

Appendix A5: Draft Keys to Species of *Amanita* Occurring in California, Idaho, Oregon, and Washington, U.S.A. and in Neighboring Regions of Canada and Mexico

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Because there are several observers whose ideas are gathered in this document, provisional names and species numbers come from a variety of sources. Unless some other source is specified, species numbers all have been generated by Janet E. Lindgren, Vancouver, Washington, and myself. We are also responsible for a number of provisional names as are Dr. Cornelis Bas, Leiden, the Netherlands; Greg Wright, Claremont, California; and the late Dr. Alexander H. Smith. Many “numbered” species have a “number” composed from a collector’s name and number; and many of these collections are deposited in MICH and annotated by Dr. Smith. I have indicated the source of provisional names so the reader can tell which entries are based only on second hand knowledge.

Spore measurements or other data given within quotation marks or following a source citation indicates that the data is not based on my personal observation.

“PNW” abbreviates “Pacific Northwest” [of the contiguous states of the U.S.A.].

Color names in italic type with first letters capitalized (e.g., *Drab*) are from Ridgway (1912).

Users of this key will also find valuable the North American Mycological Association slide presentation and script called *Amanitas of the Pacific Northwest* (Lindgren, 1998a) and the Pacific Northwest Key Council key for *Amanita* (Lindgren, 1998b), which is written in a style emphasizing macroscopic characters.

SUBGENUS *Amanita* SECTION *Amanita* [revised 27 Nov. 2006]

[NOTE: does not include *Amanita* sp. *NW8*.]

1. Pileus some shade of red, red-orange, yellow, pale cinnamon, pale tan, pale sordid yellow, off-white or white; relatively common clamps on basidia. (See also, “*Amanita gemmata* #1,” below, if clamps not common.)
2. Pileus red to orange-red initially, may become paler and take on some duller, dominated by yellowish or browner tones after exposure to sunlight.
3. Pileus red and tending to remain so or, if decolorized by sunlight, then pinkish rather than dull orange; universal veil often white (even in the button stage, although sometimes then yellow) on the pileus margin in early stages of expansion; lamella trama with $w_{st-near} = 80 - 115 \mu m$ (good rehydration); $w_{st-far} = 90 - 135 \mu m$ (good rehydration); spores $(7.4-) 8.5 - 11.5 (-13.1) \times (5.6-) 6.5 - 8.5 (-9.8) \mu m$, with $Q = 1.26 - 1.41 (-1.42)$; known in Alaska and NW Canada, more southerly distribution not definitively confirmed; could be imported with conifers, eucalypts, *Betula*, etc.
Amanita muscaria subsp. *muscaria* (L. : Fr.) Lam.
3. Not with the above coloration; universal veil yellow, at least in the button stage; lamella trama with $w_{st-near} = 60 - 80 \mu m$ (good to very good rehydration); $w_{st-near} = 80 - 85 (-100) \mu m$ (excellent rehydration); $w_{st-far} = 85 - 100 \mu m$ (good to very good rehydration); $w_{st-far} = 95 - 100 (-110) \mu m$ (excellent rehydration); spores $(7.5-) 9.1 - 12.8 (-19.0) \times (5.5-) 6.5 - 8.5 (-11.5) \mu m$, with $Q = (1.29-) 1.31 - 1.65 (-1.95)$; range extending from PNW to Costa Rica and exported with pines to Colombia, common from N California to Costa Rica

including montane SW U.S.A. and U.S. Gulf Coast states, rarely in eastern U.S.A. as far north as Massachusetts, occurring with conifers, *Quercus*, and (rarely) *Betula*

Amanita muscaria subsp. *flavivolvata* Singer

=*Amanita muscaria* [subsp. *muscaria*] var. *formosa sensu* Thiers (at least in part).

2. Pileus a shade of yellow, tan, buff, or cinnamon or off-white to white.

4. Pileus not strongly pigmented, but white or whitish only in age; **Q** > 1.45.

5. Stipe with persistent partial veil and large piece of *limbus internus* suggesting second, basal partial veil; pileus with pale shades of yellow, tan, buff, or cinnamon; spores (7.2-) 9.8 - 12.8 (-16.0) × (4.5-) 6.2 - 7.8 (-10.8) μm, with **Q** = (1.51-) 1.52 - 1.74 (-1.85); known from Washington to California under *Picea* and *Pinus*

Amanita breckonii Thiers & Ammirati.

5. Stipe rapidly becoming exannulate; pileus pale yellow to cream color but in age often whitish, finally discoloring brownish; universal veil as a free-margined volva that is not inrolled; spores “9 - 12 × 6 - 7.5 μm,” with **Q** approx. 1.55; reported from Idaho under *Pinus* at “high elevations”

Amanita alpina A. H. Sm. *nom. prov.*

[See also, [below](#).]

4. Pileus white or whitish, off-white to slightly more densely pigmented in disk, stipe bruising somewhat yellowish; spores (8.4-) 9.1 - 9.8 × 6.6 - 7.7 (-8.0) μm, with **Q** = 1.31; known from PNW to Pennsylvania and New York in the U.S.A. and from Prov. Québec, Canada

Amanita muscaria var. *alba* Peck.

1. Pileus some shade of yellow, brown, tan, or gray including very pale shades or white; basidial clamps occasional to uncommon to absent—or as yet of unknown frequency.

6. Universal veil as a grayish brown powdery smear on top of small, subabrupt bulb; basidial clamps occasional; spores 7.8 - 9.2 × (5.0-) 5.8 - 7.2 (-7.5) μm, with **Q** = 1.31; reported from Washington and Oregon

Amanita farinosa sensu auct. PNW.

