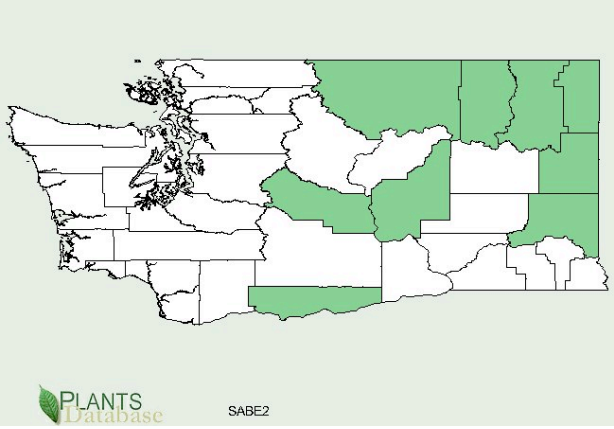

Plant Propagation Protocol for *Salix bebbiana* Sarg.
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	Salicaceae
Family Common Name:	Willow Family
Scientific Names	
Genus:	Salix L.
Species:	bebbiana
Species Authority:	Sarg.
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	*Salix bebbiana* Sarg. var. *capreifolia* (Fernald) Fernald *Salix bebbiana* Sarg. var. *depilis* Raup *Salix bebbiana* Sarg. var. *luxurians* (Fernald) Fernald *Salix bebbiana* Sarg. var. *perrostrata* (Rydb.) C.K. Schneid. *Salix bebbiana* Sarg. var. *projecta* (Fernald) C.K. Schneid. *Salix depressa* L. ssp. *rostrata* (Richardson) Hiitonen *Salix livida* Wahlenb. var. *occidentalis* (Andersson) A. Gray *Salix livida* Wahlenb. var. *rostrata* (Richardson) Dippel *Salix perrostrata* Rydb. *Salix rostrata* Richardson, non Thuill. *Salix rostrata* Richardson var. *capreifolia* Fernald *Salix rostrata* Richardson var. *luxurians* Fernald

	Salix rostrata Richardson var. *perrostrata* (Rydb.) Fernald *Salix rostrata* Richardson var. *projecta* Fernald *Salix starkeana* Willd. ssp. *bebbiana* (Sarg.) Youngberg *Salix vagans* Hook. f. ex Andersson var. *occidentalis* Andersson *Salix vagans* Hook. f. ex Andersson var. *rostrata* (Richardson) Andersson
Common Name(s):	Bebb Willow, beak willow, beaked willow, long-beaked willow, diamond willow, chaton, Petit Minou, smooth Bebb willow
Species Code (as per USDA Plants database):	SABE2
GENERAL INFORMATION	
Geographical range (distribution maps for North America and Washington state)	From NE Canada west to Alaska, South to Arizona, up to South Dakota, then over to the NE United States. See maps above for distribution in North America and Washington state
Ecological distribution (ecosystems it occurs in, etc):	Bebb willow can dominate or codominate early seral willow communities along riverbanks, streambanks, overflow channels, and seeps [1]
Climate and elevation range	Moist, wet climate with sun accessibility and partial shade. Grows in clay, sand, and loam. Woodlands with 35-60% cover.[2] Elevation: 2,130-2850 m (7,000-9,400 ft) [3]
Local habitat and abundance; may include commonly associated species	Frequent in "shrub zones" where there has been disturbance. [4] Good for soil stability.
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Species of early succession. Important in the early and middle stages of successional recovery after disturbance. [5]
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	Densely branched shrub to 10 ft. Occasionally grows as a small multi stemmed tree. Alternate, simple, elliptical to obovate, 2 to 4 inches long, margin entire, gray-green above, white, hairy, and net-veined beneath. Dioecious. Fuzzy catkins, yellowish white appear in spring with leaves. Twigs has gray fuzz when young gray pointed buds are appressed. Bark shiny gray-green with numerous reddish lenticles. Diamond shaped patterns due to fungus on trunk. [6]
PROPAGATION DETAILS	
Ecotype (this is meant primarily for	Southwestern US [7]

experimentally derived protocols, and is a description of where the seed that was tested came from):	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants and Seeds [7]
Propagation Method (Options: Seed or Vegetative):	Vegetative and Seed. Softwood. Seeds must be only a few days old. [7]
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Container(plug) [9] 164ml Ray Leach Super CellIs™ 1GTP Seed orchards [7]
Stock Type:	1GTP [7]
Time to Grow (from seeding until plants are ready to be outplanted):	1 and 2 growing seasons [7]
Target Specifications (size or characteristics of target plants to be produced):	1.4-1.9m in height [9] 1 yr seed production [7] Consolidated root mass to prevent root ball disintegration during out-planting. Caliper: 12mm [9]
Propagule Collection (how, when, etc):	Frequent observation of female catkins. Catkin harvest when cotton emerges from opening capsules. Placed in paper sack. [9] Allow seedheads to dry on plants; remove and collect seed. [8] Collected from wild stands at 2400 m elevation in June 2002. [7]
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Use a compressed air source and a set of soil screens in a series from top to bottom of 250 µm, 500 µm, 125 µm. Seed remains on the 125 µm screen. [9] Seeds are non dormant. [10]
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	No stratification needed. Sow cleaned seeds as soon as possible after collection. [9] Thin seed germinates easily
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Greenhouse temp should be from 55^{o} F-70^{o}F during winter and a max of 85^{o} F during summer with evaporative pads for cooling. Automate watering once everyday in the morning. Texel Tex-R® Forestry fabric and Dewitt soil separator fabric work together to reduce root egress and provided the plug cells with capillary water movement. Mini-plug trays were used containing 512 cells at 14mm x 14mm x 29mm. Transplanting into bigger cells (Super Cells) will need to happen later in plant development. The germination

