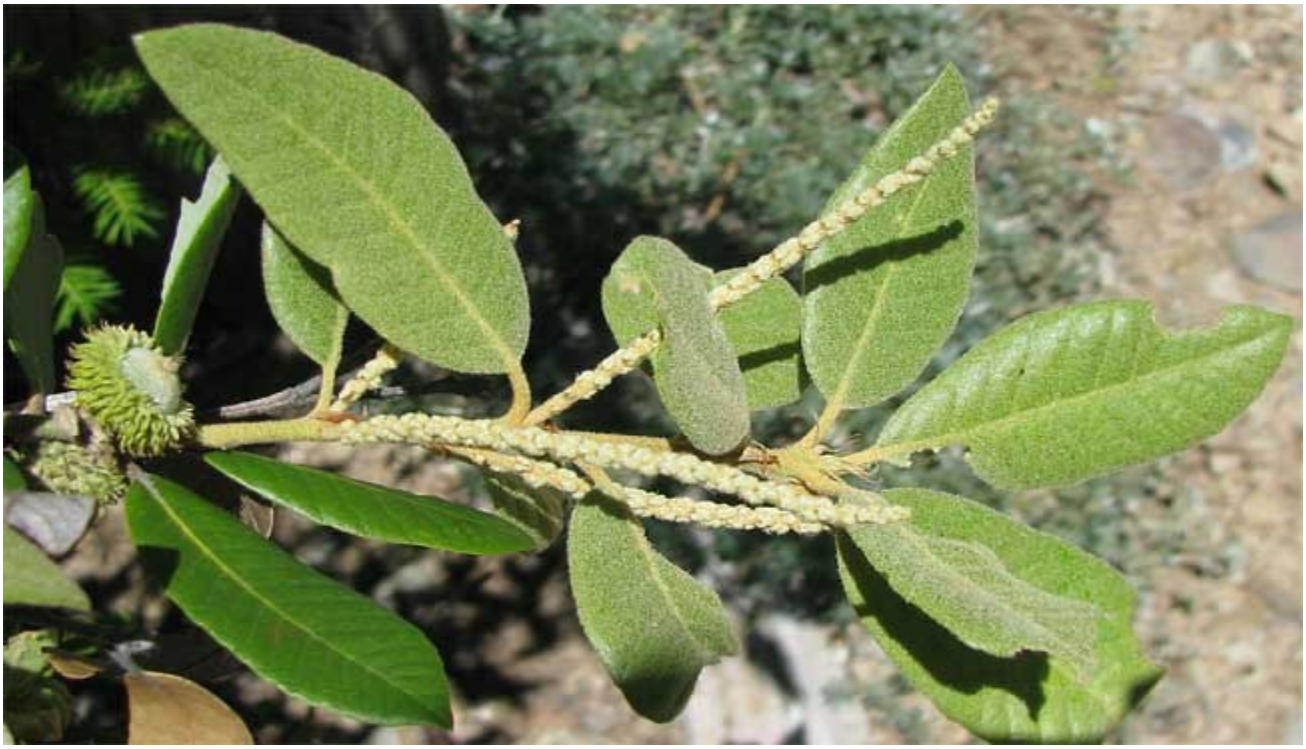
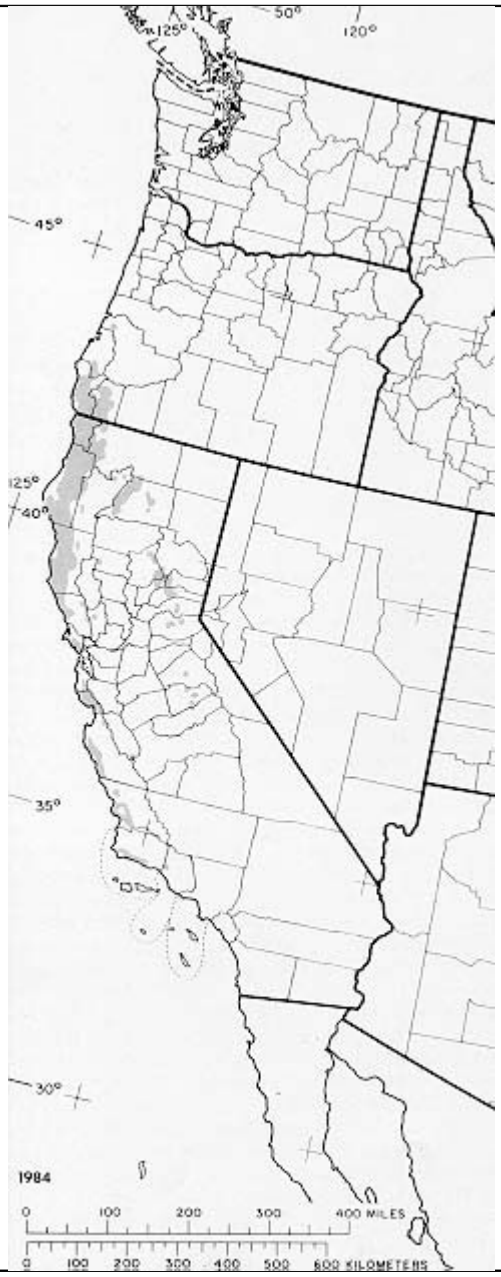
Plant Propagation Protocol for Lithocarpus Densiflorus
ESRM 412 – Native Plant Production
Prepared by Galen Cheney



