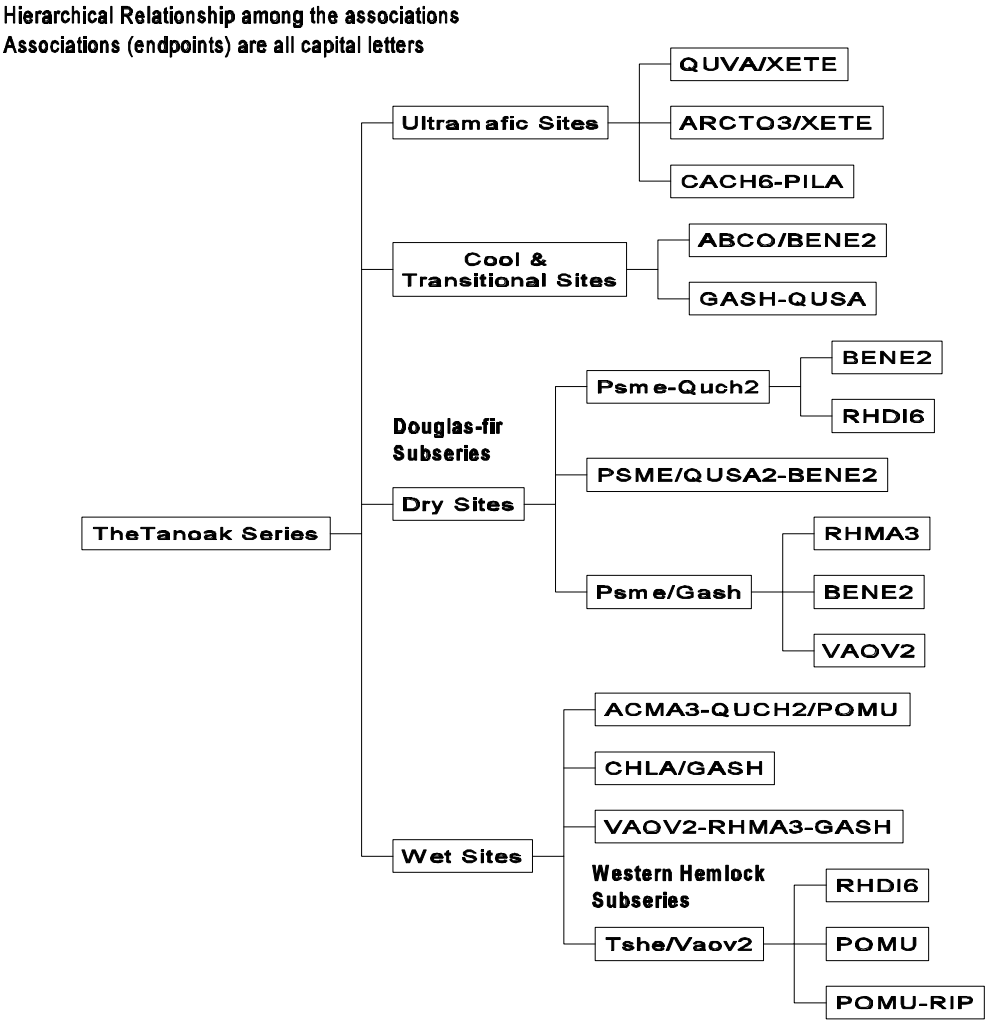
TANOAK SERIES
Lithocarpus densiflorus
LIDE3

Thomas Atzet

Lands climax to tanoak were classified into 17 plant associations and two subseries. (Their hierarchical relationship is shown in the organizational chart below.) Douglas-fir and western hemlock are co-climax with tanoak on the drier and wetter sites, respectively. Each condition defines a subseries (a division of the series). Tanoak is climax in the moist middle of southwestern Oregon's environmental gradient. The Douglas-fir Series and the Western Hemlock Series bracket tanoak's environmental range. The Tanoak-Douglas-fir-Canyon Live Oak/Dwarf Oregongrape Association represents the drier end of the gradient. Tanoak-Western Hemlock/Evergreen Huckleberry/Western Sword-fern-RIP (Riparian) represents the wet end. Other associations are associated with ultramafic parent material, high elevation, or specific topographic positions, particularly lower slopes, canyon bottoms or riparian zones.

