

Key to Common California Puffballs

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Lowland Puffballs (see Page 4 for Montane species)

- A. Grassland puffballs B
- AA. Puffballs found along trails, cultivated fields, dry sandy areas, open woodlands, or on rotting wood L

- B. Small puffballs, up to 4-5 cm broad C
- BB. Medium to large puffballs > than 5 cm broad G

- C. Globose to subglobose puffballs, lacking a pseudostipe D
- CC. Pear-shaped to cylindrical; pseudostipe and subgleba well developed, separated by a membranous diaphragm; exoperidium cream-colored, a mix of fine spines and granules, becoming mustard colored; peridium opening broadly at the apex.
..... *Vascellum pratense*

- D. Young exoperidium glabrous or with minute, flattened warts (use hand lens) E
- DD. Young exoperidium covered with conspicuous, pointed white warts F

- E. Globose, small, typically attached with a white rhizomorphic cord when young; exoperidium at first white, with inconspicuous, low white to tan warts; endoperidium tan, to olive in age often retaining exoperidial remnants; subgleba absent.
..... *Bovista dermoxantha* (= *Lycoperdon pusillum*)

- EE. Subglobose, small, lacking a basal rhizomorphic cord; exoperidium glabrous white; endoperidium silvery-grey; subgleba absent; spores globose, with a long sterigmatal tail *Bovista plumbea*

- F. Fruiting bodies small, globose, often clustered; exoperidium a covering of sharp-pointed warts, joined at the tips; spores released via an apical pore; subgleba absent; true capillitium absent, replaced by paracapillitium; resembles *Lycoperdon marginatum* but smaller in size and clustered in habit
..... *Vascellum curtisii*

- G. Possessing a pseudostipe H
- GG. Lacking a pseudostipe I

- H. Pear-shaped to subglobose, rooted at the base; exoperidium smooth, becoming grey to brownish, often areolate, ie. finely cracked; subgleba well-developed; capillitium with tiny round pits, not slits; gleba purple at maturity; endoperidium falling away leaving a broad apical opening, and with age, a basal leathery cup.
..... *Calvatia cyathiformis*

- HH. Broadly peg-shaped to turbinate, usually with a stout pseudostipe; pseudo-diaphragm separates the base from the upper portion; exoperidium white, tomentose with small, low, flat warts; at maturity, apical portion of endoperidium falling away leaving a leathery basal cup; gleba brown, not purple at maturity; capillitium with slit-shaped pores. *Calvatia utriformis*
- I. Exoperidium glabrous, finely cracked in dry weather J
- II. Exoperidium matted-tomentose (felty), or with with large polygonal warts K
- J. Exoperidium smooth, finely areolate in dry weather, white, flushed greyish-tan in age; fruiting body subglobose, ovoid to cushion-shaped, not rooted; pseudostipe and subgleba absent; endoperidium up to 3 mm thick, brittle, gleba bright yellowish-green at maturity; endoperidium opening by cracks/splits; not forming a basal cup; spores smooth. *Calvatia pachyderma*
- K. Fruiting body cushion-shaped, occasionally lobed, largest of California puffballs; attached to the substrate by a root-like rhizomorph; exoperidium covered with large, pale tan, polygonal warts over a whitish background; pseudostipe and subgleba usually absent; capillitium lacking slit-shaped pores; gleba olivaceous-brown; spores nearly smooth. *Calvatia booniana*
- KK. Fruiting body globose to subglobose, grapefruit-sized; exoperidium matted-tomentose to floccose, near maturity forming patches on the endoperidium, then falling away; endoperidium relatively thick, tough, splitting irregularly in age; capillitium of discrete separate units, the main axes with short thorn-like side branches, resembling somewhat those of *Calbovista subsculpta*; gleba reddish-brown to brown; spores reticulate *Mycenastrum corium*
- L. Puffballs with pseudostipes M
- LL. Puffballs more or less globose, lacking a pseudostipe and or a subgleba T
- M. Small puffballs, usually < 5 cm broad or less N
- MM. Large puffballs > than 5-6 cm broad S
- N. Fruiting on rotting wood or lignin-rich soils; subglobose to pear-shaped; exoperidium variable in color: cream, pale-tan, grey to reddish-brown, covered with similar colored granules, occasionally with short spines; exoperidium persistent, slowly flaking away from the apex; subgleba and pseudostipe usually present; spores smooth; capillitium lacking pores; clustered to gregarious in habit.
. *Morganella pyriformis* (= *Lycoperdon pyriforme*)
- NN. Terrestrial in fruiting habit O
- O. Exoperidium white when young, with short, angular, pointed warts, frequently united at the tips; exoperidium shed from the endoperidium in large plates; subglobose to stocky pear-shaped; subgleba and pseudostipe usually present; spores smooth. *Lycoperdon marginatum*
- OO. Exoperidium not falling away in plates or sheets P

