Plant Propagation Protocol for *Abies grandis*
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	*Pineceae*
Family Common Name:	Pine Family
Scientific Names	
Genus:	*Abies*
Species:	*grandis*
Species Authority:	Douglas ex D. Don
Variety:	*grandis*
Sub-species:	*Abies grandis* (Douglas ex D. Don) Lindl. Var. *idahoensis* Silba
Cultivar:	
Authority for Variety/Sub-species:	Douglas ex D. Don
Common Synonyms:	*Abies excelsior* Franco, 1949 *Pinus grandis* Dougl. Ex D. Don
Common Names:	Grand fir, grand fir, lowland white fir
Species Code:	ABGR
GENERAL INFORMATION	
Geographical range:	USA: CA, ID, MT, OR, WA CA: BC
Ecological distribution:	Stream bottoms, valleys, and mountain slopes of northwestern Unites States and southern British Columbia.
Climate and elevation range	*A. grandis* grows in drier climates, areas with less than 150cm of precipitation annually. Elevations range from sea level to 5,000ft.
Local habitat and abundance; may include commonly associated species	*A. grandis* can grow in pure stands but is much more common in mixed coniferous and hardwood forests. East of the cascades it is associated with *Pinus monticola, Larixz occidentalis, Psuedotsuga menziesii, Tsuga heterophylla, Quercus garryana,* and many others. West of the cascades it is associated with *Picea sitchensis, Abies amabilis, Chamaecyparis lawsoniana, Thuja plicata, Larix occidentalis,* and hardwoods like *Acer macrophyllum and Alnus rubra.*
Plant strategy type / successional stage:	*A. grandis* is either seral or climax species in different types. On moist sites it grows rapidly enough to compete with other seral species in the dominant overstory. On dry sites it becomes a shade-tolerant understory and eventually assumes dominance as climax conditions are approached.
Plant characteristics:	*A. grandis* is a long-lived species that is commonly found to have 250 year old trees with reports of some over 300 years old.
PROPAGATION DETAILS	
Ecotype:	Spruce / Fir forest, Glacier National Park, Mt.
Propagation Goal:	Plants
Propagation:	Seed

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Product Type:	Container (plug)
Stock Type:	172 ml conetainers
Time to Grow:	2 years
Target Specifications:	Height: 15cm. Root System: firm in plug container
Propagule Collection:	Cones are collected in early September when they are dark brown, but before they begin to dehisce. It is preferable to collect from the upper third of the tree crown because seed quality is generally higher. Due to typically low seed fill rates, less than 30%, it is necessary to collect as many high quality cones as possible. Fir seeds go through two stages of ripening, you should not extract seeds from cones immediately. Cones should be stored in burlap sacks for several weeks in ventilated sheds.
Propagule Processing/Propagule Characteristics:	Seeds are extracted from cone scale by using a tumbler. Fir seeds are fragile and can be easily damaged, had cleaning of small lots is preferable. Seed longevity is at least 5 years when sealed and kept at 3 to 5C. Seeds/kg: 50,000/kg %Purity: 100% %Germination: 4 to 17%
Pre-Planting Propagule Treatments:	Seeds are soaked in running water for 48 hours. Imbibed seeds are then placed into bridal mesh bags and suspended in a refrigerator kept at 1 to 3C for 40 days. Seed bags are monitored weekly and washed with water if mold is present.
Growing Area Preparation / Annual Practices for Perennial Crops:	Seeds are surface sown, because Fir's require light for germination. The growing medium is a 6:1:1 mix of milled sphagnum peat moss, perlite, and vermiculate. 1 gram of Osmocote controlled release and 0.2 grams of Micromax fertilizers are used per every 172 ml conetainer. Greenhouse controls are set at a 22C/15C day/night cycle for 12hrs each during germination. Seeded containers are misted twice daily to keep seeds evenly moist.
Establishment Phase (from seeding to germination):	Germination is typically non-uniform, however will usually complete within 4 weeks. Germinates shed their seed coats after 15 days. Seedlings are thinned at this stage.
Length of Establishment Phase:	4 weeks
Active Growth Phase:	Seedlings should be protected from direct sunlight during cultivation. *A. grandis* develops at a moderate rate. Plants are fertilized with 20-10-20 liquid NPK at 100 ppm during the growing season and were fully root tight 30 weeks after germination and averaged 5cm in height.
Length of Active Growth Phase:	20 weeks
Hardening Phase:	Trees are fertilized with 10-20-20 liquid NPK at 200 ppm starting in mid August. Irrigation is gradually reduced in September and October. Plants are leached with clear water once before winterization.
Length of Hardening Phase:	8 weeks

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Harvesting, Storage and Shipping:	Total time to harvest: 1 year Harvest date: September and October Storage Condition: Overwinter in an outdoor nursery under insulating foam cover and snow.
Length of Storage:	5 months
Guidelines for Outplanting / Performance on Typical Sites:	
Other Comments:	
INFORMATION SOURCES	
References:	-Wick, Dale; Luna, Tara; Evans, Jeff. 2008. Propagation protocol for production of container Abies grandis (Dougl.) ex D. Don plants (172 ml conetainers); USDI NPS - Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 15 April 2009). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery. - "ITIS Standard Report Page: Abies grandis." *ITIS Report*. 16 Apr 2009 http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=183284. -Foiles, Marvin. "Abies grandis (Dougl." *www.na.fs.fed.us*. US Forest Service. 16 Apr2009<http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/abies/grandis.htm>. - Zhang, Yongjiang. "Abies grandis." *depts.washington.edu*. 11 April 2003. ESRM 412 Past Students. 16 Apr 2009 http://depts.washington.edu/propplnt/Plants/Abiesgrandis.htm. - "PLANTS Profile for Abies grandis (grand fir) | USDA PLANTS." *plants.usda.gov*. ESRM 412 Past Students. http://plants.usda.gov/java/profile?symbol=ABGR.
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