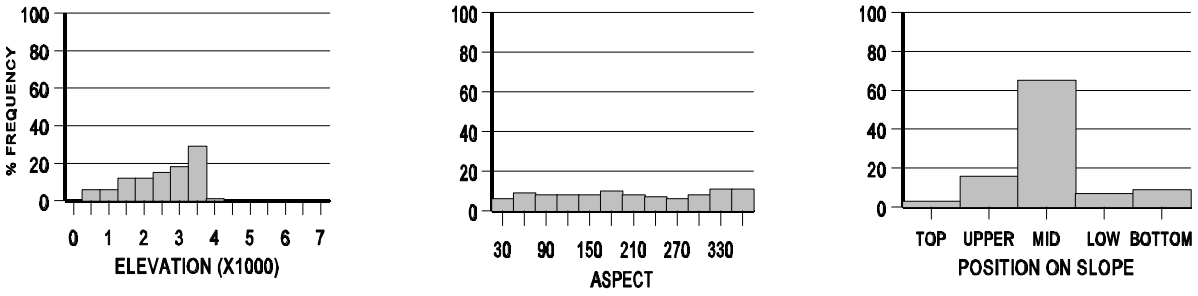


Tanoak's range is limited to southwest Oregon and northwest California. Unlike many of its associates, frost, drought, and fire limit its survival and ability to compete. North of Coos Bay, and at elevations above 4000 feet, frost occurs more often and later in the spring, killing or damaging tanoak. To the south and inland, where marine precipitation and fog wane, drought resistant species are better adapted. Fire, like frost, periodically kills or damages tanoak, forcing it to use its root reserves, and keeping it in a reduced competitive condition. In the last 50 years, lack of fire has enhanced tanoak's competitive status. The effects on species composition and stand structure are evident; absolute cover and relative density have increased.

Tanoak is not climax throughout its range. Its major associates and competitors, Douglas-fir, Port-Orford-cedar, western hemlock, white fir, and even Jeffrey pine dominate sites well into late successional stages and will maintain dominance, even where tanoak is abundant. Observation, in southwest Oregon, suggests that within 100 years after a major disturbance, the dominant climax species has established itself. After 300 years, keying to the correct series is almost assured.

Tanoak is climax where frost events and drought occur less often: (1) in an inland midslope elevational belt below the high elevation cold, but above cold air accumulation in the valleys (mostly 2000 to 4000 feet, see the three figures below); (2) on the coast where marine air softens severe frosts and reduces summer evapotranspirational demand; (3) in protected inland, often north facing, coves; and (4) on ultramafic sites heavily modified by precipitation or by other normal rock types.

