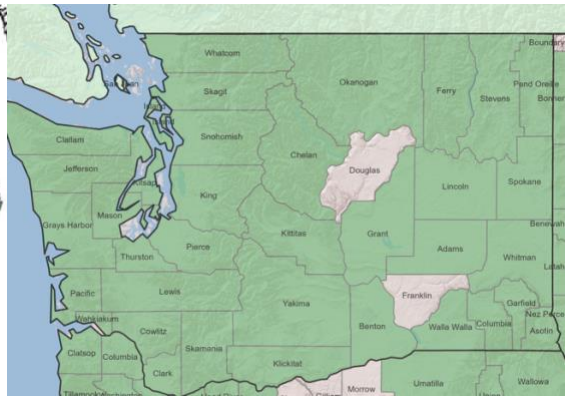
Plant Propagation Protocol for *Salix lucida*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/*2023/SALU.pdf*



https://plants.usda.gov/home/plantProfile?symbol=SALU

William & Wilma Follette @ USDA-NRCS PLANTS Database / USDA NRCS. 1992.

TAXONOMY	
Plant Family	
Scientific Name	Salicaceae Mirb.
Common Name	Willow Family
Species Scientific Name	
Scientific Name	*Salix lucida* Muhl.
Varieties	1. *Salix lucida* Muhl. var. macrophylla Andersson 2. *Salix lucida* Muhl. var. angustifolia (Andersson) Andersson 3. *Salix lucida* Muhl. var. intonsa Fernald 4. *Salix lucida* Muhl. var. latifolia (Andersson) Andersson 5. *Salix lucida* Muhl. var. serissima L.H. Bailey
Sub-species	1. *Salix lucida* Muhl. Ssp. Lasiandra (Benth.) A. E. Murr. 2. *Salix lucida* Muhl. ssp. caudata (Nutt.) A.E. Murray

	3. *Salix lucida* Muhl. Ssp. lucida
Cultivar	Not Specified
Common Synonym(s)	Not Specified
Common Name(s)	Shining Willow, Pacific Willow, Yellow Willow, Red Willow, Black Willow, Whiplash Willow, Golden Willow, Caudate Willow, Western Shining Willow
Species Code	SALU
GENERAL INFORMATION	
Geographical range	Found across the United States and in Canada, however *Salix lucida* is not typically found in dry regions. [1] United States species is found in: AK, AZ, CA, CO, CT, DE, ID, IL, IN, IA, ME, MD, MA, MI, MN, MT, NV, NH, NJ, NM, NY, ND, OH, OR, PA, SD, UT, VT, VA, WA, WI, WY[1] Canada: AB, BC, MB, NB, NS, ON, PE, QC, SK, YT, NWT, LB, NF[1]
Ecological distribution	*Salix lucida* is adapted to many soils but prefers wet, heavy, fine particle, alluvial soils in riparian ecosystems.[2,3,4] This may include stream and riverbanks, creeks, floodplains, silt bars, lake shores, wet meadows, slough margins, and sand dune slacks.[3,4,5] They have moderate tolerance for low light but prefer to be exposed to lot of light. [1]
Climate and elevation range	Sea level to 10,000ft[4] Washington, Mt. Rainer National Park: 2,000-4,000ft[4]
Local habitat and abundance	*Salix lucida* is commonly co-dominate with black cottonwood or balsam poplars. They also tend to occur in riparian mixed shrublands.[4]
Plant strategy type / successional stage	*Salix lucida* is an early successional and early seral species, making it successful at colonizing disturbed sites.[4] The seeds are non-dormant and germinate readily. This species has a moderate tolerance for low light but thrives in direct light.[1] Moderate tolerance to anerobic environments, which it may encounter in the riparian ecosystems. It also has high tolerance to fire.
Plant characteristics	Deciduous, perennial, medium-tall tree/shrub.[3,9,10] Short lived (about 25 years) and rapid growth. Blooms in spring, seed dispersal from catkins in late spring-early summer.[1,4] Can reproduce from seed or vegetatively.
PROPAGATION DETAILS	