6. Universal veil as patches or warts or as a distinct rim on top of bulb or as a limbate volva or absent; differing in other characters from the above.

7. Basidial clamps occasional—not rare or absent.

8. Pileus creamy yellow to tannish yellow or slightly orangish tan or orangish yellow over disc, yellow to pale creamy yellow to cream at margin; universal veil as a narrowly limbate volva, sometimes with a second larger flaring limb; spores (8.8-) 9.0 - 11.2 (-12.8) × (6.0-) 6.8 - 8.5 (-9.8) μm, with **Q** = 1.25 - 1.38; reported from British Columbia to Oregon with conifers

“*Amanita gemmata* #1.”

8. Not as above; especially, **Q** value higher.

9. 1.4 < **Q** < 1.7.

10. Pileus pale yellow to cream color, but, in age, often whitish, finally discoloring brownish; universal veil as a free-margined volva that is not inrolled; spores “9 - 12 × 6 - 7.5 μm,” with **Q** approx. 1.55; reported from Idaho under *Pinus* at “high elevations”

Amanita alpina A. H. Sm. *nom. prov.*

[See also, [above](#).]

10. Pileus bright yellow to egg yellow to lemon yellow or bright orangish yellow, occasionally orange; universal veil as a low free limb encircling top of bulb, seldom rolled outward, sometimes also as detrusile rings on lower stipe above limb; spores (8.0-) 9.5 - 13.0 (-21) × (5.0-) 6.5 - 8.5 (-12.5) μm, with **Q** = (1.38-) 1.42 - 1.62 (-1.80); reported from British Columbia to California with conifers (mainly *Pseudotsuga menziesii* and *Pinus*) and *Quercus*

Amanita aprica J. Lindgr. & Tulloss.

10. Pileus cream at margin, *Pinkish Buff* over disc, *Massicot Yellow* to *Maize Yellow* under pileipellis; universal veil as a white, thin, membranous sheath collapsing on stipe; spores (8.0-) 11.2 - 12.8 (-14.4) × (4.8-) 5.6 - 7.2 (-8.0) μm, with **Q** approx. = 1.8; reported from Mendocino Co., California, in mixed coastal forest

Amanita sp. Breckon 676.

8. Basidial clamps rare or absent or of unknown frequency.

11. Basidial clamps of unknown frequency.

12. Universal veil on stipe base suggesting that of *A. gemmata*.

13. Pileus white to pale brownish; universal veil as a short membranous limb encircling the stipe base; spores “8.2 - 9.5 × 5.8 - 6.6 μm,” with **Q** = 1.43; reported from southern California in *Abies-Pinus-Quercus* forest

Amanita albopantherina G. Wright nom. prov.

13. Pileus white; universal veil like that of *A. gemmata sensu* Thiers; spores “10 - 11 (-14) × 7 - 8 (-11) μm,” with **Q** approx. = 1.4; reported from San Mateo Co., California, under *Quercus*

Amanita gemmata “white form” of Breckon.

13. Pileus brown to almost white; universal veil like that of *A. pantherina*; spores 8.8 - 10.5 (-12.0) × (6.2-) 6.5 - 8.2 (-9.0) μm, with **Q** = 1.34; reported from Washington and Oregon with *Pseudotsuga menziesii* ..

Amanita sp. NW1.

12. Basidial clamps rare or absent.

14. Stipe with series of appressed (obscure to well-developed) white to pale orange scales near middle and base; spores “10.2 - 12.5 × 9.4 - 10.9 μm,” with **Q** = 1.15; known from southern Idaho with *Pseudotsuga menziesii*, *Populus tremuloides*, and *Juniperus scopulorum*

Amanita aurantisquamosa Trueblood, O. K. Mill & Dav. T. Jenkins.

14. Stipe lacking such decoration; spores with **Q** greater than 1.30.

15. Spores with **Q** ≥ 1.70.

16. Pileus dark yellow or orangish yellow, fading to yellow to pale yellow with age, sometimes with pale brownish tints on disc; stipe exannulate; universal veil as irregular warts or patches irregularly distributed on stipe or as a somewhat flaring margin at apex of bulb, in either case usually disappearing at maturity; spores “11 - 15 × 6 - 9 μm,” with **Q** approx. 1.75; reported from San Francisco Bay Area under conifers.....

Amanita junquillea var. *exannulata sensu* Breckon.

16. Pileus white; stipe with superior, skirt-like partial veil; universal veil as a thick rim around lower portion of stipe, with a longer flat free limb; spores “9.5 - 12.1 × 5.9 - 6.2 μm,” with **Q** = 1.79; reported from California in *Abies-Pinus-Quercus* forest

Amanita pseudo-albopantherina G. Wright nom. prov.

16. Spores with **Q** < 1.70.

17. 90% or more of spores with length 9.0 - 11.7 μm.

18. Pileus ranging from very dark brown to tan to cream: universal veil as a thick rim (“rolled sock”) on bulb at base of stipe.

19. Subhymenium with $w_{st-near} = 50 - 70 \mu m$ and $w_{st-far} = 70 - 100 \mu m$; spores (8.8-) 9.8 - 14.2 (-16.5) × (5.5-) 6.5 - 9.2 (-11.0) μm, with **Q** = 1.43 - 1.59 (-1.80); reported from the Yukon to New Mexico in mixed forest (e.g., with *Quercus* or in conifer-*Alnus-Populus tremuloides* forest

Amanita ameripanthera Tulloss nom. prov.