TAXONOMY	
Family Names	
Family Scientific Name:	Fagaceae
Family Common Name:	Beech
Scientific Names	
Genus:	Lithocarpus Blume
Species:	L. densiflorus
Species Authority:	Hooker & Arnott
Variety:	echinoides
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	Hooker & Arnott
Common Synonym(s):	*Notholithocarpus densiflorus* (Hook. & Arn.) Manos, C.H. Cannon & S. Oh *Pasania densiflora* (Hook. & Arn.) Oerst *Quercus densiflora* Hook. & Arn.
Common Name(s):	tanoak tanbark oak dwarf tanoak
Species Code:	LIDE3

GENERAL INFORMATION	
Geographical range	
Ecological distribution:	While Asia contains many hundreds of Lithocarpus species, Tanoak is the only representative of this genus in north America. Slightly north of the Umpqua River in southwestern Oregon has been reported as the northernmost limit of tanoak's natural range. The general northern limit of tanoak in the Coast Ranges,. Its eastern limit in Oregon extends from west of Roseburg to Grants Pass, and then southwesterly into the Applegate River drainage. Tanoak's range stretches southward through the Coast Ranges in California to the Santa Ynez Mountains north and east of Santa Barbara. The range also extends northeastward from the

	Humboldt Bay region to the lower slopes of Mount Shasta, then southward along the western slopes of the Sierra Nevada as far as Mariposa County (Griffin and Critchfield 1972).
Climate and elevation range:	Tanoak grows naturally from sea level to 5000', preferring moist, often sandy or gravely but always well drained soils. Tanoak required more moisture than most hardwood (Tappeiner et al .1990). Tanoak grows in a climate broadly classified as humid (USDA).
Local habitat and abundance:	Tanoak is a common component in the following forest cover types: Redwood, Pacific Ponderosa Pine, Pacific Ponderosa Pine-Douglas-Fir, Sierra Nevada Mixed Conifer, and California Coast Live Oak. It is a particularly important component of Pacific Douglas-Fir and Douglas-Fir-Tanoak-Pacific Madrone (Eyre 1980). Species that live in Tanoak's habitat include: **Trees:** giant chinkapin *(Castanopsis chrysophylla),* canyon live oak *(Quercus chrysolepis),* California black oak *Q. kelloggii),* California-laurel *(Umbellularia californica),* alifornia white fir *(Abies concolor* var. *lowiana),* Sitka spruce *(Picea sitchensis),* sugar pine *(Pinus lambertiana),*ponderosa pine *(P. ponderosa* var. *ponderosa),* California torreya (nutmeg) *(Torreya californica),* and western hemlock *(Tsuga heterophyl1a).* **Shrubs:** blueblossom *(Ceanothus thyrsiflorus),* California hazel *(Corylus cornuta* var. *californica),* salal *(Gaultheria shallon),* Pacific bayberry *(Myrica californica),* Pacific rhododendron *(Rhododendron macrophyllum),* flowering currant *(Ribes sanguineum),* thimbleberry *(Rubus parviflorus),* western poison-oak *(Toxicodendron diversilobum),* and California huckleberry *(Vaccinium ovatum).* prince's-pine *(Chimaphila umbellata* var. *occidentalis)*, Oregon grape *(Berberis nervosa),* bull thistle *(Cirsium vulgare),* New Zealand fireweed *(Erechtites arguta),* Australian fireweed *(E. minima),*western whipplea *(Whipplea modesta)* ***Grasses:*** California brome *(Bromus carinatus),* soft chess *(B. mollis),* California fescue *(Festuca californica),* and California sweetgrass*(Hierochloe occidentalis).* Western swordfern *(Polystichum munitum)* and western bracken *(Pteridium aquilinum* var. *pubescens)*
Plant strategy type / successional stage:	Because it is tolerant of shade and other understory conditions, tanoak is able to persist, and often flourish, through most stages of forest succession.