P. Exoperidium with conspicuous conical spines, usually 1 mm or longer sometimes recurved and joined at the tips Q
 PP. Exoperidium consisting of minute spines, warts, or a mixture of fine spines and granules. ... R

Q. Pear-shaped, sometimes clustered; exoperidium white to cream-colored when young, covered with conspicuous conical warts, these surrounded by smaller warts or spines; at maturity conical warts falling away leaving circular scars on the membranous endoperidium; pseudostipe and subgleba well developed; spores faintly warted *Lycoperdon perlatum*

QQ. Pear-shaped to subglobose; exoperidium darkly colored from a covering of relatively long, >1 mm, brown to black conical spines, these clustered, united at the tips; at maturity as in *Lycoperdon perlatum*, spines falling away, leaving circular scars on the endoperidium; pseudostipe and subgleba well developed; spores faintly warted; rare in S.F. Bay area, more common in Northern California and the Pacific Northwest. *Lycoperdon nigrescens* (= *L. foetidum*)

R. Pear-shaped; exoperidium dark-brown to blackish, from minute spines < 1 mm or tufted warts (use hand lens); endoperidium matt-yellow to bronze-yellow, visible between the spines or warts; scars not left on the endoperidium; pseudostipe and subgleba well developed; spores roughened, not truly warted as in *Lycoperdon molle*. *Lycoperdon umbrinum*

RR. Pear-shaped to subglobose; exoperidium cream-colored then brownish from mixed, sometimes clustered fine spines and granules, these covering the endoperidium (unlike *Lycoperdon umbrinum*); spines not leaving scars on endoperidium; subgleba and pseudostipe usually well developed; spores distinctly warted with sterigmatal remnants in mounts *Lycoperdon molle*

S. Fruiting body broadly peg-shaped to turbate with a stout pseudostipe, pseudo-diaphragm separating the pseudostipe from the upper portion; exoperidium white, tomentose, with small, low, flat warts; apical portion of peridium falling away leaving a leathery basal cup; gleba brown at maturity; capillitium with slit-shaped pores. *Calvatia utriformis*

T. Small puffballs, < 6 cm broad U
 TT. Medium to large puffballs > than 6 cm broad W

U. Subglobose, golf-ball to hens-egg in size, rooted with a white mycelial cord; exoperidium white, at first smooth, becoming finely tomentose, aging yellowish, finally brown, persistent to the endoperidium, the latter bronze-like to silvery-grey when exposed; subgleba and pseudostipe absent; fruiting body splitting to form a broad apical opening; capillitium of discrete units, tree-like, i.e. more or less dichotomously branched from a thickened base; spores globose, smooth. *Bovista pila*

UU. Depressed-globose in shape, partially hypogeous, rooted to the substrate when young; immature exoperidium encrusted with sand and debris, the buried portion dehiscing, left in the soil, the upper portion remaining attached to the endoperidium resulting in a top-heavy fruiting body which eventually breaks free from the substrate, rolls upside down exposing the former base where a

pore develops eventually releasing spores. *Disciseda species*

W. Large, subglobose to ovoid to cushion-shaped puffballs; exoperidium smooth, white, in age flushed grey-tan, becoming finely areolate; pseudostipe and subleba absent; endoperidium thick up to 3mm, brittle, gleba bright yellowish-green at maturity; endoperidium opening by splits/fractures; not forming a remnant basal cup. *Calvatia pachyderma*