19. Subhymenium with $w_{st-near} = 10 - 25 \mu\text{m}$ and $w_{st-far} = 25 - 50 \mu\text{m}$; spores (7.5-) 9.0 - 12.0 (-14.0) \times (5.2-) 6.2 - 8.2 (-9.8) μm , with $Q = 1.32 - 1.51 (-1.61)$
Amanita pantherina (DC. : Fr.) Krombh.
 [Euroasian species; reported, but not confirmed, from region of study.]
19. Universal veil limbate, not as a thick rim on top of bulb. [Probably, there are only one or two taxa in the following group. The holotypes are somewhat poorly preserved.]
20. Pileus “dark melleous” with “melleous-avellaneous” center (*praegraveolens*) or “melleous or dirty cremeous” with “brown or chestnut” center, with margin not striate; universal veil at stipe base limbate, with rather thin limb; spores (8.5-) 9.0 - 11.2 (-12.2) \times (6.3-) 6.5 - 7.8 (-8.5) μm , with $Q = 1.42 - 1.44$; known from Washington and Oregon in conifer and hardwood forests.....
Amanita pantherinoides (Murrill) Murrill
 =*Amanita praegemmata* (Murrill) Murrill per Jenkins (1978).
20. Pileus melleous fading to stramineous over the “conspicuously long” striae, with umbo yellow in young plants and becoming umbrinous with age; universal veil as stipe base limbate; spores (Jenkins, 1979) 10.2 - 11.7 \times 7.0 - 7.8 (-8.6) μm , with $Q = 1.46$; known from Washington in conifer forest.....
Amanita umbrinidisca (Murrill) Murrill.
20. Pileus pale tan to yellow with “butterscotch” disc; universal veil as pronounced limbate volva; spores (9.7-) 10.0 - 11.0 (-12.0) \times (6.9-) 7.0 - 8.0 (-9.0) μm , with $Q = 1.38$; known from Washington in mixed conifer forest
Amanita sp. NW7.
18. 90% or more of spores with length 7.9 - 13.2 μm .
21. Pileus yellow to creamy yellow on margin, brown to reddish brown on disc; universal veil as a thick rim on top of bulb; spores “7.9 - 13.2 \times 6.3 - 7.9 μm ,” with $Q = “1.43”$
Amanita velatipes G. F. Atk.
 =*Amanita pantherina var. velatipes* (G. F. Atk.) Dav. T. Jenkins.
 [Eastern North American species; reported, but not confirmed, from region of study.]
21. Pileus pale yellow orange to tannish cream with tan disc; universal veil as a short, somewhat appressed limb or ridge encircling top of bulb; spores “9 - 13 \times 6.5 - 9 μm ,” with Q approx. 1.4; reported from California, probably with *Quercus*.....
 “*Amanita gemmata* #2.”

SUBGENUS *Amanita* SECTION *Vaginatae* (Fr.) Quél.

1. Stipe exannulate from early states of basidiocarp expansion.
2. Pileus white, sometimes graying or otherwise discoloring with age.
3. Spores with $Q > 1.15$.
4. Spores with $Q > 1.35$.
5. Odor nauseating; reported from western Canada with *Populus tremuloides*
Amanita sp. ALB4
 =*Amanita roanokensis sensu* Schalkwijk-Barendsen (1991) non Coker.
5. Lacking nauseating odor; not reported with *Populus*.
6. Spores “8.8 - 13.3 \times (8-) 8.4 - 9.2 (-10.2) μm ,” with “ $Q = 1.41$ ”; reported from southern California...
Amanita calyptrovelosa G. Wright nom. prov.

6. Pileus surface dry and suggesting kid leather; spores (7.9-) 10.2 - 13.5 (-16.5) × (6.3-) 6.6 - 9.0 (-10.0) μm, with **Q** = 1.49 - 1.58; reported from Oregon with *Corylus cornuta*, *Pseudotsuga menziesii*, and *Quercus garryana*
Amanita sp. NW9.
4. Spores (10.5-) 11.0 - 13.0 (-13.8) × (8.2-) 8.5 - 11.0 (-11.5) μm, with **Q** = 1.23; reported from Idaho in *Populus tremuloides* stand near *Pinus*
Amanita sp. Cripps 331.
3. Spores with **Q** ≤ 1.15.
7. Pileus not markedly discoloring with age; universal veil not graying with age
8. Universal veil as calyptra on pileus and rather robust saccate volva; spores [*per* Thiers (1982)] “9.5 - 12.0 × 9.5 - 11.5 μm,” with **Q** approx. 1.1; reported from California in hardwood (especially *Quercus*) and mixed forests.....
Amanita alba sensu Thiers (1982)
non Pers. (= *A. ovoidea* (Bull. : Fr.) Link) *non* Thiers (= *A. thiersii* Bas)
 [At least in part, this is a white variant (probably not deserving of any taxonomic rank) of *A. velosa*, which see.
8. Pileus with cream disc; universal veil having some remnants pulled up 50[±] mm by elongation of stipe; spores “9 - 11 μm,” with **Q** approx. 1; reported from Oregon
Amanita sp. Collier 1.
7. Pileus discoloring with age.
9. Pileus graying with age; universal veil graying with age, submembranous, often with strangulate region; spores “globose 10 - 14 μm,” with **Q** approx. 1; reported from Oregon
Amanita sp. Folsom 3.xi.1973.
9. Pileus becoming brownish or rusty with age; universal veil discoloring similarly, fragile, often leaving patches or warts on pileus, often detaching from stipe and left as cup in substrate by collectors; spores (7.0-) 9.2 - 12.5 (-21) × (6.0-) 8.2 - 11.2 (-15.8) μm, with **Q** = (1.06-) 1.08 - 1.15 (-1.19); known from Kansas to Michigan in the east and Idaho to New Mexico in the west, occurring only with *Populus spp.*
Amanita populiphila Tulloss & E. Moses.
2. Pileus not white.
10. Spores with **Q** > 1.20
11. Pileus dark brown; thickness of universal veil not specified; spores “11.2 - 13.5 × 8.7 - 10.6 μm” with “**Q** = 1.28”; reported from California under *Abies* and *Populus*
Amanita atrobrunnea G. Wright *nom. prov.*
11. Pileus gray or grayish brown; universal veil not fragile; spores [*per* Thiers (1982); not in agreement with European authors] “7.0 - 12.0 × 6.0 - 9.0 μm,” with **Q** approx. 1.25; reported from California with hardwoods and conifers
Amanita vaginata sensu Thiers.
10. Spores with **Q** < 1.20.
12. Universal veil on stipe base as a large, thick, membranous, saccate volva, white with rusty or orangish stains; pileus a shade of brown from fuliginous (especially in early stages of basidiocarp expansion) to fulvous brown.
13. Spores (7.8-) 10.0 - 13.5 (-16.5) × (7.5-) 8.8 - 11.8 (-14.0) μm, with **Q** = 1.06 - 1.20 (-1.21); known from northern coastal forests with conifers or *Quercus*
Amanita pachycolea Stuntz *in* Thiers & Ammirati.
13. Spores 11.1 - 13.9 (-15.4) × 10.4 - 12.6 μm, with **Q** = 1.08; reported from northern California with *Quercus*
Amanita sp. C14.

