

GUIDE FOR AUTHORS

Contributing to the Second Edition of The Jepson Manual and to the Jepson Flora Project



THE JEPSON FLORA PROJECT

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Part I. General Information

Introduction: coverage; approach for users, contributors; resources; other, future products 

The Jepson Flora Project (JFP) is concerned with all aspects of continuing research on the flora of California. Among its projects and resources are the Jepson Online Interchange for California Floristics (<http://ucjeps.berkeley.edu/interchange.html>), The Index to California Plant Names (http://ucjeps.berkeley.edu/about_ICPN.html), A Flora of California Online (<http://ucjeps.berkeley.edu/jepson-project3.html>), Electronic Identification Keys to California Plants

(<http://ucjeps.berkeley.edu/keys/index.html>), the SMASCH database (http://www.mip.berkeley.edu/www_apps/smasch/). The Jepson Manual (1993), The Jepson Desert Manual (2002), and the second edition of The Jepson Manual (in prep.).

Like The Jepson Manual (TJM), the second edition of The Jepson Manual (TJM2) will be an illustrated guide to the identification of native and naturalized (see expanded definition in [Glossary](#)) vascular plants growing outside of cultivation in California. Any plant clearly demonstrating the potential to become naturalized outside of cultivation (e.g., commonly encountered garden escapes, waifs, or plants occurring spontaneously in crop fields, orchards, gardens, and urban settings) should be included in your treatment. Decisions about which of these to treat fully will be deferred until such time as we have a better idea about the ultimate size of the book. Any plants for which treatments are submitted under this guideline that are excluded because of space limitations will be included in the keys in TJM2, but otherwise will be fully treated only in the online accounts, as discussed at the end of this Introduction.

TJM2 will include in a single volume treatments of approximately 185 families, 1250 genera, and 7800 taxa at the level of species and below (terminal taxa), prepared by more than 150 specialists in several countries. In addition, it will accommodate the backgrounds and satisfy the needs of a broad spectrum of users, including students, environmental consultants, naturalists, and amateur as well as professional botanists. It will incorporate profound and extensive changes in taxonomy and nomenclature that have occurred since the publication of TJM in 1993, most of which have resulted either from refinements in taxonomic philosophy, or from dramatic increases in the quality and quantity of the information we have about the plant resources of the state. TJM2 will include revised names for taxa already known to occur in California (e.g., taxa treated in different genera since TJM), taxa previously known to science but not known from California (e.g., alien taxa whose naturalization in the state has been established since TJM), and taxa completely new to science since TJM. [Note: As discussed below, TJM2 will not include new names or combinations that have not been validly published elsewhere].

The diversity of users and severity of space constraints conspire to pose special difficulties, with the result that TJM2, like TJM before it, will differ in significant ways from other regional floras. Strict adherence to this guide will enable Authors to produce treatments in line with our goals and at the same time render manageable our task of unifying the contributions of a diverse group of Authors.

This guide has benefitted from trial and error as well as advice from experienced Contributors to, as well as users of, TJM. Even so, we continue to solicit comments and suggestions from Authors and are committed to finding mutually acceptable solutions to differences that may arise.

Our experience has indicated that there are many uncertainties in finalizing individual treatments and in preparing them for publication. In addition, in order to render manageable the task of producing a book with such a massive amount of information, it is necessary for us to distribute our efforts more or less evenly over time. Thus, in order to meet our commitment to publish TJM2 in 2008, we must operate under the rule that our agreement to use a contribution is automatically non-binding after the deadline for that treatment has passed.

Within the Jepson Flora Project, other resources of the Jepson Online Interchange for California Floristics, or Jepson Interchange, (<http://ucjeps.berkeley.edu/interchange.html>) will continue to be developed and maintained in connection with work on TJM2. The Index to California Plant Names (ICPN), distribution maps, and species lists will be updated to reflect advances made in the preparation of treatments for TJM2.