Montane Puffballs

A. Montane puffballs fruiting in the spring B

AA Montane puffballs fruiting in the fall I

B. Small, globose to cushion-shaped puffballs, lacking a pseudostipe or subgleba C

BB. Medium to large puffballs >6 cm broad D

C. Peridium up to 3 mm thick E

CC. Peridium, thin, fragmenting in plates at maturity F

D. Medium to large puffballs lacking a pseudostipe and subgleba G

DD. Medium to large puffballs possessing a pseudostipe and or a subgleba
(section globose puffballs to check for subgleba) H

E. Subglobose to cushion-shaped; peridium thick; exoperidium white covered with small greyish to brownish-tipped, pointed low warts; pseudostipe and subgleba usually absent; capillitium with sinuous slits; spores slightly roughened
. *Calvatia subcretacea*

EE. Subglobose to flattened-globose; peridium thick; exoperidium greyish-tan over a white background, the surface finely areolate, occasionally more deeply cracked and warted in dry weather; pseudostipe and subgleba usually absent; capillitium with slit-like pores; spores distinctly warted to spinulose. *Calvatia fumosa*

F. Subglobose to cushion-shaped; peridium thin; exoperidium a mixture of fine, short spines and furfuraceous granules, becoming areolate with low warts in age; exoperidium and endoperidium remaining united at maturity at which time the peridium breaks up into large plates; gleba cottony persistent in age; subgleba and pseudostipe absent; capillitium with slit-like pits; spores warted to spinulose.
. *Calvatia lycoperdoides*

G. Fruiting body cushion-shaped, occasionally lobed, largest of California puffballs, up to 60 cm broad, attached to the substrate by a root-like rhizomorph; peridium thick, the exoperidium whitish with large, incised, pale tan, polygonal warts; pseudostipe and subgleba usually absent; capillitium lacking short side branches as in *Calborista subsculpta* *Calvatia booniana*

H. Subglobose with a well-developed basal root; peridium thick, the exoperidium surface felty, consisting of large, polygonal warts, the tips usually rounded to flattened; peridium cracking around the base of the warts; at maturity, apex of fruiting body forming a ragged opening; pseudostipe absent, but subgleba well developed; capillitium of individual units, the main axes with short antler-like side branches; spores nearly smooth *Calbovista subsculpta*

HH. Turbinate to pear-shaped, not rooted as in *Calbovista subsculpta*; exoperidium white with large pyramidal warts, the tips pointed and frequently recurved; peridium breaking at base of warts, fruiting body opening irregularly at apex; pseudostipe and subgleba usually well-developed; capillitium lacking short abundant short side branches as in *Calbovista subsculpta*; spores minutely spiny.
 *Calvatia sculpta*

I. Puffballs with a well developed pseudostipe and subgleba J
 II. Puffballs lacking a pseudostipe and subgleba M

J. Fruiting on decayed wood or lignin-rich soil K
 JJ. Terrestrial fruiting habit L

K. Subglobose to pear-shaped; exoperidium granulose, variable in color: cream, pale-tan, grey to reddish-brown, occasionally with short spines; exoperidium persistent, slowly flaking away from the apex; subgleba and pseudostipe usually present; spores smooth; capillitium lacking pores; clustered to gregarious on rotting wood or lignin-rich soil *Morganella pyriformis* (= *Lycoperdon pyriforme*)

L. Subglobose to pear-shaped; exoperidium cream-colored then brownish from a covering of mixed short spines, some of which are clustered and united at the tips, and granules; scars not left on endoperidium; subgleba and pseudostipe usually well developed; spores distinctly warted with sterigmatal remnants in mounts.
 *Lycoperdon molle*

LL. Pear-shaped, sometimes clustered; exoperidium white to cream-colored when young, covered with conspicuous conical warts, these surrounded by smaller warts or spines; at maturity conical warts fall away leaving circular scars on the membranous endoperidium; pseudostipe and subgleba well developed; spores faintly warted *Lycoperdon perlatum*

M. Subglobose, to cushion-shaped, peridium thin, the exoperidium and endoperidium remaining united; exoperidium a mixture of fine, short spines and furfuraceous granules, becoming areolate with low warts in age; at maturity peridium breaking up into large plates; gleba cottony persistent, even in age; subgleba and pseudostipe absent; capillitium with slit-like pits; spores warted to spinulose. *Calvatia lycoperdoides*

MM. Subglobose, small; exoperidium glabrous white; endoperidium silvery-grey; subgleba absent; spores globose, with a long sterigmatal tail
 *Bovista plumbea*