12. Universal veil at stipe base not large and thick, may be membranous and saccate; also may differ in other characters.
14. Universal veil at stipe base often breaking so as to suggest an ocreate volva as in *A. pantherina*; stipe decorated densely with dark gray to black fibrils; pileus often with thin pulverulent layer from interior of universal veil; spores (8.7-) 9.5 - 13.0 (-21) × (7.3-) 8.7 - 11.5 (-16.2) μm, with **Q** = (1.07-) 1.10 - 1.19; known from coastal California with *Quercus* and, in the north, occasionally with conifers (Thiers, 1982)
Amanita protecta Tulloss & G. Wright
 =*Amanita inaurata sensu Thiers*.
14. Universal veil as a membranous to submembranous sac or pulverulent; stipe not densely covered with very dark gray to black fibrils; pileus lacking a pulverulent coating.
15. Universal veil as membranous to submembranous sac, with exterior not discoloring to gray or grayish brown with age, never pulverulent, never strangulate.
16. Pileus gray, brownish gray, dark gray-brown, or nearly black; universal veil fragile.
17. Pileus a shade of gray or brownish gray; universal veil very fragile; spores “globose 9 - 12 μm,” with **Q** approx. 1.0; reported from Idaho under conifers
Amanita sp. A. H. Sm. 65577.
17. Pileus dark gray-brown to nearly black; universal veil fragile, easily lost during collecting; spores **22** × **22** μm, with **Q** = **22**; known from western Canada.....
Amanita sp. ALB2
 =*Amanita vaginata sensu Schalkwijk-Barendsen (1991)*.
16. Pileus a shade of orange.
18. Pileus pale orangish to pale salmon to brownish orange, with pigment washing out in heavy rains; stipe white; spores (8.7-) 9.1 - 12.0 (-16.3) × (7.0-) 7.7 - 10.0 (-13.0) μm, with **Q** = 1.15 - 1.24; known from western Oregon to Baja California with *Quercus agrifolia* and *Q. garryana*
Amanita velosa Peck.
18. Pileus tawny orange to fox brown; stipe peach colored above, tawny below; spores **22** × **22**, with **Q** = **22**; reported from as far north as the Northwest Territories, present throughout southern provinces of western Canada *per* Schalkwijk-Barendsen (1991) with hardwoods
Amanita sp. ALB3
 =*Amanita fulva sensu Schalkwijk-Barendsen*.
15. Universal veil as a membranous to submembranous sac of which at least the upper portions or interior surface of the limbs become gray or grayish brown with age or as a submembranous and strongly strangulate volva or pulverulent.
19. Pileus some shade of brown; universal veil as a rusty staining, pallid, saccate or strangulate, occasionally fragile volva.
20. Universal veil membranous, saccate, collapsing on stipe; spores with walls 0.5 - 0.8 (-1.5) μm thick, (9.8-) 10.0 - 13.2 (-22.5) × (8.0-) 9.2 - 12.5 (-15.0) μm, with **Q** = 1.11; reported from Alberta in alpine forest with conifers; reported from Alberta in alpine forest with conifers.....
Amanita sp. ALB1
 =*Amanita battarrae sensu Schalkwijk-Barendsen (1991)*.
20. Universal veil sometimes fragile and breaking into patches, sometimes disappearing from stipe base for this reason; spores thin-walled.
21. Clamps at bases of basidia scattered; universal veil on stipe base often strangulate; almost all cells in universal veil with thickened walls; many acrophysalides of stipe thin-walled, but others with apices up to 1.0 μm thick; spores [from NW4 as an example] (7.0-) 10.0 - 13.2 (-19.2) × (6.0-) 9.0 - 12.2 (-17.8) μm, with **Q** = 1.07 - 1.11 (-1.12); reported from British Columbia to Oregon under diverse conifers
Amanita spp. NW4 and WA2.

