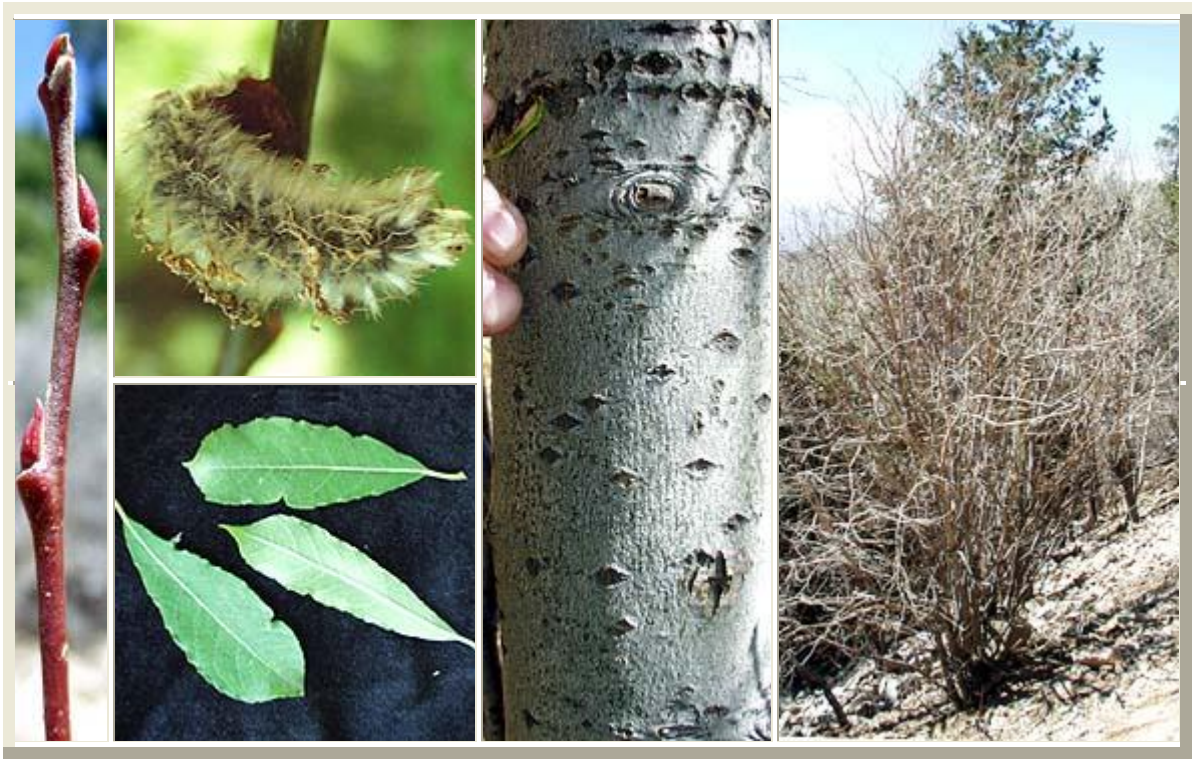
Plant Propagation Protocol for *Salix scouleriana*