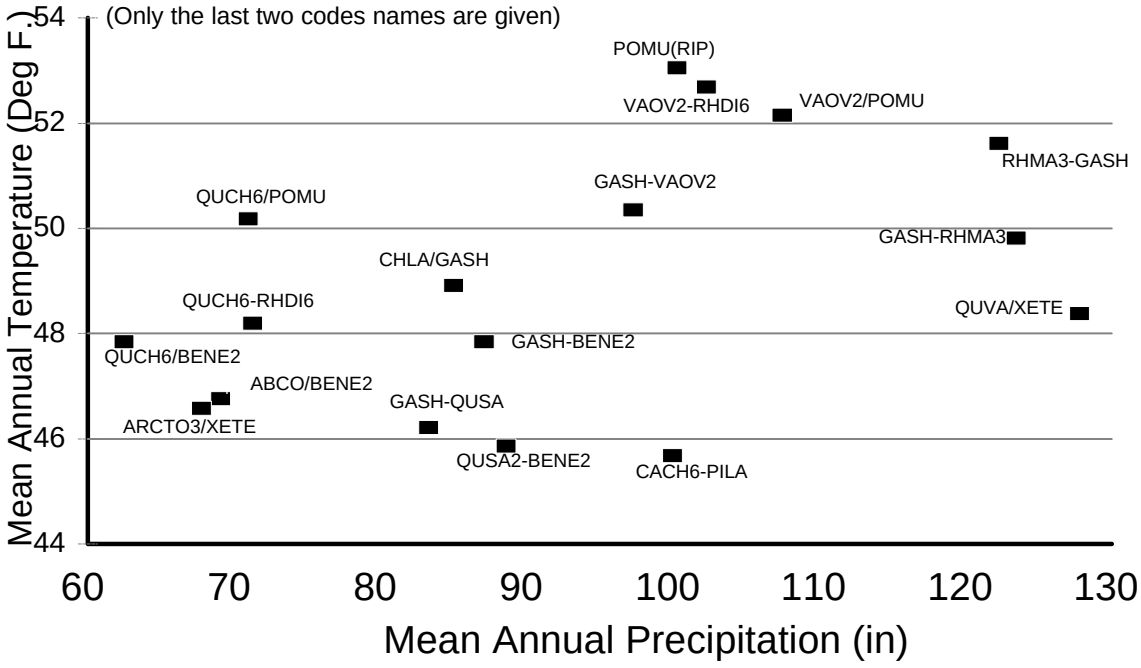
The three graphs below indicate where associations occur on the landscape. Few occur above 4000 feet in elevation, about 3000 feet seems optimum. Coastal associations, however, average about 1,000 feet. No particular aspect is favored, but a majority of the associations can be found on midslope positions. Three associations, Tanoak-Huckleberry Oak/Common Beargrass, Tanoak/Manzanita/Common Beargrass, and Tanoak-Golden Chinquapin-Sugar Pine are ssociated with ultramafic parent rock. Generally deep soils are the rule. Coastal associations tend to be associated with



sediments since most of the area west of the coast crest is sedimentary.

Relative temperature and precipitation of the plant associations are displayed in the Environmental Graph below on page LIDE3 3.

Environmental Graph



The dry inland associations are associated with low precipitation and generally cooler temperatures. Coastal associations appear in the upper right, representing the warm wet side of the gradient. Salal, dwarf Oregongrape, evergreen huckleberry, and Pacific rhododendron commonly occur in the warmer wet associations on the coastal side of the Coast Range crest. Except for evergreen huckleberry, they also occur on the east side where coastal influence modifies local climate, or where a combination of climate and topo-edaphic conditions are similar to the coastal climate.

While keying it is important to pay particular attention to the relative cover of evergreen huckleberry, Pacific rhododendron, salal, and dwarf Oregongrape. Each occupies a different environmental niche. Note that evergreen huckleberry is associated with warm, wet plant associations. It ranges from sea level to about 2500 feet in elevation and reaches maximum cover (most competitive) at about 1000 feet. Salal has a greater range. It occurs throughout southwestern Oregon, is less of a wet indicator, and reaches its maximum development at about 3500 feet in elevation. Dwarf Oregongrape is more competitive inland, particularly at higher elevations. It ranges from sea level to over 5500 feet and can attain greater than10 percent cover regardless of the elevation. Pacific rhododendron is intermediate between evergreen huckleberry and salal.

Three other species, golden chinquapin, Sadler oak, and canyon live oak are fairly faithful indicators. Sadler oak, ranging from about 3000 to 5500 feet in elevation, usually occurs on cool to cold sites which are often rocky. Canyon live oak, insensitive to elevation, but sensitive to moisture, usually occurs on warm to hot sites. It is often associated with golden chinquapin when surface soil rock content is high.

The association key is constructed to reflect the classification concept. It is divided (hierarchically) into associations that occur on ultramafic sites, those that occur in cold or transitional sites, those that occur on inland dry sites, and those that occur west of the Coast Range crest on wetter sites. It is designed so that associations can be aggregated into subseries if association resolution is not needed. Additional upward aggregation into wet and dry tanoak is also possible.