21. Clamps plentiful at bases of basidia.
22. Universal veil on stipe base not strangulate, saccate, but weakly structured and breaking into large plaques; many small, often rather slender, frequently dissociated, thick-walled cells in universal veil interior (which also contains common, larger thin-walled cells); apices of acrophysalides in stipe often having wall over 1.0 μm thick; spores (7.8-) 9.5 - 12.2 (-16.2) \times (7.5-) 8.5 - 11.0 (-13.8) μm , with $Q = 1.09 - 1.13$; reported from coastal California with hardwoods.....
Amanita sp. C12.
22. Universal veil on stipe base strangulate; most cells in universal veil interior thin-walled; acrophysalides of stipe thin-walled; spores (8.8-) 9.8 - 12.8 (-18.5) \times (7.8-) 8.0 - 11.0 (-13.0) μm , with $Q = 1.15$; reported from S California to Washington with conifers or *Quercus*
Amanita sp. NW5.
19. Pileus a shade of brown or gray; universal veil pulverulent or submembranous with strongly graying limb and often strongly strangulate at stipe base.
23. Universal veil strongly strangulate, submembranous, gray on interior surface from early in fruiting body expansion, eventually entirely graying, with a large and flaring limb, pileus brown, often with darker umbo and yellow-brown region between umbo and area of margin striations by the time the pileus is planoconvex; spores (7.2-) 9.5 - 12.8 (-19.0) \times (6.2-) 8.2 - 11.5 (-17.8) μm , with $Q = (1.06-) 1.09 - 1.17 (-1.18)$; known from northern coastal forests with conifers or hardwoods.....
Amanita constricta Thiers & Ammirati.
23. Universal veil on stipe base not strangulate, often breaking up and disappearing; spores “9 - 12 (-13),” with Q approx. 1; reported from Idaho in *Pinus-Picea* forest.....
Amanita sp. A. H. Sm. 65576.
1. Stipe annulate at least in early stages of basidiocarp expansion.
24. Pileus grayish brown or white and, and in the latter case, developing *Cinnamon Buff* staining.
25. Pileus grayish brown to brown; partial veil narrow and appears to dissolve onto stipe surface; stipe with appearance of wax candle; basidiocarp moderately slender to moderately robust; spores (8.5-) 9.8 - 14.0 (-17.0) \times (5.5-) 6.5 - 8.9 (-11.8) μm , with $Q = (1.40-) 1.44 - 1.70$; known from central to southern California and Baja California peninsula with *Quercus agrifolia*; known from Tlaxcala edo., México (neovolcanic zone) in *Abies-Pinus-Quercus* forest.....
Amanita calyptrotoides Peck.
25. Pileus and stipe becoming tinged rather quickly with *Cinnamon Buff*; stipe white, becoming flushed with *Cinnamon Buff*; universal veil thick, but fragile; spores “11 - 14 \times 9 - 12 μm ,” with Q approx. 1.2; reported from Oregon under *Picea* and *Abies*.....
Amanita sp. A. H. Sm. 60677.
24. Pileus a shade of white, yellow, orange, orangish brown, or occasionally with a greenish tint, not developing *Cinnamon Buff* tones on pileus if white; basidiocarp often robust and rather squat, sometimes hypogeous (*e.g.*, in Sierras in Spring).
26. Pileus orange to orange-brown, sometimes with greenish tint over entire basidiocarp, sometimes with odor of fish; spores (8.6-) 9.0 - 12.0 (-24) \times (5.5-) 5.8 - 7.0 (-8.5) μm , with $Q = 1.55 - 1.68 (-1.69)$; known from Oregon to southern California with hardwoods and conifers.....
Amanita calyptroderma G. F. Atk. & Ballen
=*Amanita lanei* (Murrill). Sacc. & Trott.
=*Amanita calyptrata* Peck non Lam.
26. Pileus white to pale yellow to yellowish.

27. Pileus white to pale yellow to yellowish; lamellae white at first, then developing yellowish tones; odor and taste of fish; spores (9.0-) 9.5 - 12.4 (-17.2) × (5.5-) 6.0 - 7.8 (-9.8) μm, with **Q** = 1.53 - 1.67; reported from Washington to southern California with *Quercus* or conifers

“*Amanita calyptroderma*, pale, Spring form.”

[Believed by some California collectors to be at least two species—one yellow or yellowish and one white.]

27. Pileus white; lamellae with pinkish tinge; partial veil collapsing and sliding down stipe to inferior position; stipe white, sometimes becoming ochraceous below, with white floccules/squamules that become ochraceous on their tips; spores (10.0-) 11.0 - 13.2 (-14.2) × (7.2-) 7.8 - 9.0 (-9.8) μm, with **Q** = 1.46; known from Montana in *Populus tremuloides* stands with scattered conifers

Amanita sp. *Cripps* 531.

SUBGENUS *Lepidella* (E.-J. Gilbert) Veselý *emend.* Corner & Bas SECTION *Lepidella*

1. Having very large pyramidal warts on the pileus at least when young often becoming areolate or more or less strongly imbricate.

2. Pileus surface with pale salmon or pale cinnamon tint, areolate; splitting of pileal warts descending into pileus context; universal veil including many chains of elongate inflated cells, not strongly differentiate from pileus context, and with anticlinal orientation in the upper part; often not obviously associated with an ectomycorrhizal plant; spores: (8.5-) 9.5 - 13.0 (-15.0) × (6.8-) 7.5 - 10.2 (-11.5) μm, with **Q** = 1.22 - 1.32 (-1.44); known from E Texas to southern California

Amanita subcaligata (A. H. Sm. & P. M. Rea) A. H. Sm. *ex* Tulloss
= *Amanita salmonea* Thiers.

2. Pileus whitish or whitish, often becoming strongly areolate or imbricate; if universal veil inflated cells elongate and in chains, then with periclinal orientation throughout scales on pileus.