	medium is sphagnum peat moss, screened softwood bark, and perlite mix of fairly coarse texture. Super Cell seedlings should be ready to move outside in early May.[9]
Establishment Phase (from seeding to germination):	The Super Cell seedlings in the greenhouse are watered with soluble fertilizer at every other watering. The fertilizer solution is Peters Peat Lite Special 20-10-20 at a rate of 200 mg/l nitrogen. Thinning of seedlings down to one per container can occur during this phase, usually when the seedlings are 2 to 4 cm tall. Ray Leach Super Cell – 10 in.3 (164 ml) volume, 1.5 in. (3.8 cm) diameter, and 8.25 in. (21 cm) depth. Planting Technique: The filled Super Cells are dibbled to provide a hole for the mini-plug seedling. The mini-plug seedling root ball is removed using a flat powder spatula with a blade. The blade is plunged along the side of root ball and the seedling plug is levered out of the cell. The plug is dropped into the dibbled hole and the media is pressed around the root ball with fingers. Top watering firms and fills any voids around the plug. If excessive numbers of seed have germinated, excess seedlings can be cut off during the plug transplanting process or later after the seedlings are well rooted. Thinning of seedlings down to one per container can occur during this phase, usually when the seedlings are 2 to 4 cm tall**.** [9]
Length of Establishment Phase:	Germination of willow seeds often in 1 or 2 days. Noted by swelling and seperation of the cotyledons. [9]
Active Growth Phase (from germination until plants are no longer actively growing):	Transplanting into treepots usually occurs in the late summer of the first year or late spring of the second year. The treepots are filled with media and dibbled with a Super Cell planting dibble. Controlled release fertilizer (CRF) is top-dressed at planting or soon thereafter. For pots transplanted in late spring, a 5 to 6 month delivery CRF is used. Seedlings transplanted later in the summer receive a 3 to 4 month delivery CRF at a rate of about 15 g per pot. Watering frequency in this phase in usually three times a week. Plants are typically grown without shade. Rapid Growth Phase: Watering frequency can be as often as every day for plants with substantial leaf areas. [9]
Length of Active Growth Phase:	May-Sept [9]
Hardening Phase (from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and	The watering frequency is reduced in late September to early October to promote hardening. [9]

preparation for winter):	
Length of Hardening Phase:	Oct. [9]
Harvesting, Storage and Shipping (of seedlings):	The treepot cages are surrounded by straw bales before winter to lessen temperature fluctuations and provide some insulation for the root systems. [9]
Length of Storage (of seedlings, between nursery and outplanting):	Oct-May [9]
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	Planting sites with sufficient precipitation following outplanting, shallowly planted small containers can sustain the transplants until root systems can access the capillary fringe above the water table. For planting sites that experience over-bank flooding and have sufficient stored soil moisture to allow subsequent root growth to extend to the capillary fringe, planting can be conducted post-flooding to prevent loss by scouring. For sites lacking sufficient overbank flooding or precipitation, periodic irrigation water is applied in surface basins or to subsurface soils using irrigation tubes until root systems reach the capillary fringe. Alternatively, sites lacking sufficient overbank flooding or precipitation could be planted with containerized stock to such a depth that the roots are in contact with the capillary fringe at the time of planting. The depth to the capillary fringe will vary seasonally with the river or stream stage as well as with soil texture. Therefore, attention must be made to planting dates and sites which will not experience too rapid of a decline in the water table exceeding the root extension rate. Young seedlings with thin bark appear to be preferred food and would require the most protection. [9]
Other Comments (including collection restrictions or guidelines, if available):	
INFORMATION SOURCES	
References (full citations):	See Below
Other Sources Consulted (but that contained no pertinent information) (full citations):	. "Salix bebbiana." Encyclopedia of Life. N.p., n.d. Web. 16 May 2012. <http://eol.org/pages/584378/literature>. . "Salix bebbiana Sarg.." Calflora. N.p., n.d. Web. 16 May 2012. <http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=7263>.
Protocol Author (First and last name):	Joey Shaughnessy
Date Protocol Created or Updated (MM/DD/YY):	5/15/12

Reference:

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[2] "Plant Detail: Salix bebbiana." *Native Plant Database*. N.p., n.d. Web. 16 May 2012. <http://nativeplants.evergreen.ca/search/view-plant.php?ID=00607>.

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[5] . *Willow Family (Salicaceae) - Economic And Ecological Importance Of Willows*. N.p., n.d. Web. 16 May 2012. <http://science.jrank.org/pages/7398/Willow-Family-Salicaceae-Economic-ecological-importance-willows.html>.

[6]. "Salix bebbiana Fact Sheet." *Virginia Tech: Department of Forest Resources and Environmental Conservation*. N.p., n.d. Web. 16 May 2012. <http://dendro.cnre.vt.edu/dendrology/syllabus2/factsheet.cfm?ID=691>.

[7] Dreesen, David R. "Propagation Protocol for Container Willows." Web. 16 May 2012. <http://www.nm.nrcs.usda.gov/programs/pmc/articles/container-willows.pdf>.

[8]. "Plant Files: Salix bebbiana." *Dave's Garden*. N.p., n.d. Web. 16 May 2012. <http://davesgarden.com/guides/pf/go/81755/

[9] Dreesen, David. "Protocol Information." *Native Plant Network*. N.p., 2003. Web. 16 May 2012. <http://www.nativeplantnetwork.org/Network/ViewProtocols.aspx?ProtocolID=2380>.

[10] Baskin, Carol. "Protocol Information." Native Plant Network. N.p., n.d. Web. 16 May 2012. <http://www.nativeplantnetwork.org/Network/ViewProtocols.aspx?ProtocolID=1452>.