ESRM 412 – Native Plant Production



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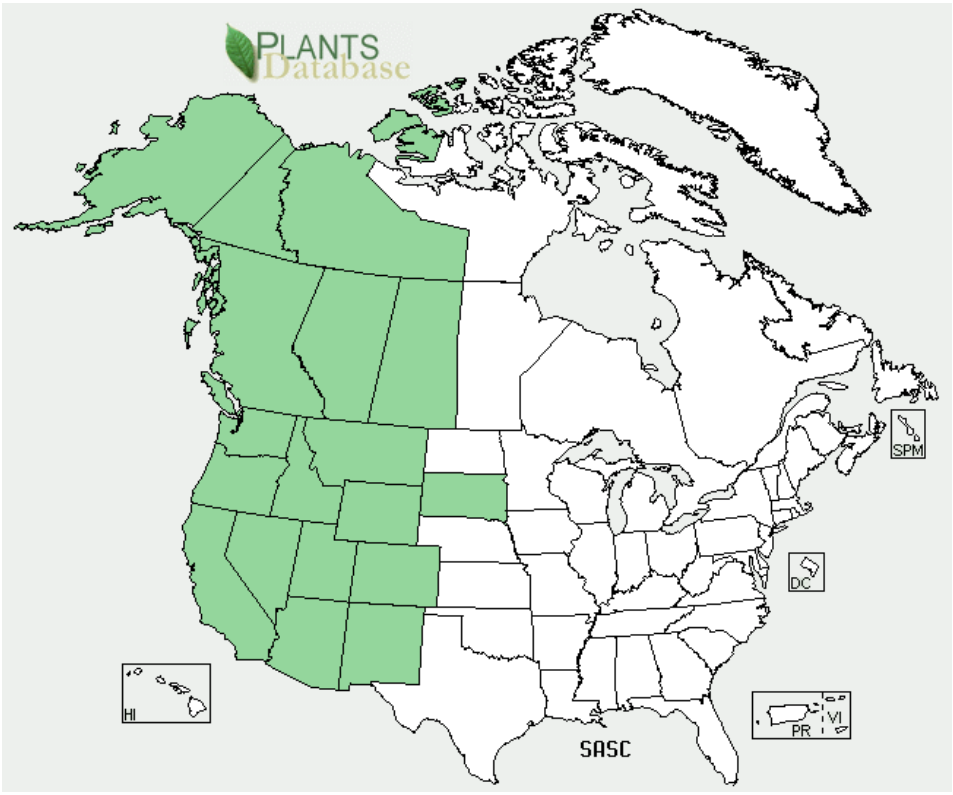
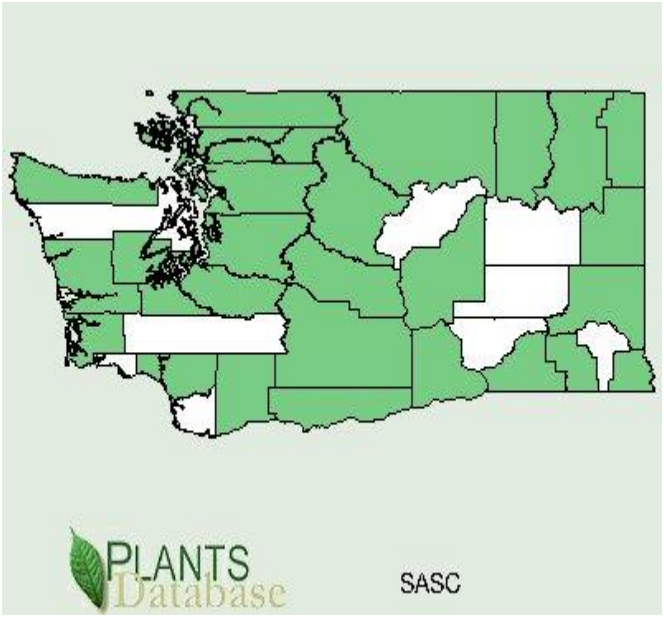
TAXONOMY	
Family Names	
Family Scientific Name:	*Salicaceae*
Family Common Name:	Willow
Scientific Names	
Genus:	*Salix*
Species:	*scouleriana*
Species Authority:	Barratt ex Hook.
Variety:	n/a
Sub-species:	n/a
Cultivar:	n/a
Authority for Variety/Sub-species:	n/a
Common Synonym(s):	*Salix brachystachys* Benth. *Salix brachystachys* Benth. var. *scouleriana* (Barratt ex Hook.) Andersson *Salix capreoides* Andersson

	Salix flavescens Nutt. *Salix flavescens* Nutt. var. *capreoides* (Andersson) Bebb *Salix flavescens* Nutt. var. *scouleriana* (Barratt ex Hook.) Bebb *Salix nuttallii* Sarg. *Salix nuttallii* Sarg. var. *capreoides* (Andersson) Sarg. *Salix scouleriana* Barratt ex Hook. var. *brachystachys* (Benth.) M.E. Jones *Salix scouleriana* Barratt ex Hook. var. *coetanea* C.R. Ball *Salix scouleriana* Barratt ex Hook. var. *crassijulis* (Andersson) C.K. Schneid. *Salix scouleriana* Barratt ex Hook. var. *flavescens* (Nutt.) J.K. Henry *Salix scouleriana* Barratt ex Hook. var. *poikila* C.K. Schneid. *Salix scouleriana* Barratt ex Hook. var. *thompsonii* C.R. Ball *Salix stagnalis* Nutt.
Common Name(s):	Scouler's willow, Western pussy willow and fire willow
Species Code	SASC
GENERAL INFORMATION	
Geographical range:	United States distribution:  Image courtesy of USDA Plants Database