3. Universal veil whitish at first becoming clay color to rusty brown, on pileus dominated by chains of fusiform to subfusiform cells with periclinal orientation; pileus with sterile margin; apparently not associated with an ectomycorrhizal host; spores: (8.0-) 10.0 - 14.1 (-19.2) × (5.2-) 6.4 - 10.0 (-12.2) μm, with **Q** = (1.30-) 1.33 - 1.75 (-1.85); known from SE Oregon southward to SE Arizona and eastward to Kansas.....

Amanita prairiicola Peck
= *Amanita malheurensis* Trueblood, O. K. Mill. & Dav. T. Jenkins.

3. Universal veil on pileus whitish at first, becoming sordid in separable warts, with upper portion sometimes becoming separable pyramidal warts (especially in rainy weather) and remainder falsely appearing to be pileus context or a “pileipellis in the form of a trichodermium”; spores: (6.5-) 8.0 - 12.6 (-15.5) × (4.5-) 5.8 - 8.0 (-9.5) μm, with **Q** = (1.39-) 1.41 - 1.66; known from California (possibly) to Baja California Norte with *Pinus muricata* and *Quercus agrifolia*

Amanita magniverrucata Ammirati & Thiers.

1. Lacking very large, pyramidal warts on the pileus.

4. Entire basidiocarp having yellow-green tint; spores: (9.1-) 9.8 - 13.3 (-16.1) × 4.5 - 7.0 (-8.4) μm, with **Q** = 2.01 - 2.21; reported from southern California in *Pinus* plantation

Amanita sp. *C3*
= *Amanita viriditincta* Tulloss & G. Wright *nom. prov.*

4. Basidiocarp entirely lacking yellow-green tint.

5. Basidiocarp staining wine to reddish to reddish brown in all parts; spores: “10.0 - 11.0 × 6.4 - 7.1 μm,” with **Q** = “1.56”; reported from southern California in *Abies-Pinus-Quercus* forest.....

Amanita giganteo-rubescens G. Wright *nom. prov.*
[Also see *Amanita* section *Validae*, below.]

5. Basidiocarp completely lacking reddish stains or lacking reddish stains except in bulb and stipe base.
6. Having radicating, pointed base to bulb, with bulb bearing brief membranous limbate volva; infrequently with wine-colored stains in bulb and stipe base; clamps lacking at bases of basidia. [*Amanita* stirps *Preissii* of Bas (1969). Smith's *Amanita* sp. *Morris* 22.x.1972 (reported from Oregon under *Quercus*) will probably key out here.]
7. Spores: (8.0-) 9.4 - 13.3 (-14.3) × (5.6-) 6.5 - 8.0 (-8.5) μm, with **Q** = 1.48 - 1.65; reported from Contra Costa, Riverside, and San Diego Cos., California with *Arctostaphylos* and *Quercus agrifolia*.....
Amanita sp. C5
 =*Amanita conicobulbosa* G. Wright nom. prov.
7. Spores [20/1/1] 8.5 - 10.2 (-10.5) × 4.5 - 5.5 μm, with **Q** = 1.85; reported from Santa Cruz Co., California with associated woody plants unknown.....
Amanita sp. C16
6. Lacking a membranous, limbate volva on bulb; entirely lacking wine-colored stains.
8. Lacking an obvious ectomycorrhizal associate; universal veil on pileus dominated by fusiform to subfusiform cells in chains often having periclinal orientation.
9. Vascular hyphae arising in lamella trama penetrate subhymenium and hymenium, terminating as pseudocystidia with refractive contents; universal veil usually absent from pileus, when present, as low floccose crusts or patches with pale salmon tint; spores: (8.8-) 10.2 - 15.0 (-17.0) × (6.0-) 6.6 - 8.9 (-11.3) μm, with **Q** = (1.39-) 1.56 - 1.79; known from Alberta and from SE Oregon and adjacent Idaho south to Colorado.....
Amanita armillariiformis Trueblood, O. K. Mill. & Dav. T. Jenkins.
9. Lacking such vascular hyphae and pseudocystidia.
10. Basidiocarp suggesting an “armillarioid” species of *Tricholoma*; pileus up to 150 mm wide; exanulate; spores: (6.8-) 8.0 - 11.2 (-14.0) × (5.8-) 6.5 - 9.0 (-11.2) μm, with **Q** = (1.17-) 1.19 - 1.31 (-1.35); known from Oregon to central California.....
Amanita pruittii A. H. Sm. ex Tulloss & J. Lindgr. nom. prov.
 [=David Arora's “anonymous amanita”, sp. C9].
10. Spores 10.0 - 14.1 μm long. [Possibly a single species.]
11. Spores: (8.8-) 10.2 - 13.2 (-14.5) × (6.8-) 7.5 - 9.2 (-10.8) μm, with **Q** = 1.39 - 1.40; reported from southern Arizona to southern California to Baja California, possibly also in Morelos edo., Mexico
Amanita sp. Vitt7.
11. Spores: (8.0-) 10.0 - 14.1 (-19.2) × (5.2-) 6.4 - 10.0 (-12.2) μm, with **Q** = (1.30-) 1.33 - 1.75 (-1.85); known from SE Oregon south to SE Arizona and east to Kansas.....
Amanita prairiicola
 =*Amanita malheurensis*.
8. Associated with an ectomycorrhizal plant; inflated cells of universal veil not elongate, not periclinally oriented.
12. 90% of spores 6 - 10 μm long; basidial clamps absent.
13. Pileus surface glabrous; spores: “6 - 8 × 4 - 4.5 μm,” with **Q** approx. 1.65; reported from Oregon
Amanita sp. Oswald 3.
13. Pileus bearing floccose to felted volval layer; 95% or more of spores with length < or = 7.0 μm.
14. Stipe with subcylindric rooting bulb; basidiocarp slender; spores: (6.6-) 7.1 - 9.0 × 5.0 - 6.2 μm; with **Q** = 1.42 - 1.45; reported only from southern California.....
Amanita californica Bas nom. prov.
14. Bulb on stipe not subcylindric or cylindric; basidiocarp stocky. [Probably a single species.]