	In the stem initiation stage of a mixed hardwood–conifer stand can occur as sprouts from seedlings, or most commonly as sprouts vegetatively. New clumps of stems are quite vigorous and will out-compete most other species. As the stand becomes denser and enters the stem exclusion stage, tanoak is able to sustain itself due to shade tolerance. However, tanoak in the tree form will sometimes revert to a shrubbier form as large upright stems die and smaller stems arising from the tree's base persist. As the stand enters the stem re-initiation stage, gaps appear in the canopy and light begins to reach the forest floor. During this stage, seedling establishment occurs and established seedlings begin to sprout; large clumps of shrubby tanoak often begin to develop into multi-stemmed trees. In the old-growth stage of mixed hardwood–conifer stands, tanoak is especially common in the understory and is likely to appear in all shapes, sizes, and ages. After the overstory is logged or burned, even small tanoaks can respond, and tanoaks of all sizes may dominate disturbed areas. Because of its ability to respond to disturbance and to reproduce and grow in the shade, it is considered to be a climax species in Douglas-fir, redwood, and mixed-conifer forests (Jensen 1985).
Plant characteristics:	Tanoak (Lithocarpus densiflorus), also called tanbark-oak, is an evergreen hardwood that, with other species in the genus, is considered a link between the chestnut, Castanea, and the oak, Quercus. Tanoak has flowers like the chestnut and acorns similar to the oak. This medium-sized tree grows best on the humid moist slopes of the seaward coastal ranges. It usually occurs in a complex mixture with conifers and other hardwoods, but often forms pure even-aged stands. The wood is hard, strong, and fine-grained. Tanoak is designated a commercial species in California. Current major uses are for fuel and pulp. The acorns are a valuable food source for many kinds of wildlife (Tappeiner et al .1990).
PROPAGATION DETAILS	
Ecotype:	Marin County, California
Propagation Goal:	Plant
Propagation Method:	Seed
Product Type:	Container (plug)
Stock Type:	1 gallon can
Time to Grow:	In its natural outdoor conditions: Seedlings begin to grow Burls at 1-2 years old. After 6-8 years, the original stem dies and the seedling becomes a sprout.
Target Specifications :	Sprouts reach 4m