Production of a full-fledged, electronic flora of California is another, long-term goal of the Jepson Flora Project. Such a resource will not need to be constrained as to content, so that it will be possible to display more complete and extensive floristic information than can be included in print, and especially in a field manual. Descriptions of morphology as well as of the habitats in which the plants occur, lists of alternate names (synonyms) under which the plants have been known, citations of specimens belonging to each taxon, illustrations, and photographs are some of the elements that will be much more extensive in the online flora. Contributed treatments will be "marked-up" by Jepson Flora Project Staff so that users will be able to generate lists of taxa satisfying a wide range of criteria (e.g., all plants with yellow flowers growing in

vernal pools in GV), and to key out specimens using electronic, multiple-entry identification keys (see MEKA, below), with a few key strokes and clicks of a mouse. These and other plans for the management and presentation online of information about the flora of California were discussed in greater detail by Rosatti and Duncan (Floristic Information for California Tracheophytes (FISCT), *Madroño* 42:189–196. 1995).

Authors preparing treatments for TJM2 are encouraged to submit longer, more thorough and detailed treatments of their groups (as described above) for the online flora, following the same formats and conventions, as appropriate, presented here for TJM2. Those wishing to prepare electronic identification (MEKA) keys, or to evaluate such keys already available (<http://ucjeps.berkeley.edu/keys/index.html>), should contact Tom Rosatti.

While we encourage the more detailed treatments for the online flora, electronic identification keys, complete synonymies, and other contributions to our floristic efforts, top priority is to be given to preparation of your treatment for TJM2. This is the only product currently with a deadline for completion, and the only one for which funds are being specifically raised.

Categories of Involvement and Corresponding Responsibilities

Jepson Flora Project Editors

Appointed by the Jepson Herbarium Board of Trustees, the Jepson Flora Project Editors are charged with: setting editorial policy (including taxonomic philosophy); selecting Contributors, Consultants, Family Editors, and External Reviewers; and serving in other editorial capacities.

Jepson Flora Project Staff

The Convening Editor, Database Manager, Managing Editor, Project Manager, Project Research Specialist, and Scientific Editor will, to various extents, be involved in all aspects of scientific and technical editing, manuscript processing, and illustration management, except in families for which there is a Family Editor. In general, correspondence regarding scientific content will occur between the Contributor and Scientific Editor, while that regarding technical editing, the processing of manuscripts, and the development of illustrations will take place between the Contributor and Managing Editor.

Family Editors

Family Editors have been appointed, after unanimous agreement by the Jepson Flora Project Editors, to be in charge of all aspects of scientific and technical editing, manuscript processing, and illustration management for several large, taxonomically difficult families. Correspondence regarding these matters will take place between the Contributor and the Family Editor, in conjunction with illustrators when appropriate.

Contributors (Authors)

Potential Contributors are invited to participate after they have been identified as having expertise in the taxonomic group in question, and accepted by the Jepson Flora Project Editors.

Consultants

Individuals possessing expertise in a particular taxonomic group, but who will not serve as Contributors, are selected by the Jepson Flora Project Editors because of their willingness to make themselves available to Contributors in areas and to extents determined by the Consultants. Areas in which Consultants may assist Contributors include but are not limited to: study of plants in the field or herbarium; acquisition or examination of literature not readily accessible to the Contributor;

help in resolving taxonomic or nomenclatural problems; and review and editing of draft treatments.

External Reviewers

Based on availability and willingness to participate, External Reviewers will be selected by the JFP Editors for treatments that have undergone substantial revision since TJM, or as deemed necessary for other reasons.

Scientific Advisory Board

Appointed by the Jepson Flora Project Editors, this group acts as a sounding board for philosophical matters pertaining to the project, and passes along to the Jepson Flora Project Editors concerns expressed to them by the community of people using floristic information.

Overview of Procedures: those involved in preparing, submitting, and finalizing treatments

It is essential to refer to this guide in preparing your accounts. We suggest that you quickly read through it before beginning so that you will know where to find an answer when a question comes up during the course of your work. If questions arise that are not resolved by the Contributors' Guide, please contact us for clarification.

In reading this guide bear in mind that it is addressed both to those highly experienced in the preparation of floristic treatments and to those for whom this is the first such involvement; we provide suggestions for all Authors as to how to conform most efficiently to our design and offer guidance for those who are unsure as to how to proceed.