	Washington State distribution:  Image courtesy of USDA Plants Database
Ecological distribution:	Found in upland thickets, streamside areas, clearings, edges of forests, wetlands, open deciduous forests and open conifer forests *(1)*.
Climate and elevation range:	Found at low to middle elevations, up to10,000 feet *(1, 2)*. It is most often found in areas with 9.5 to 63 inches of annual precipitation *(3)*.
Local habitat and abundance; may include commonly associated species:	Found in moist to drier soils in sun and shade *(4)*. It is the only willow that thrives in upland sites *(5)*. It also grows in riparian zones *(2)*. Associated with the following animal species: deer, elk, moose, bighorn sheep, upland birds, ducks, woodpeckers and honey bees *(3)*.
Plant strategy type / successional stage:	Fast growing colonizer, often quickly occupies recently burned areas *(4)*. Forms dense thickets and an excellent competitor.
Plant characteristics:	Perennial deciduous multi-stemmed tall shrub or small tree reaching up to 40 feet in height *(2, 6)*. Branching is alternate and flowers are dioecious yellowish white catkins of a length 1-2 inches *(5)*. Leaves are shaped as reverse eggs with tapering bases and smooth (sometimes weakly toothed) margins *(2)*.
PROPAGATION DETAILS	
Ecotype:	n/a
Propagation Goal:	Plants
Propagation Method:	Vegetative
Product Type:	Container (plug)
Stock Type:	3 L containers
Time to Grow:	18 Months *(7)*
Target Specifications:	Stock Type: Container cuttings Height: 20 cm Caliper: 8 mm Root System: firm plug in 3L (1 gallon) containers *(7)*.

Propagule Collection:	Fall through spring, collect hardwood stem cuttings and in the summer collect softwood stem cuttings *(2, 7).* Take care in the spring to collect hardwood tip cuttings prior to bud break. Whereas the summer softwood cuttings may be harvested at any point post flowering *(7).*
Propagule Processing/ Propagule Characteristics:	One source recommends keeping cuttings moist and refrigerated prior to planting *(7)* whereas another recommends planting the same day as propagule collection *(2).*
Pre-Planting Propagule Treatments:	Rooting %: 40-94% rooting was obtained in hardwood cuttings without the use of IBA *(2).* 84% to 100% rooting was obtained in both hardwood and softwood cuttings treated with 1000, 2000, and 3000 ppm IBA. Generally, softwood stem tip cuttings root more quickly than hardwood cuttings. *Salix* has latent preformed root initials present in the stem and initial rooting occurs in 1 week *(7).*
Growing Area Preparation / Annual Practices:	The cuttings are buried 12 cm beneath a rooting medium that consists of 50% perlite and 50% sand *(7).* Take care that the cuttings are facing right side up when buried.
Establishment Phase:	After cuttings are potted, they can be moved to a mistbed in an outdoor shadehouse. Set the mistbed on automatic intermittent mist applied on 6-second intervals every 6 minutes. Take care not to mist too frequently as it will lead to leaf and stem rot *(7).* The misting frequency should be decreased or increased depending on temperature and wind conditions. Within the mist beds, bottom heat should be maintained at 21ºC via the use of buried heating cables. After cuttings start to develop adequate roots from the buried portion of the stem, they are removed from the mistbed *(7).*
Length of Establishment Phase:	4 weeks.
Active Growth Phase:	After cuttings are removed from the mistbed, pot into 3 L containers. Use a growing medium of "70% 6:1:1 milled sphagnum peat, perlite, and vermiculite with 30% sand with Osmocote controlled release fertilizer (13N:13P2O5:13K2O; 8 to 9 month release rate at 21C) and Micromax fertilizer (12%S, 0.1%B, 0.5%Cu, 12%Fe, 2.5%Mn, 0.05%Mo, 1%Zn) at the rate of 5 grams of Osmocote and 2 grams of Micromax per container" *(7).* Move to full sun in an outdoor nursery and water with an automatic irrigation system each early morning. Irrigate until the soil is saturated through *(7).*
Length of Active Growth Phase:	20 weeks.
Hardening Phase:	Gradually reduce irrigation in September and October. Give plants a final irrigation prior to winter dormancy *(7).*
Length of Hardening Phase:	8 weeks *(7).*