15. Spores: (7.3-) 7.7 - 9.4 (-10.1) × 4.9 - 6.6 (-7.0) μm, with **Q** = 1.47; reported from California under *Quercus wislizenii*
Amanita sp. C1.
15. Spores: (6.1-) 7.0 - 10.0 (-12.5) × (4.0-) 4.2 - 6.6 (-7.8) μm, with **Q** = 1.52 - 1.83; known from Washington to California with *Quercus*, in *Thuja-Tsuga* forest, and (probably) other habitats.....
Amanita silvicola Bas.
13. 90% of spores 8.4 - 14.3 μm long; basidial clamps present.
16. Stipe “armillarioid” or with rooting bulb; 90% of spores 6.2 - 9.0 μm wide.
17. Vascular hyphae arising in lamella trama penetrate subhymenium and hymenium, terminating as pseudocystidia with refractive contents; universal veil usually absent from pileus, when present, as low floccose crusts or patches with pale salmon tint; stipe tapering downward, “armillarioid”; spores: (8.8-) 10.2 - 15.0 (-17.0) × (6.0-) 6.6 - 8.9 (-11.3) μm, with **Q** = (1.39-) 1.56 - 1.79; known from Alberta and SE Oregon and adjacent Idaho south to Colorado.....
Amanita armillariiformis.
17. Such vascular hyphae and pseudocystidia not reported; pileipellis reported to be a “trichodermium” (an otherwise unreported character state in *Amanita* suggesting that this entity may be closely related to *A. magniverrucata*); stipe with conspicuous rooting bulb; spores: “9.2 - 14.3 × 6.3 - 9.0 μm”, with **Q** approx. 1.55; reported from central California under *Pinus*.....
Amanita cokeri sensu Thiers.
 [See also *Amanita magniverrucata*.]
17. Stipe with deeply raditating or lumpy carrot-like or elongate-fusiform bulb; 90% of spores 4.9 - 7.8 μm wide.
18. Lamellae gray-green; phenol gives no reaction on stipe context; spores: (7.7-) 8.4 - 10.8 × 4.9 - 7.0 μm, with **Q** = 1.51 - 1.53; reported from southern California with *Quercus agrifolia*.....
Amanita sp. C6
 =*Amanita squarrosi-bulbosa* G. Wright *nom. prov.*
18. Lamellae not gray-green; paracresol (and, hence, phenol) gives positive reaction in stipe of *A. smithiana*.
- 19 Spores: (8.8-) 9.8 - 12.5 (-15.8) × (4.8-) 5.2 - 6.5 (-8.5) μm, with **Q** = 1.80 - 1.98; bulb obclavate to carrot-shaped to turnip-shaped, lacking a radical, rounded below; reported from central California with *Arctostaphylos*, *Castanopsis*, *Pinus*, and *Quercus*.....
Amanita baccata sensu Arora.
19. Spores: (6.5-) 8.7 - 12.0 (-16.0) × (4.3-) 5.8 - 7.8 (-10.8) μm, with **Q** = (1.29-) 1.43 - 1.71 (-1.98); known from British Columbia and Idaho south to southern California and New Mexico in forests with *Arctostaphylos*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga menziesii*, *Quercus*, and *Tsuga*.....
Amanita smithiana Bas.

SUBGENUS *Lepidella* SECTION *Amidella* (E.-J. Gilbert) Konrad & Maubl.

Only one species is known from the area of study—*Amanita fallax* Tulloss & G. Wright *nom. prov.*—which usually has been determined as *A. volvata* by southern California mycologists. It has spores (7.2-) 9.4 - 14.5 (-20.8) × (4.9-) 5.6 - 8.0 (-12.2) μm, with **Q** = (1.64-) 1.65 - 2.12 (-2.30). It is reported from Idaho to central Mexico and occurs with *Quercus*.

SUBGENUS *Lepidella* SECTION *Phalloideae* (Fr.) Quél.

1. Pileus entirely white to pale yellow at least in young specimens; universal veil as limbate volva.
 2. Most basidia bisterigmate; spores $\underline{22}$, with $\mathbf{Q} = \underline{??}$
Amanita bisporigera sensu A. H. Sm.
 2. Most basidia 4-sterigmate.
 3. Pileus up to 120 mm wide, white; stipe often shaggy; universal veil at stipe base limbate to saccate; globose to subglobose to infrequently broadly ellipsoid spores $\underline{22}$, with $\mathbf{Q} = \underline{??}$
Amanita virosa sensu Schalkwijk-Barendsen (1991).
 3. Spores broadly ellipsoid to ellipsoid.
 4. Pileus lacking yellow reaction to KOH; inflated cells in context and universal veil often with walls up to 1.3 μm thick; spores (7.5-) 7.8 - 10.8 (-12.0) \times 6.0 - 8.0 (-10.8) μm , with $\mathbf{Q} = 1.23 - 1.29$; possible throughout area of interest with *Castanea dentata*, *Pinus*, and *Quercus*.....
Amanita phalloides f. *alba*
[Probably not worthy of taxonomic status separate from the species.]
 4. Pileus with yellow reaction to KOH; inflated cells in context and universal veil with walls thin or up to 0.5 μm thick; spores (6.8-) 8.8 - 12.0 (-13.8) \times (5.9-) 6.3 - 8.5 (-10.8) μm , with $\mathbf{Q} = 1.27 - 1.47$ (-1.52); known from Washington to California with *Corylus*, *Pinus*, and *Quercus*.....
Amanita ocreata.
1. Universal veil as a limbate volva; pileus virgate with greenish tinges; spores (7.5-) 8.0 - 10.1 (-12.5) \times (5.5-) 6.1 - 8.0 (-9.0) μm , with $\mathbf{Q} = 1.20 - 1.33$ (-1.40); becoming extremely common in the Pacific coastal portion of the region of interest and possible throughout that region with *Castanea dentata*, *Pinus*, and *Quercus*.....
Amanita phalloides f. *phalloides*.