Ecotype	Not applicable
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Bareroot (field grown)
Stock Type	Not specified
Time to Grow	1 year,
Target Specifications	Roughly 12 in / 30 cm above and below ground.
Propagule Collection Instructions	Collection of cuttings may be collected from stool beds or from local native stands.[6] Cuttings are typically performed during the winter dormant season.[2,6] The length of cutting is dependent on the soil depth, but cuttings are suggested be cut to 8-10 inches.[3,6] Cuttings preferably should be cut from straight branches and should be 3/4ths of an inch to 1.5 inches in diameter.[5,6,8] Cuttings should be taken from 1 to 4 year old wood.[2,8]
Propagule Processing/Propagule Characteristics	Cuttings should sit in water for a day prior to out planting to hydrate (aerated or unaerated).[5] They may also be wrapped and stored in dark, cold, and humid conditions to prolong the period between cutting and planting. The USDA Plant Guide suggests that the cuttings/poles should be left to soak for 5-7 days before planting. [8]
Pre-Planting Propagule Treatments	Liquid rooting hormone or cut willow leaves may be added to the water with the cuttings to increase rooting success.[5] The cuttings grow quite fast so long term storage is not feasible.
Growing Area Preparation / Annual Practices for Perennial Crops	*Salix lucida* prefers damp and fine textured soil in an area that receives a lot of light. [1,2,3,4]
Establishment Phase Details	Cuttings may be placed in the soil by hand or with an electric hammer drill, depending on quantity of seedlings and depth of placement. Ensure that the soil is packed down around the planting sites to reduce air pockets.
Length of Establishment Phase	1 month, rooting begins at about 10 days.[2,6] Root growth is rapid in the warm soils that come with the late spring.
Active Growth Phase	Fertilizer and irrigation may be applied as needed. Root pruning in the beginning of the summer (June) may be performed to accelerate growth, but this may cause wilting. Irrigation of the site may be used to combat excessive wilting. Pruning of the lower lateral buds on the seedlings is more common during this phase.

Length of Active Growth Phase	4 months – Late Spring through Summer[1,6]
Hardening Phase	Hardening begins late summer through the fall. During this time irrigation and fertilization may be lessened if used.
Length of Hardening Phase	About one month between the end of August and the first weeks of October.[6]
Harvesting, Storage and Shipping (of seedlings)	The lifting window is at the end of fall, when the plants are most dormant.[6] The seedlings may then be hand lifted if grown in beds rather than directly at out planting site.[6] They should be stored and transported in sandy soils in bundles until early spring, before they break dormancy, in coolers right about freezing at high humidity.[6]
Length of Storage	*Salix lucida* seeds are non-dormant, so they are not suited for long-term storage. Kept room temperature, the seeds are only viable for a few days. They are to be collected within a short window before planting. There is some disagreement between the sources I have reviewed regarding the length of viability of the seeds in storage. The USDA NRCS Plant Guide states that maximum storage is four to six weeks, the USDA Fire Effects Information System states that seed viability may be up to eight weeks, and the Alberta Centre for Reclamation and Restoration Ecology says that seeds may remain viable for up to six months if stored at subfreezing temperatures. [2,4,8] Similarly, cuttings are quick rooting so they tend to be collected close to planting date. If being kept longer than 7 days, they should be wrapped and stored in cool dark conditions.
Guidelines for Outplanting / Performance on Typical Sites (e.g., percent survival, height or diameter growth, elapsed time before flowering)	The USDA Fire Effects Information System states that Salix species tend to begin producing seeds at 5-10 years of age, but sprouts may produce seeds at 1-2 years.[4] The Woody Seed Manual mentions that following disturbances vegetative Salix individuals/communities tend to flower and seed sooner (1-2 years). [7]
Other Comments	May be propagated by bareroot, containers, or by seed. By seed: Seeds may be collected, germinated, and then promptly out planted via direct seeding. Seeds cannot be stored for long, there is some debate as to how long this may be, but all agree that it is best to plant close to

	time of collection.[3] Seeds germinate quickly (12-14 hours post planting) and must be kept damp.[2]