Associations are part of a gradient that has been teased apart during analysis and made into associations at environmental breaks. All breaks are artificial, and may be difficult to recognize in the field. These concepts reflect how ecosystems exist and how they may be managed. Names (particularly long in this Series), are based on the dominant species of each layer, and are designed to highlight the hierarchy, yet reflect the vegetation continuum. Where Douglas-fir is co-climax, its name is used. The Western Hemlock Subseries is divided into three associations reflecting their position in the environmental gradient.

When working in the southern end of the Series range, check the “Key to Tanoak Associations in Northern California” by Thomas Jimerson in Region Five. A copy may be obtained by contacting the Six Rivers National Forest. The subseries and associations are similar and occasionally may describe sites more often found in California.

Plant associations appear in the text in the order they appear in the key. The key deals with associations related to ultamafic parent material first and moves through the associations generally from dry to wet (see the organization chart on Page LIDE3 1).

White and grand fir hybridize in southwest Oregon. They are difficult to distinguish in the field and at times even with laboratory data. Although coastal individuals have more grand fir morphological characteristics and inland samples appear more like white fir, we have chosen to call it all white fir, knowing there are an infinite variety of intergrades.

LITERATURE CITED

Jimerson, T.M. 1997*. A Field Guide To Tanoak Plant Associations In Northwest California. USDA Forest Service, Six Rivers National Forest, Eureka, CA.
(*to be published this year)

The relationship of draft and final plant associations. Draft associations are underlined and final associations are listed below (Page LIDE3 5) in the order they most likely fall into the final associations. This cross reference could be used to determine how sites keyed with the draft should fall into the final classification. However, re-keying in the field or running existing species information through the new key is recommended.

LIDE3\RHCA N = 7
LIDE3-PIMO3/QUVA/XETE (70%)
PIMO-LIDE3/QUVA/XETE (15%)
PSME/QUVA-ARNE-XETE (15%)

LIDE3-SESE2 N = 6
LIDE3/VAOV2-RHMA3-GASH (75%)
LIDE3-TSHE/VAOV2/POMU (25%)

LIDE3\UMCA N = 24
LIDE3/VAOV2-RHMA3-GASH (75%)
LIDE3-TSHE/VAOV2/POMU (15%)
LIDE3-PSME-QUCH2/RHDI6 (10%)
PSME-CACH6/BENE2 (5%)

LIDE3-CHLA N = 15
LIDE3-CHLA/GASH (33%)
LIDE3-PIMO3/QUVA/XETE (22%)
LIDE3-PSME-QUCH2/RHDI6 (22%)
LIDE3/VAOV2-RHMA3-GASH (11%)
CHLA/RHMA3-GASH (11%)

LIDE3/VAOV2-GASH N = 6
LIDE3/VAOV2-RHMA3-GASH (100%)

LIDE3/VAOV2 N = 10
LIDE3-PSME-QUCH2/RHDI6 (67%)
LIDE3/VAOV2-RHMA3-GASH (33%)

LIDE3/RHMA N = 7
LIDE3-TSHE/VAOV2/POMU (100%)

LIDE3\RHMA-VAOV2 N = 21
LIDE3/VAOV2-RHMA3-GASH (86%)
PSME/GASH-RHMA3 (14%)

LIDE3/RHMA-GASH N = 14
PSME/GASH-RHMA3 (100%)

LIDE3/GASH N = 14
LIDE3-PSME-QUCH2/RHDI6 (100%)

LIDE3/GASH-RHMA N = 10
LIDE3-PSME-QUCH2/BENE2 (20%)
LIDE3-PSME-QUCH2/RHDI6 (20%)
PSME-CACH6/BENE2 (20%)
PSME/GASH-RHMA3 (20%)

LIDE3/GASH-BENE N = 17
LIDE3-PSME-QUCH2/RHDI6 (100%)

LIDE3-ACCI N = 8
LIDE3-PSME-QUCH2/BENE2 (60%)
LIDE3-PSME-QUCH2/RHDI6 (40%)

LIDE3-ABCO-ACCI N = 11
LIDE3-PSME-QUCH2/BENE2 (60%)
LIDE3-PSME-QUCH2/RHDI6 (30%)
LIDE3-CHLA/GASH (10%)

