices for Perennial Crops	Based on similar practices as the congener protocol for the genus, 4 grams of seeds should be sown into flats with a well-draining, peat-based media with 200mM of NaCl added to the growing media, as this is the recorded level of salinity for optimal germination rates.[4][7][12] Flats are kept in a controlled temperature greenhouse, with higher daytime temperatures and lower nighttime ones, watered with an automatic mist and irrigation system biweekly on a heated bench.
Establishment Phase Details	The seeds should be lightly mixed into the media and surface sown at most 1-2mm into the soil.[4]
Length of Establishment Phase	27 days
Active Growth Phase	After 27 days, the seedlings should be transplanted to Leach tubes that are 1.5 by 8 inches using the same mixture of media.[4] Following the establishment phase,

	plants should be maintained under full sun conditions during their peak growing season at the beginning of June, as *Salicornia rubra* naturally occurs in habitats with full sunlight access and sparse vegetation.[5] Additionally, the media used is well-draining but irrigation should be used as needed to keep the soil moist but reflecting its natural habitat of occasional dry-periods.[5] Throughout active growth, saline conditions should be maintained to reflect its natural high salinity habitat.
Length of Active Growth Phase	3-4 months
Hardening Phase	Plants remain actively growing and green from late spring through late summer, beginning to stop growth and turn red in early fall, typically around September-October.[7] Since *Salicornia rubra* is an annual species, the seeds disperse during late fall after the plants have reddened and died entirely.[7] Seeds remain viable in the soil throughout the winter. Due to these circumstances, in the nursery context the seeds should be watered less and less as it gets closer to reddening and outplanted before plant death around early fall.
Length of Hardening Phase	Around 1-2 weeks before outplanting they should be watered less and exposed to cooler temperatures gradually.
Harvesting, Storage and Shipping	Once the seedlings have a proper root foundation they can be transported carefully.
Length of Storage	Between nursery and outplanting, seedlings should be outplanted as soon as the plants are established within the same growing season as they were planted.
Guidelines for Outplanting / Performance on Typical Sites	Outplanting should be in a natural habitat where the seedlings were initially gathered east of the Casade range in Washington in salt flats and alkaline depression habitats. Since the species thrives in a highly specific region, it is essential that they are redistributed in the same area to their collection.
Other Comments	
PROPAGATION DETAILS: VEGETATIVE	
Ecotype	No experimentally derived vegetative propagation protocols currently exist for any population of *Salicornia rubra.*
Propagation Goal	Cuttings
Propagation Method	Vegetative

Product Type	Container (plug)
Stock Type	Leach tubes
Time to Grow	Due to limited information on specific vegetative protocols available for the species, the recommendations are based upon the congener *Salicornia* species in the same genus as *Salicornia rubra.*[13][14] 4-6 weeks is the estimated growth period.
Target Specifications	Well rooted plug, no signs of reddening, bright green color, active stems 5-25cm in height.
Propagule Collection Instructions	Stem cuttings should be collected east of the Cascade Range from a population of healthy, actively growing plants during the growing season (late June or early July) in the summer.
Propagule Processing/Propagule Characteristics	Cuttings should consist of at least 3-4 nodes and placed vertically in the media to promote both root and shoot development.[12]
Pre-Planting Propagule Treatments	Based on congener species, *Salicornia bigelovii*, treatment of cuttings with indole butyric acid (IBA) combined with chitosan prior to planting help to promote shoot and root production.[13]
Growing Area Preparation / Annual Practices for Perennial Crops	Based on research on *Salicornia europaea*, further recommended for other species of the same genus is cuttings being maintained under high light intensity, as dark light hinders growth.[14] A peat moss and perlite based well-draining mix with 200mM of NaCl supplemented.[4] Specimens should be placed in Leach tubes that are 1.5 by 8 inches.
Establishment Phase Details	Cuttings of 3-4 nodes should be inserted vertically into Leach tubes containing saline growing media and placed under full sun conditions with high light intensity consistent with the species' natural habitat requirements.[5]
Length of Establishment Phase	Based on congener species, *Salicornia bigelovii,* research root development from cuttings should occur within approximately 3 weeks.[13]
Active Growth Phase	Similar to the seeding protocol, irrigation should keep the soil moist and reflect the seasonal rainfall patterns of the species natural habitat. Additionally, 200mM of NaCl should be maintained throughout the entirety of the growth process.
Length of Active Growth Phase	Approximately 4-6 weeks from rooting until outplanting.[13]

Hardening Phase	Same as seed protocol, gradual reduction of sunlight exposure and rainfall before plant death in early fall, mimicking natural habitat conditions.
Length of Hardening Phase	1-2 weeks.
Harvesting, Storage and Shipping	When plants still remain green and roots are well established within the Leach tubes they should be outplanted.
Length of Storage	Outplanting between the nursery should occur as soon as possible within the same season as the cuttings, since the species has an annual lifecycle.
Guidelines for Outplanting / Performance on Typical Sites	Outplanting should occur in sites east of the Cascade Range in Washington near the same populated site in which cuttings were gathered from due to limited populations in the PNW.
Other Comments	
INFORMATION SOURCES	
References	See below
Other Sources Consulted	
Protocol Author	Greta Ardern
Date Protocol Created or Updated	05/19/2026

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