Propagule Collection:	Seeds are collected between September 1st and October 31st. Mature nuts are brown.
Propagule Processing/Propagule Characteristics:	Tanoak mean annual acorn production is 454kg. Tanoak acorns are large and heavy, though their density is undetermined in this report.
Pre-Planting Propagule Treatments:	No cleaning necessary. Stratification in moist peatmoss at temperatures just above freezing is all that is needed to give high germination values (97% and 6 days).
Growing Area Preparation / Annual Practices for Perennial Crops:	Direct seeding within fully controlled greenhouse. Acorns are sown 1 per 1 gallon can containing standard potting mix of peat moss, fir bark, perlite, and sand. Nuts are surface sown. Containers are watered in with an automatic irrigation system.
Establishment Phase (from seeding to germination):	Almost all natural seedlings emerge in the spring; some germination may occur in the fall, but only if the weather is mild and moist. To preserve their viability, tanoak acorns must either be planted immediately in the nursery in light soil, or be stratified until spring at temperatures just above freezing. Plant acorn seed up for maximum germination (Douglas 1974).
Length of Establishment Phase:	3 weeks
Active Growth Phase:	Tanoak can reach 5 to 21 cm in its first year.
Length of Active Growth Phase:	After 6-12 years, seedlings become sprouts.
Hardening Phase:	Simulate winter conditions
Length of Hardening Phase:	1 season
Harvesting, Storage and Shipping:	Store acorns in near freezing temperature, wrapped in peatmoss
Length of Storage:	NA
Guidelines for Outplanting / Performance on Typical Sites:	NA
Other Comments:	Beware of “Sudden Oak Death” disease. Further research into this plant illness is recommended before outplanting.
INFORMATION SOURCES	
References:	1. Griffin, James R., and William B. Critchfield. 1972. The distribution of forest trees in California. USDA Forest Service, Research Paper PSW-82. Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 118 p. 2. Tappeiner, J.C., P.M. McDonald, and D.F. Roy. 1990. Lithocarpus densiflorus (Hook. & Arn.) Rehd. Tanoak. P. 417–425 in Silvics of North America. Volume 2. Hardwoods. R.M. Burns and B.H. Honkala, tech. coords. USDA Forest Service, Washington, D.C. Agriculture Handbook 654.

	3. Eyre, F. H., ed. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington, DC. 148 p. 4. Jensen, E.C, D.J. Anderson, and J.C. Tappeiner II. 1995. The reproductive ecology of broadleaved trees and shrubs: tanoak (Lithocarpus densiflorus [Hool. & Arn.] Rehd.). Forest Research Laboratory Research Contribution 9d. Oregon State University, Corvallis, USA. 5.Roy, Douglass F. 1974. *Lithocarpus densiflorus* ([Hook. & Arn.] Rehd.) Tanoak. *In* Seeds of woody plants in the United States. p. 512-514. C. S. Schopmeyer, tech. coord. U.S. Department of Agriculture, Agriculture Handbook 450. Washington, DC. 6. http://plants.usda.gov/java/profile?symbol=LIDE3
Other Sources Consulted:	
Protocol Author:	Galen Cheney
Date Protocol Created or Updated:	04/28/2011

Species (common name, Latin name)

'Tan Oak' FAGACEAE Lithocarpus densiflorus

Range

1. Pacific Coast of Oregon and California, hardy to Seattle.

Climate, elevation

1. Sea level to 1500 meters, Humid moist conditions

Local occurrence (where, how common)

1. Freeze of 1955 destroyed population in Seattle area

Habitat preferences

1. Moist slopes of coastal ranges

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

1. Sprouts can dominate quickly after a fire

Associated species

1. Pacific Madrone, Castanopsis chrysophylla, Quercus chrysolepsis, Q. kelloggii, Umbellularia californica, Psuedotsuga menziesii, Sequoia sempervirens, Abies concolor, Picea sitchensis, Pinus lambertiana, P. ponderosa, Torreya californica, Tsuga heterophylla.

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

1. Collect acorns

Collection restrictions or guidelines

1. Gather in fall, seeds produced every other year on mature (30-40yrs.) trees.

Seed germination (needs dormancy breaking?)

1. Stratify through winter > 0 degrees C.

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

1. Plant acorns point up, seedlings appear in three weeks.

Soil or medium requirements (inoculum necessary?)

1. Use appropriate methods to avoid root binding in containers, use well draining medium. Not found in clay soils.

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

1. Tree to 30 meters in garden with 10 meter crown. Attractive foliage, evergreen hardwood.

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

2. Keep moist

Normal rate of growth or spread; lifespan

2. Seedlings slow growing, 2" per year. Lifespan > 250 years

Sources cited

1. WOODY NORTHWESTERN NATIVE PLANTS FOR URBAN LANDSCAPES: ORNAMENT AND RESTORATION IN THE NATIVE IDIOM. Center for Urban Horticulture, May 1994

2. http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_2/lithocarpus/densiflorus.htm

Data compiled by (student name and date)

Rob Wines June 11, 2003