LIDE3-ABCO N = 19
LIDE3-PSME-QUCH2/RHDI6 (92%)
LIDE3-PSME-QUCH2/BENE2 (8%)

LIDE3/BENE N = 23
LIDE3-PSME-QUCH2/RHDI6 (84%)
LIDE3-PSME-QUCH2/BENE2 (8%)
PSME-ABCO (8%)

LIDE3/BENE-RHDI N = 7
LIDE3-PSME-QUCH2/BENE2 (100%)

LIDE3-QUCH N = 14
LIDE3-PSME-QUCH2/RHDI6 (50%)
PSME-QUCH2-LIDE3 (50%)

LIDE3-QUCH/BENE N = 8
LIDE3-PSME-QUCH2/RHDI6 (50%)
LIDE3-PSME-QUCH2/BENE2 (25%)
PSME-QUCH2-LIDE3 (25%)

LIDE3-RHDI-LOHI N = 16
LIDE3-PSME-QUCH2/RHDI6 (92%)
PSME-QUKE/RHDI6 (8%)

KEY TO THE TANOAK PLANT ASSOCIATIONS

Ultramafic parent material influenced associations

1a. Ultramafic parent material or soils with ultramafic influence (serpentine/peridotite); western white pine (PIMO3) greater than 10 percent cover in the overstory and understory combined. LIDE3-PIMO3/QUVA/XETE
Page LIDE3 10

1b. Ultramafic parent material or soils with ultramafic influence (serpentine/peridotite); manzanita (ARCTO3) species dominating the shrub layer, Jeffrey pine (PIJE) absent. LIDE3/ARCTO3/XETE
Page LIDE3 12

1c. Ultramafic parent rock or soils with ultramafic influence (serpentine/peridotite); Jeffrey pine (PIJE) usually present, golden chinquapin (CACH6) cover usually greater than 30 percent. LIDE3-CACH6-PILA
Page LIDE3 14

1d. Not as above 2

2a. Drier sites usually east of the coastal crest at higher elevations and usually dominated by Douglas-fir (PSME) in the regeneration layer. Canyon live oak (QUCH2), Pacific madrone (ARME), Golden chinquapin (CACH6), poison oak (RHDI6), hairy honeysuckle (LOHI2), and common snowberry (SYMO) usually present in some combination. *"Dry associations"* 3

2b. Wetter sites usually west of the coastal crest or in inland coves on northerly aspects usually less than 2000 feet elevation. Usually dominated by salal (GASH), and Pacific rhododendron (RHMA3). Western hemlock (TSHE), evergreen huckleberry (VAOV2), red alder (ALRU2), Oregon oxalis (OXOR), or western sword-fern (POMU) often present in some combination. *"Wet associations"* 6

2c. A mix of moist and dry, on lower slopes or in protected canyon bottoms. Big-leaf maple (ACMA3) usually present with high cover (about 30 percent) LIDE3-ACMA3-QUCH2/POMU
Page LIDE3 16

"Dry associations" including part of the *Tanoak-Douglas-fir Subseries*
(see the flow chart on Page LIDE3 Tanoak 1)

3a. Sadler oak (QUSA2) cover greater than 20 percent. LIDE3-PSME/QUSA2-BENE2 Page LIDE3 18

3b. Sadler oak (QUSA2) absent or cover less than 20 percent. 4

4a. White fir (ABCO) frequently present in both the overstory and understory. Poison oak (RHDI6) canyon live oak (QUCH2), and sugar pine (PILA) absent or less than one percent cover. LIDE3-ABCO/BENE2 Page LIDE3 20

4b. White fir (ABCO) regeneration rarely present or less than five percent cover. Canyon live oak (QUCH2) frequently present at greater than 10 percent cover. 5

5a. Dwarf Oregongrape (BENE2) cover frequently greater than 10 percent, Douglas-fir regeneration cover less than 10 percent. LIDE3-PSME-QUCH2/BENE2 Page LIDE3 22

5b. Dwarf Oregongrape (BENE2) cover frequently less than 10 percent and Douglas-fir (PSME) regeneration cover greater than 10 percent. LIDE3-PSME-QUCH2/RHDI6 Page LIDE3 24