Harvesting, Storage and Shipping:	Total Time to Harvest: 1.5 years. Harvest Date: Fall. Storage Conditions: Overwinter in outdoor nursery under insulating foam and snow *(7)*.
Length of Storage:	5 months *(7)*.
Guidelines for Outplanting / Performance on Typical Sites:	Outplanting can occur in fall, winter or spring. Survival rate will increase if plants are installed during dormant period *(7)*. Outplanting Survival at 5 Years: 100%
Propagation Method:	Seeds.
Product Type:	Container (plug) *(8)*.
Stock Type:	
Time to Grow:	18 months.
Target Specifications:	Height: 28 cm. Caliper: 3.5 mm *(9)*.
Propagule Collection:	*Salix scouleriana* blooms in early spring. In Alaska, catkins will form at the end of March and seeds may be released as early as the beginning of June *(10)*. In order to not miss the release of seeds, catkin fruits should be collected by hand as soon as they change color from green to yellow. Then, air dry the capsules until opening *(11)*.
Propagule Processing/ Propagule Characteristics:	Seeds are non-dormant *(8)*. Sources vary as to whether the seeds can be stored or not. Some say that they can be stored in moist-cold storage for 4-6 weeks at 0˚C to 5˚C *(2)* whereas other say that the seeds only remain viable for a few days and rapidly drop off in germination rates after 10 days of cold-moist storage *(8)*. Light is required for rapid seed germination within the first 12 to 24 hours after seed release *(8)*.
Pre-Planting Propagule Treatments:	Germination occurs at 5˚C to 25˚C *(8)*. Germination can reach 95% in 1-3 days after sowing seeds, if using fresh (less than a day old) harvested seeds.
Growing Area Preparation / Annual Practices for Perennial Crops:	Sow fresh untreated seeds on the top of the soil in a moist seedbed *(2)* in sphagnum peat moss and perlite mix of a coarse texture. This growing medium allows optimal moisture, aeration and light *(9)*. Plant into miniplug containers. Light is required for germination *(11)*.
Establishment Phase:	Keep mineral soil beds continuously moist until germination and seedling emergence *(11)*. Apply soluable fertilizer weekly: a rate of 200 mg/l (ppm) nitrogen (20N:OP2O5:20K2O Peat Lite Special *(9)*.
Length of Establishment Phase:	1-2 days until emergence *(11)*. Transplant seedlings after 3-6 weeks growth- as soon as root system is sufficient to maintain soil root plug *(9)*.
Active Growth Phase:	Transplant seedlings into SC-10 supercells (leach tubes) after 3-6 weeks growth. Fill pots with 2 parts Sun- shine Mix #l or #2 (sourced from Sun Gro Horticulture, Bellevue, WA) with 1 part perlite that has 2.7 kg of CRF incorporated per 1 yd^3 of material. Dibble the filled pots prior to transplanting *(9)*. Thin at this point.

	Transplant to 1 gallon pots the winter following the first growing season *(9)* with a growing medium of aged bark:pumice:peat (55:35:10). Irrigate 3 times per week *(9)*. Apply 5- to 6- month release CRF at a rate of 15 g (0.5 oz) per pot *(9)*. No shade use necessary.
Length of Active Growth Phase:	From late spring propagation until early fall, about 20-28 weeks.
Hardening Phase:	Gradually reduce irrigation in September and October. Give plants a final irrigation prior to winter dormancy *(7)*.
Length of Hardening Phase:	8 weeks *(7)*.
Harvesting, Storage and Shipping (of seedlings):	Total Time to Harvest: 1.5 years. Harvest Date: Fall. Storage Conditions: Overwinter in outdoor nursery under insulating foam and snow *(7)*.
Length of Storage:	5 months *(7)*.
Guidelines for Outplanting / Performance on Typical Sites:	Outplanting can occur in fall, winter or spring. Survival rate will increase if plants are installed during dormant period *(7)*.
Other Comments:	It is common for deer and elk to browse on young branches *(3)*. Scouler's willow is self infertile and will hybridize with other willow species *(2)*.