Confer with us throughout your work, especially regarding taxa that you have not seen in the field and at junctures where you are uncertain of the next step. Make use of our familiarity with the California flora and our access to individuals who work extensively in the field. Also feel free to contact us with questions about finding or interpreting information in this Guide. Do not be afraid to let us see imperfect material; we understand how treatments evolve, having been through many drafts of our own work.

In considering the following, make special note of those elements requiring early attention.

1. Read this guide, including the Glossary, before beginning, so that you will know where to find answers to questions that will come up during the course of your work. Reading the guide once through will also help you develop a sense for the kind of treatment to be prepared, limits on what can be included, acceptable terms, taxonomic concepts, etc. Many Authors have commented that it is extremely helpful to refer to treatments already published in TJM (available online) while writing keys, descriptions, and associated material.
2. Become familiar with existing literature and other resources to complement your own knowledge about the group, to help identify areas of difficulty, and especially to become acquainted with potentially conflicting taxonomic views. Consult original descriptions, journal articles, monographs, and the various floras pertinent to western North America. Make use of the vast amount of information now available online, especially through the Jepson Online Interchange for California Floristics. In connection with the latter, consider everything included for your group in the [Index to California Plant Names \(ICPN\)](#), which includes new or potentially new names for your plants — resulting from either taxonomic or purely nomenclatural changes — as well as names of taxa that have been or possibly will be added to the flora of California. Only names that have been validly published will be used for recognized taxa in TJM2, so if your group requires the publication of new names or new combinations, the processes involved will have to be set into motion soon. For some taxa, it may be necessary to study type specimens.

We will provide contact information for people who have expertise in your groups and who have agreed on that basis to act as Consultants. We encourage you to communicate with anybody who has knowledge of the plants covered by your treatments, and to let us know so that they can be properly acknowledged.

3. Collect important or interesting facts that will not be used in identification, such as those having to do with chemistry, cytology, medicinal uses, and positive or negative economic significance.
4. Study herbarium material immediately available to you first, in order to develop a sound plan for visiting herbaria and borrowing specimens. If you do not study a representative sampling of herbarium material, preparation of a treatment that is better than existing ones will be less likely. (See also "[Loan Requests](#)")
5. Write a preliminary draft of your treatment as early as possible, in order to identify problems and allow time for their resolution. Difficulties thought to be minor or nonexistent often prove to be otherwise once an attempt is made to put thoughts into words. Especially if you have not prepared a treatment for us before, it might be helpful to submit a draft of all or of part of the treatment to us for comments.
6. Investigate nomenclature when differences between the Index to California Plant Names (ICPN) and recent floristic accounts are not specifically addressed in ICPN (these should be rare), or when an issue is addressed but left unresolved in ICPN. In the past few years, extensive and detailed information has accumulated in ICPN that has resolved many questions about correct usage of plant names and citations of authors of plant names. Access to protologues (i.e., original descriptions of taxa) and type specimens is often difficult to obtain, so determine your needs early if your problem is either not addressed or not resolved in ICPN. Please inform us of any developments not addressed in ICPN, so we can keep this resource as current as possible.

Lists of synonyms cannot be exhaustive, but should include names that have become synonyms since TJM (see "[Synonyms, Misapplied Names, Illegitimate Names, Excluded Taxa](#)"). Names that have not been validly published will not be used for recognized taxa in TJM2.

7. Check existing illustrations in TJM and The Jepson Desert Manual (TJDM) for accuracy as well as usefulness, and convey to us any concerns resulting from this effort.
8. Prepare and submit your final draft of your treatment, along with a covering letter in which areas requiring additional research and departures from conventional or previous taxonomy are summarized and justified. See [Taxonomy and Nomenclature](#) and "[Computer and Network Issues](#)".
9. Respond promptly to communications from us, especially evaluations or reviews of your treatments.
10. As time permits, verify the identifications of plants in your groups as represented on the CalPhotos website (<http://elib.cs.berkeley.edu/photos/>) and contribute your own photographs to this resource.