"Wet associations" including the *Tanoak-Western hemlock Subseries*

6a. Salal (GASH) dominated. Usually more than three miles from the coast. Sugar pine (PILA), western twinflower (LIBOL), Port-Orford-cedar (CHLA) golden chinquapin (CACH6), common prince's-pine (CHUM), or Sadler oak (QUSA2) may be present. 7

6b. Evergreen huckleberry (VAOV2) dominated. Usually coastal. Western hemlock (TSHE), red alder (ALRU2), California-laurel (UMCA), salmonberry (RUSP), western sword-fern (POMU), or Oregon oxalis (OXOR) may be present or common. 9

6c. Big-leaf maple (ACMA3) and vine maple (ACCI) dominate, often riparian or lower slope positions. LIDE3-ACMA3-QUCH2/POMU
Page LIDE3 16

7a. Port-Orford-cedar (CHLA) often present in the overstory and co-dominant with tanoak (LIDE3) in the understory. LIDE3-CHLA/GASH
Page LIDE3 26

7b. Sadler oak (QUSA2) present, usually cover greater than 30 percent. LIDE3-CACH6/GASH-QUSA2
Page LIDE3 28

7c. Not as above. Douglas-fir (PSME) coclimax with tanoak (LIDE3). 8

Wetter sites of the *Tanoak-Douglas-fir Subseries* (8a, 8b, 8c) (Douglas-fir competes well with tanoak regeneration in the understory, salal (GASH) dominates the shrub layer.)

8a. Pacific rhododendron (RHMA3) is the most dominant secondary shrub; usually the driest sites of the three (8a, 8b, 8c) LIDE3-PSME/GASH-RHMA3
Page LIDE3 30

8b. Dwarf Oregongrape (BENE2) is the most dominant secondary shrub; usually higher elevation. LIDE3-PSME/GASH-BENE2
Page LIDE3 32

8c. Evergreen huckleberry (VAOV2) is the most dominant secondary shrub, moister sites of the three (8a, 8b, 8c). LIDE3-PSME/GASH-VAOV2
Page LIDE3 34

9a. Evergreen huckleberry (VAOV2) dominates the shrub layer, Pacific rhododendron (RHMA3) with greater cover than salal (GASH). Driest coastal sites. Poison oak (RHDI6), hairy honeysuckle (LOHI2), or California hazel (COCOC) may be present, western hemlock (TSHE) absent, and western sword-fern (POMU) less than five percent cover. LIDE3/VAOV2-RHMA3-GASH
Page LIDE3 36

9b. Western hemlock (TSHE) present and co-dominant or subdominant to tanoak (LIDE3). Wet indicators such as red alder (ALRU2), salmonberry (RUSP), western sword-fern (POMU), Pacific yew (TABR2), and Oregon oxalis (OXOR) are often present and with high covers. 10

Tanoak-Western hemlock Subseries (10a, 10b, 10c)
Western hemlock (TSHE) competes with tanoak regeneration but remains subordinate or rarely co-climax. The subseries is a gradient from dry (10a) to wet sites (10c).

10a. Driest of the subseries. Poison oak (RHDI6) present, usually with low cover. LIDE3-TSHE/VAOV2-RHDI6
Page LIDE3 38

10b. Moist sites, often north aspects and lower slope positions. Western sword-fern (POMU) cover less than 35 percent, Oregon oxalis (OXOR) cover usually less than 5 percent. LIDE3-TSHE/VAOV2/POMU
Page LIDE3 40

10c. Wettest sites of the tanoak series, often riparian or adjacent to riparian sites. Western hemlock (TSHE), western sword-fern (POMU), Oregon oxalis (OXOR), salmonberry (RUSP), red alder (ALRU2), and occasionally western redcedar (THPL) present. Western sword-fern (POMU) cover greater than 50 percent, Oregon oxalis (OXOR) cover often greater than 20 percent. LIDE3-TSHE/VAOV2/POMU-RIP
Page LIDE3 42