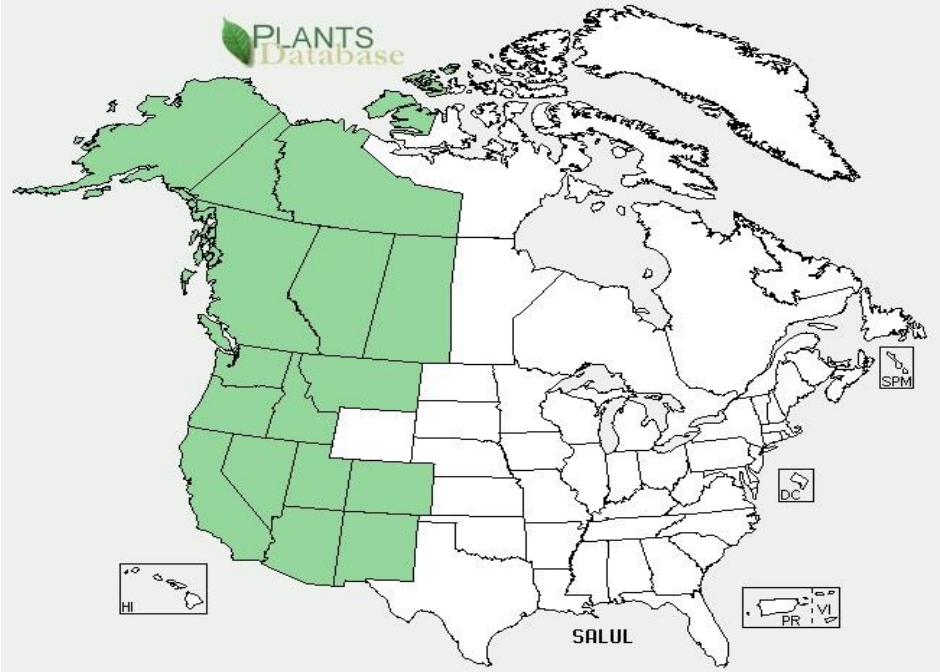
INFORMATION SOURCES	
References	1. "Salix Lucida Muhl. ." *United States Department of Agriculture* , plants.usda.gov/home/plantProfile?symbol=SALU. Accessed 1 May 2023. 2. "Scientific Name: Salix lucida Muhl Family: Salicaceae." *Alberta Centre for Reclamation and Restoration Ecology* , University of Alberta, Shell, Canadian Natural, Imperial Oil, Suncor Energy, Syncrude, Total , https://acrre.ualberta.ca/acrre/wpcontent/uploads/sites/45/2018/04//Salix_lucida.pdf. 3. "Salix lucida - Muhl. ." *Plants for a Future* , https://pfaf.org/user/Plant.aspx?LatinName=Salix%2Blucida. 4. Fryer, Janet. 2015. Salix lucida, shining willow. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/tree/salluc/all.html [2023, May 1]. 5. Dagit, Rosi, et al. *Los Angeles County Native Tree Priority Planting Plan*. Resource Conservation District of the Santa Monica Mountains, https://www.rcdsmm.org/wp-content/uploads/2019/12/Los-Angles-County-SMMNRA-FINAL-Native-Tree-Priority-Planting-Plan-12.13.19.pdf. 6. Trimmer , Eddie. "Native Plant Network: Propagation Protocol Database: Salix (Lucida)." *Reforestation Nurseries, & Genetic Resources* , Lone Peak Conservation Nursery , https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=salicaceae-salix-2712. 7. Bonner, Franklin T., et al. "Salix L. Willow ." *The Woody Plant Seed Manual*, U.S. Dept. of Agriculture, Forest Service, Washington, D.C.., 2008. https://www.fs.usda.gov/rm/pubs_series/wo/wo_ah727.pdf 8. Stevens , Michelle, and Ivan Dozier. *USDA Plants Database*, USDA NRCS National Plant Data Center and Illinois State Office , https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_salu.pdf 9. Beck, R. W. (1891). SALIX LUCIDA, Muhlenberg.: Shining Willow. *American Journal of Pharmacy (1835-1907), 63*(12), 581. https://www.proquest.com/scholarly-journals/salix-lucida-muhlenberg/docview/89693078/se-2 10. Rocha, S. P. (1991). Micropropagation and Agrobacterium transformation of willow (Salix lucida Muhl.). ProQuest Dissertations Publishing. https://experts.esf.edu/esploro/outputs/graduate/Micropropagation-and-Agrobacterium-transformation-of-willow/99890002304826
Other Sources Consulted	Zeidler, Scott; Justin, John. 2003. Propagation protocol for production of Bareroot (field grown) *Salix lucida* Benth. plants 1+0; Utah Division of Forestry, Fire and State Land - Lone Peak Nurse Draper, Utah. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2023/05/03). US Department of

	Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.
Protocol Author	Callysta Coyne
Date Protocol Created or Updated	05/01/23

Plant Propagation Protocol for *Salix lucida ssp. lasiandra*
ESRM 412 – Native Plant Production
Spring 2008