Taxonomy and Nomenclature

Taxonomic Philosophy

Some of the changes that have been or will be proposed or confirmed since TJM result from changes in taxonomic philosophy, either on the part of individual specialists regarding their particular group or groups, or on the part of the Editors of the Jepson Flora Project regarding plant systematics and the flora of California as a whole. Some refinements in taxonomic philosophy have been adopted in light of the importance of floristic information to the management of lands and biological diversity in California, as such information is gathered and managed at UC/JEPS. One of these refinements has to do with ever-changing ideas about the relationship between evolution and classification in plants. Opinions do and probably always will vary on this subject, but an attempt is being made within the Jepson Flora Project to recognize only groups in which all members have evolved from a single, common ancestor (i.e., to recognize only monophyletic groups), insofar as is practical and to the extent that data bearing on this matter are available. Such a philosophy is in keeping with modern systematic practice as well as with the needs of biologists for classifications that reflect evolutionary relationships. Also, society in general needs classifications that are predictive; that is, that allow us to predict or suspect characteristics (e.g., medicinal uses) of a plant by understanding its evolutionary relationships. This criterion for recognition of taxonomic groups is not new, and it was certainly applied to some extent in TJM. What is new is the extent to which it now is being applied in the classifications we employ.

Taxonomic Concepts

Taxonomic concepts of equal scientific validity may differ with respect to rank (e.g., whether to recognize a particular group as a species, subspecies, or variety) or circumscription (e.g., whether to recognize one widely delimited species or to treat the same set of plants within multiple, more narrowly delimited species). Taxonomic concepts of equal validity may even differ regarding the position of a plant group (e.g., which genus a particular species belongs in), insofar as circumscriptions of higher-level taxa may differ. Such legitimate differences in taxonomic practice should not be misconstrued as a lack of rigor in systematics and do not take away from the fundamental reality of plant groups as evolutionary entities. A common feature of all taxonomic concepts recognized by The Jepson Flora Project and the modern systematic community in general is that the taxa being recognized should represent natural, evolutionary lineages. Also, because TJM2 will be used (like TJM) as a definitive resource for assessing plant diversity in California (e.g., for conservation planning by state and federal agencies), we seek to capture within it all biologically meaningful, minimal-rank taxa (e.g., species, subspecies, and varieties) recognized to occur in the California flora.

Our primary goal is to produce a guide for identification of plants by a wide spectrum of users, many of whom will be professional botanists, but most of whom will not be. Therefore, insofar as possible, keys and descriptions should emphasize features that are readily determined, and most frequently present. In contrast to TJM, morphologically indistinct or not very distinct taxa that differ most significantly in aspects of molecular biology, chemistry, cytology, physiology, or ecology, will be recognized and fully treated if such taxa represent evolutionary lineages that are well resolved and biologically distinct.

The following guidelines are intended to help minimize conceptual inconsistencies in taxonomy both within and between treatments. We do not intend to be dogmatic in these matters; we respect the judgment of Contributors because it is based on high levels of expertise in the groups involved.

Morphologically identical or indistinct (cryptic) taxa at the level of species and below that are well supported on the bases of multiple lines of non-morphological evidence may be recognized and fully treated, except that not all will be completely resolved in the keys. Please note that the Editors expect the Contributors to exercise considerable caution in formally recognizing cryptic taxa, and to reserve such status for evolutionary lineages that are biologically meaningful. Contributors should present in a covering letter to the Editors convincing evidence in support of any and all cryptic taxa to be recognized in the treatment(s) submitted. Taxa that do not differ in any readily determined morphological characteristics but that do differ consistently in geography and/or ecology may be separated (on the basis of such differences) in the keys, but those that differ only in molecular, chemical, cytological, physiological, or other non-morphological data will not. For such taxa, the key will lead to an indication that the unknown belongs to one of a list of taxa, the members of which may or may not constitute an evolutionary lineage, and the user will be directed from there to treatments of those taxa for further explanation.

Taxonomic Ranks (see also "Descriptions and Associated Matter")

Families

We will follow in general the system of Judd et al. (*Plant Systematics: A Phylogenetic Approach*) for family circumscription. Among the gymnosperms, we will recognize the Cupressaceae (to include Taxodiaceae), Ephedraceae, Pinaceae, and Taxaceae. Changes in taxonomic philosophy (discussed above) as well as the accumulation of massive amounts of new systematic information have led to substantial re-circumscription of a number of families; as new systematic data become available during the course of this project, we may (if practicable) adjust family delimitations as appropriate.