SUBGENUS *Lepidella* SECTION *Validae* (Fr.) Quél.

1. Pileus white at first, staining pinkish to wine colored to tan to reddish brown; universal veil concolorous. [Possibly a single species.]
 2. With $w_{cs} = 40 - 65 \mu\text{m}$; $w_{st\text{-near}} = 25 - 55 \mu\text{m}$; $w_{st\text{-far}} = 35 - 70 \mu\text{m}$; spores (6.2-) 8.2 - 10.8 (-14.8) \times (4.2-) 5.5 - 7.2 (-8.8) μm , with $\mathbf{Q} = (1.34\text{-}) 1.39 - 1.58$ (-1.72); known from British Columbia and Idaho to southern California with *Abies*, *Picea*, *Pinus*, *Pseudotsuga menziesii*, and *Quercus*.....
Amanita novinupta.
 2. With $w_{cs} = 60 - 85 \mu\text{m}$; $w_{st\text{-near}} = 70 - 120 \mu\text{m}$; $w_{st\text{-far}} = 95 - 135 \mu\text{m}$; spores (7.0-) 8.2 - 10.8 (-12.2) \times (5.2-) 5.6 - 6.6 (-8.4) μm , with $\mathbf{Q} = 1.43 - 1.61$; reported from southern California with *Abies*, *Pinus*, and *Quercus*.....
Amanita sp. C4.
1. Basidiocarp differently pigmented, occasionally staining pinkish or wine colored or reddish brown in and near stipe base of only one taxon.
 3. Universal veil and/or partial veil grayish; context unchanging.
 4. Pileus pallid with brownish disc; universal veil cinereous; context unchanging; spores “8 - 10 \times 5 - 5.5 μm ,” with \mathbf{Q} approx. 1.7; reported from Idaho in coniferous forest with *Pinus*.....
Amanita sp. A. H. Sm. 73569.
 4. Stipe with marginate bulb, gray annulus, and gray fibrils below annulus; pileus brownish with purplish tints; spores (7.5-) 8.0 - 9.8 (-11.2) \times (7.0-) 7.5 - 9.2 (-11.0) μm , with $\mathbf{Q} = 1.05 - 1.07$; distributed through northern

and Northern Hemisphere alpine forests around the world, in the area of interest especially with *Picea* and *Tsuga*, but also, rarely, in *Castanopsis-Pinus-Quercus* forest (Santa Cruz, California).....
Amanita porphyria.

3. Pileus yellow, orange, *Cinnamon Buff* to ochraceous, brown, yellow with umbrinous tints or wholly umbrinous; universal veil pallid to strongly yellow; context changing or not.

5. Context changing, often somewhat slowly.

6. Stipe with abrupt bulb, all parts of basidiocarp bruising/staining brownish; pileus citron to brown; spores (7.0-) 7.5 - 9.2 (-9.5) × (6.5-) 7.0 - 8.5 (-9.2) μm, with **Q** = 1.08.....
Amanita brunnescens var. *brunnescens*.
 [Not confirmed for region of study.]

6. Pileus yellow with olive to umbrinous tones or wholly umbrinous or umbrinous with yellow margin; stipe context sometimes staining pinkish or wine colored or reddish brown in and near base; universal veil yellow, but not bright yellow, becoming sordid with age; spores (9.1-) 9.5 - 12.4 (-14.0) × (6.4-) 6.6 -7.9 (-9.5) μm, with **Q** = 1.50[±]; reported from Washington and Idaho south to (at least) central California in mixed coastal forest.....
Amanita franchetii sensu Thiers non (Boud.) Fayod.

5. Context not changing.

7. Pileus near *Cinnamon Buff* on disc, paler and nearer ochraceous toward margin; context unchanging; universal veil *Avellaneous* tinged with yellow; spores “7 - 9 (-10) × 5 - 6 (-7) μm,” with **Q** approx. 1.45; reported from Idaho with *Tsuga*.....
Amanita sp. A. H. Sm. 73798.

7. Pileus pale yellow, pale greenish yellow, yellow-orange or yellowish with olive to umbrinous tones or wholly umbrinous; spores longer than “7 - 9 (-10).” See also, *A. franchetii sensu* Thiers, above.

8. Pileus yellow-orange; context unchanging; universal veil *Cream Color* to *Naples Yellow* to *Colonial Buff* to *Maize Yellow*; spores “7.8 - 11.1 × 3.5 - 5.0 μm” with **Q** approx. 2.24; reported from Mendocino Co., California, in mixed coastal forest.....
Amanita flavoconia sensu Thiers non G. F. Atk.

8. Pileus under 45 mm wide, pale yellow to pale greenish yellow; stipe smooth with submarginate bulb; spores (6.0-) 6.9 - 10.5 (-11.0) × (5.2-) 6.6 - 10.0 (-10.2) μm, with **Q** = 1.07 - 1.08; reported from Washington.....
Amanita sp. O'Dell 1785/1794.