TAXONOMY	
Family Names	
Family Scientific Name:	*Salicaceae*
Family Common Name:	Willow
Scientific Names	
Genus:	*Salix*
Species:	*lucida*
Species Authority:	Muhl
Variety:	
Sub-species:	*lasiandra*
Cultivar:	
Authority for Variety/Subspecies:	(Benth.)E. Murray
Common Synonym(s):	*Salix arguta* Andersson *Salix arguta* Andersson var. *erythrocoma* (Andersson) Andersson *Salix arguta* Andersson var. *lasiandra* (Benth.) Andersson *Salix lancifolia* Andersson *Salix lasiandra* Benth. *Salix lasiandra* Benth. var. *abramsii* C.R. Ball *Salix lasiandra* Benth. var. *lancifolia* (Andersson) Bebb *Salix lasiandra* Benth. var. *lyallii* Sarg. *Salix lasiandra* Benth. var. *macrophylla* (Andersson) Little *Salix lasiandra* Benth. var. *recomponens* Raup *Salix lucida* Muhl. var. *macrophylla* Andersson *Salix lyallii* (Sarg.) A. Heller *Salix speciosa* Nutt., non Host nec Hook. & Arn.
Common Name(s):	Pacific Willow, yellow willow
Species Code:	SALUL
GENERAL INFORMATION	

Geographical range	

	
Ecological distribution (ecosystems it occurs in, etc):	
Climate and elevation range	Low to mid elevations.
Local habitat and abundance; may include commonly associated species	This species is often found in riverbanks, floodplains, lakeshores, and wet meadows often standing in quiet river backwaters. It grows best in a sunny position scattered at low elevations along major rivers[i]. Sites typically have a high water table year-round[ii].
Plant strategy type / successional stage:	Seral, rapidly colonizes disturbed areas.
Plant characteristics:	Perennial tree/shrub, short-lived, deciduous, rapid growth, growing 2060ft, blooming in mid-spring, male and female flowers occur on separate plants in catkins. Yellow, inconspicuous flowers. Serrated, lanceolate leaves. Fruit is a capsule. After fruits ripen, seeds are dispersed from spring to early summer[iii].
PROPAGATION DETAILS	
Ecotype:	
Propagation Goal:	Plants
Propagation Method (Options: Seed or Vegetative):	Vegetative
Product Type:	Bareroot

Stock Type:	

Time to Grow:	About 1 year.
Target Specifications:	12 in
Propagule Collection:	
Propagule Processing/Propagule Characteristics:	Very small seeds, around 11,000,000/lb. Hardwood cuttings are collected from stooling beds or from wild collections in late winter before budbreak and cut to 8 to 10 inch lengths. Cuttings can be wrapped, bundled and stored in the cooler until they are stuck into field beds[iv]
Pre-Planting Propagule Treatments:	
Growing Area Preparation / Annual Practices for Perennial Crops:	Prefers a damp, heavy soil.
Establishment Phase:	Cuttings are stuck by hand in prepared field beds during early spring to a depth of 6 inches. Soil is firmed around stems after sticking to remove air pockets and irrigated after planting. Beds are irrigated as surface begins to dry. Rooting occurs when field soils warm in later spring and rapidly produce root growth[iv].
Length of Establishment Phase:	
Active Growth Phase:	
Length of Active Growth Phase:	Spring and summer[v].
Hardening Phase:	Around the end of August, with decreased irrigation rates.
Length of Hardening Phase:	1 month.
Harvesting, Storage and Shipping:	Lifting window is during mid November when cuttings are completely dormant. Cuttings are hand lifted after the beds have been undercut at a depth of 12 inches using a lifter[iv].
Length of Storage:	
Guidelines for Outplanting / Performance on Typical Sites:	5-9ft spacing within rows. Disease prone willows can decline in growth rate after 10-15 years and may need to be replaced, or the beds rotated[vi]. Willows have a rooting percentage of ninety to one-hundred percent and the rooting number is not promoted by rooting hormones[viii].

Other Comments:	If propogating by seed, seeds are not dormant and germinate rapidly, usually within 12 to 24 hours of dispersal if a moist seedbed is reached[vii]. Germination rates increase with increased amounts of light[ii]. Maximum storage period is four to six weeks with germination rates dropping off fast after ten days at room temperature[viii].
INFORMATION SOURCES	
References:	See below
Other Sources Consulted:	King County Native Plant Guide website http://dnr.metrokc.gov/wlr/PI/go-native/PlantDisplay.aspx?PlantID=10 (Last accessed 6/4/08) NCCSP Website http://www.nccsp.org/scientific_knowledge/specificeducation-projects/oregon-big-tree-registry-1/pacific-willow (Last accessed 6/4/08)
Protocol Author:	Erik Injerd
Date Protocol Created or Updated:	6/4/08

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

[i] MacKinnon, A., J. Pojar, & R. Coupe´ 1992. *Plants of the northern British Columbia*. Lone Pine Publishing, Canada.

[ii] Uchytil, Ronald J. 1989. Salix lucida subsp. lasiandra. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. (Last accessed 5/20/08).