INFORMATION SOURCES

References:

1. Pojar, J. and Mackinnon, A. (2004) Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska. Vancouver; Lone Pine Publishing. pp 89.
2. Scouler's willow. (2005) OSU Rangeland Ecology and Management. Oregon State University. Accessed 13 April 2001 at http://oregonstate.edu/dept/range/sites/default/files/Scouler_27s_20Willow.pdf
3. Anderson, M. D. (2001) *Salix scouleriana*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Accessed 13 April 2011 at http://www.fs.fed.us/database/feis/
4. Native Plant Database, *Salix scouleriana* Barratt ex Hook. (2007) Lady Bird Johnson Wildflower center, The University of Texas at Austin. Accessed 31 March 2011 at http://www.wildflower.org/plants/result.php?id_plant=SASC
5. Brunsfeld, S. and Fredrick, J. (1985) Field Guide To The Willows Of East-Central Idaho. Bulletin 39. Moscow, Idaho: University of Idaho, Forest, Wildlife, and Range Sciences. 95p.
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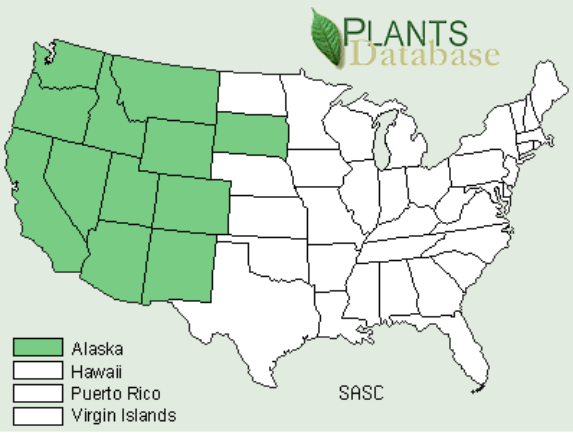
Other Sources Consulted:	1. Edson, J.L., Leege-Brusven, A.D., and Wenny, D.L. (1995) Improved vegetative propagation of scouler willow. Tree Planter's Notes. v.46*(2)*: pp 58-63 2. Paul R. Cereghino. (2004) Growth response of three native shrubs planted as un-rooted cuttings across a wetland elevation gradient: *Symphoricarpos albus*, *Rubus spectabilis*, and *Cornus sericea*. Master of Science Thesis. University of Washington. 3. Crowder, W. and Darris, D. (1999) Producing Pacific Northwest Native Trees and Shrubs in Hardwood Cutting Blocks or Stooling Beds. USDA Plant Materials Program. Technical Notes, Plant Materials No.24.
Protocol Author:	Caitlin Guthrie
Date Protocol Created or Updated:	04/19/2011

Note: This template was modified by J.D. Bakker from that available at: http://www.nativeplantnetwork.org/network/SampleBlankForm.asp

2005 Reference Protocol

Species (common name, Latin name)
Salix scouleriana (Scouler's willow)

Various forms of Salix scouleriana (Scouler's willow). ***(4)***



Range

S. scouleriana grows from southern Alaska and Yukon east to Manitoba and South Dakota and south through the Cascades and Rockies to California, Arizona, and New Mexico. *(1)*

Map of *Salix scouleriana* (Scouler's willow) range. ***(2)***

Climate, elevation

Grows from the lowlands and foothills to mid-montane elevations.

Local occurrence (where, how common)

Very Common in lowlands and foothills to mid-montane elevations.

Habitat preferences
Montane coniferous forest.

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)
Fast-growing colonizer that forms dense thickets and a great competitor.

Associated species
Abies concolor, Achillea millefolium, Achnatherum occidentale ssp. Actaea rubra,Agrostis stolonifera, Agastache urticifolia, Allium bisceptrum, Alnus incana, Alnus viridis ssp. sinuata, Amelanchier alnifolia, Amelanchier utahensis, Aquilegia formosa, Artemisia arbuscula, Arnica chamissonis, Arnica cordifolia, Arnica fulgens, Balsamorhiza sagittata, Bromus carinatus, Carex geyeri, Carex hoodii, Camissonia tanacetifolia ssp. tanacetifolia, Cercocarpus ledifolius, Claytonia perfoliata, Collomia grandiflora, Cornus sericea ssp. Sericea, Danthonia californica, Deschampsia elongate, Dodecatheon jeffreyi, Elymus elymoides, Epilobium ciliatum ssp. Watsonii, Epilobium glaberrimum, Equisetum arvense, Galium triflorum, Geranium richardsonii, Hesperostipa comata ssp., Hordeum brachyantherum, Hordeum jubatum, Hydrophyllum capitatum, Juniperus occidentalis, Linanthus harknessii, Lomatium triternatum, Lupinus caudatus,Lupinus leucophyllus, Melica bulbosa, Mimulus guttatus, Osmorhiza occidentalis, Pinus ponderosa, Populus balsamifera ssp. trichocarpa, Potentilla biennis, Polygonum douglasii, Potentilla glandulosa, Poa nervosa, Poa palustris, Populus tremuloides, Prunus emarginata, Prunus virginiana, Pseudoroegneria spicata, Ribes aureum, Ribes cereum, Ribes lacustre, Rosa woodsii, Salix exigua, Salix geyeriana, Salix lemmonii, Salix lucida ssp. lasiandra, Scirpus microcarpus, Symphoricarpos albus, Symphoricarpos oreophilus, Symphoricarpos rotundifolius, Urtica dioica.

May be collected as: (seed, layered, divisions, etc.)
Seed, spring hardwood or summer softwood stem cuttings. *(1)*

Collection restrictions or guidelines
Cuttings: Hardwood tip cuttings are collected before bud break. Softwood cuttings can be taken any time after flowering. Store cuttings in moist refrigeration. *(1)*

Seeds: The most critical factor in the collection of viable Salix seed is frequent observation of catkin development. It might be preferable to wait until the capsule are almost fully open, but spring winds can disperse the seed very quickly once the capsules reach this stage and much seed can be lost instantly. The female catkins should be placed in paper sacks to capture seed as the capsules open during drying. Seed dispersal usually only takes a few days in a room with dry air and normal working temperatures. If the number of catkins collected forms a layer one or two catkins thick in the sack, the seed will disperse easily without much oversight. If a thick layer of catkins is placed in the sack, frequent turning and mixing of the sack will be required to facilitate uniform drying and seed release. Collection in plastic bags may be acceptable for very brief periods, but the catkins need to be transferred to paper sacks or drying racks as soon as possible to prevent moisture buildup and subsequent decomposition. *(3)*

Seed germination (needs dormancy breaking?)
Sow cleaned seeds immediately. Surface sow seeds. *(3)*

Seed life (can be stored, short shelf-life, long shelf-life)
1-3 years

Recommended seed storage conditions
35º C

Propagation recommendations (plant seeds, vegetative parts, cuttings, etc.)
See above

Soil or medium requirements (inoculum necessary?)
No inoculum necessary

Installation form (form, potential for successful outcomes, cost)
Cuttings more effective and faster establishing.

Recommended planting density
18”

Care requirements after installed (water weekly, water once etc.)
Water weekly depending on weather and plant size. Reduce watering frequency in late September to early October to promote hardening-off. *(3)*

Normal rate of growth or spread; lifespan
Large shrub but often a small tree with a single, upright trunk and round crown reaching up to 25 feet in height. *(4)*

Sources cited

1. Wick, Dale; Luna, Tara; Evans, Jeff; Hosokawa, Joy; Lapp, Joyce. 2001. Propagation protocol for vegetative production of container *Salix scouleriana* Barratt. ex Hook. plants (3 L containers); Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 12 May 2005). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

2. USDA Plants Database; accessed 12 May 2005. Found at: http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=SASC

3. Dreesen, David. 2003. Propagation protocol for production of container *Salix scouleriana* Barratt plants (One Gallon Tree Pot, 4”x4”x14”); Los Lunas Plant Materials Center, Los Lunas, New Mexico. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 12 May 2005). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

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Data compiled by (student name and date)

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