[iii] Brinkman, Kenneth A. 1974. Salix L. willow. In: Schopmeyer, C. S., technical coordinator. Seeds of woody plants in the United States. Agric. Handb. 450. Washington, DC: U.S. Department of Agriculture, Forest Service: 746-750.

[iv] Zeidler, Scott; Justin, John. 2003. Propagation protocol for vegetative production of field-grown *Salix lucida* Benth. ssp. *lasiandra* (Benth.) E. Murr. plants (1+0); Utah Division of Forestry, Fire and State Land - Lone Peak Nursery, Draper, Utah. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (Last accessed 4 June 2008). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.

[v] USDA Plants Database Website http://plants.usda.gov/java/charProfile?symbol=SALUL (Last accessed 5/20/08).

[vi] Crowder, Wayne; Darris, Dale 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.

[vii] Densmore, Roseann; Zasada, John. 1983. Seed dispersal and dormancy patterns in northern willows: ecological and evolutionary significance. Canadian Journal of Botany. 61: 3207-3216.

[viii] Dirr, M.A. & C.W. Heuser, Jr. 1987. *The reference manual of woody plant propagation: from seed to tissue culture*. Varsity Press, Athens, Georgia.

Plant Data Sheet

Salix lucida ssp. lasiandra (Pacific Willow)

Photo courtesy of
http://elib.cs.berkeley.edu/cgi/img_query?enlarge=8253+3202+4148+0020

Range

Found at the interior of Alaska and Yukon Territory and south along the coast to California and New Mexico along the Rocky Mountains.

Climate, elevation

Elevation occurrence includes a range of sea level – 8,000 feet above sea level. It cannot grow in the shade, needs full sun and moist-wet soils.

Local occurrence (where, how common)

Woodland, canopy, riverbanks, stream banks, freshwater swamps, moist alluvial bottomlands, and roadside ditches.

Habitat preferences

Riparian zones with wet soil and full sun. It likes heavy soils like clay.

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)

It is a pioneer or early seral species that can be found on moist alluvial soil. Flooding helps keep this species established due to its flood resistance.

Associated species

Populus balsamifera trichocarpa, Salix lutea, S. exugua, Cornus sericea, Salix boothii, S. drummondiana, Alnus incana ssp. tenuifolia, Alnus rubra, Populus trichocarpa.

May be collected as: (seed, layered, divisions, etc.) Seeds

are very tiny, most commonly collected as cuttings.

Collection restrictions or guidelines

Cuttings are generally collected the same day as installation due to fast sprouting of root formations. Seeds can be collected before the capsule breaks, so frequent observation is recommended, should be around late summer, early fall.

Seed germination (needs dormancy breaking?)

Germination is quickly accomplished with a moist seedbed. Germination will take place within 12-24 hours of reaching the moist seedbed. Light increases germination rates.

Seed life (can be stored, short shelf-life, long shelf-life) Very

small seed life, only 4-6 weeks when stored at room temperature.

Recommended seed storage conditions

Storage can be extended to 1 month with storage in a sealed bag in the refrigerator.

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

Vegetative cuttings are the easiest. Taking a cutting of the current year to fourth year growth is recommended. Take them in late winter, early spring (November – February). Seeds can be sown on a moist medium with adequate light very easily.

Soil or medium requirements (inoculum necessary?)

Seeds can be grown on moist sand. If pre-rooting the vegetative cuttings, a mixture of 1:2 peat moss and sand that has been wetted is the best choice.

Installation form (form, potential for successful outcomes, cost)

Due to high sprouting of buds, vegetative cuttings are the easiest and best way for success. The key is having a wet soil.

Recommended planting density

Plant approximately 1-2 feet apart.

Care requirements after installed (water weekly, water once etc.)

Make sure the water level is continuously wet. Vegetative cuttings like wet soils, especially clay soils.

Normal rate of growth or spread; lifespan

This species is a fast growing tree (2-3m in one year), but a short-lived tree (~25 years).

Sources cited

1.) http://elib.cs.berkeley.edu/cgi/img_query?enlarge=8253+3202+4148+0020
2.) http://www.ecy.wa.gov/programs/sea/pubs/93-30/table3.html
3.) http://www.fs.fed.us/database/feis/plants/tree/sallas/all.html
4.) http://www.scs.leeds.ac.uk/cgi-bin/pfaf/arr_html?Salix+lasiandra&CAN=LATIND
5.) http://www.fs.fed.us/r6/uma/native/ts76.htm

Data compiled by: Kevin Klein 9 May 2003