Genera

Current, generally accepted monographs or other treatments should be followed unless compelling arguments against them are presented (e.g., those based on results of recent phylogenetic studies). An increased emphasis on monophyly (see "Taxonomic Philosophy") has resulted in the segregation of many genera since TJM.

Species

In general, specific rank should be reserved for taxa that are readily characterized as well as distinct morphologically. Exceptions include well-characterized cryptic groups that have diverged substantially in non-morphological characteristics of biological significance or have converged on similar morphology from disparate ancestry. There should be little or no intergradation between species, and the discontinuities should be the kind that may be readily conveyed in writing.

Intraspecific Taxa

Members of complexes that differ in fewer and/or less substantial morphological characters than the species recognized in a particular genus or that partially intergrade morphologically may be best recognized at an infraspecific rank. Those intergrading completely, that is, those between which there are no morphological discontinuities, also will be included in keys and fully described otherwise, provided there is substantial non-morphological evidence to justify it.

In general, within a given genus we would prefer to recognize either subspecies or varieties but not both. The rank decided upon should be that which requires the smallest number of nomenclatural changes (e.g., retention of the greatest number of epithets; formation of the smallest number of new combinations). In TJM, such considerations led to use of subspecies in *Linanthus*, but varieties in *Trifolium*.

In cases where taxa at two ranks below the level of species are recognized within a species, subspecies and variety are to be used, with variety subordinate to subspecies (as indicated by Art. 4.2, St. Louis Code). In such cases, relationships (infraspecific classifications) are to be indicated by placement of varieties, indented, under the appropriate subspecies, which in turn is (or are) indented under the species. Quadriminials will not be used in such cases, even though they and even longer representations are permitted by the International Code of Nomenclature (ICBN), primarily because they do not qualify as names under the ICBN.

In cases where an Author does not wish to group varieties under subspecies within a species, and recognizing only subspecies or varieties within a species would require publication of new combinations, both subspecies and varieties may be used, but are to be listed alphabetically by epithet, all indented to the same degree, under the species.

Hybrids

Hybrid taxa, as defined for TJM2, are true-breeding, stable lineages of verified hybrid origin in which spontaneous hybrids continue to be produced by their parent taxa. By "true-breeding" and "stable" we mean populations that reproduce either sexually or asexually and that are phenotypically stable for diagnostic or distinctive characteristics, whether morphological or otherwise. We include the criterion that the parent taxa are still engaged in hybridizing with each other so as to exclude from this category the many taxa for which suggestions have been made that they descended from hybrid origins in their distant evolutionary past, but without conclusive evidence; we are not implying that these spontaneous hybrids are part of the hybrid taxon. Hybrid taxa should be recognized and treated fully, as any other taxa (i.e., they should be included in keys and provided with complete descriptions and associated matter; see "Hybrids" under "Descriptions and Associated Matter" for guidelines having to do with names of hybrids). Spontaneous, unstable hybrids that are not true breeding are not to be treated as taxa, but, at the discretion of the Author, may be included in keys and discussed briefly; they should at least be listed under each of the parents.

Minor Variants

Variants for which there is little justification for taxonomic recognition or about which an Author wishes to remain noncommittal may be included after the brackets containing synonyms and misapplied names (see below), along with a very brief diagnosis, geographic range (if different from species), and reference to the presence on federal or state lists of taxa of restricted or troublesome occurrence by use of one of two symbols (if appropriate; see "[Taxa of Notable Occurrence](#)"). This account may be noncommittal in form (e.g., "Smaller, denser plants from higher elevations with the name *Planta pumila* may represent a distinct evolutionary lineage and merit further study."). The wording used in TJM (e.g., "Smaller, denser plants from higher elevations have been called *Planta pumila*.") is to be avoided because of the common, incorrect practice of treating such names as synonyms.

The number of minor variants treated in TJM2 may be considerably less than the number treated in TJM, primarily because of changes in taxonomic concepts (e.g., the recognition and inclusion of cryptic taxa in TJM2) and the fact that research conducted since TJM has resolved many of these issues, elevating some minor variants to full taxonomic treatment (as varieties, subspecies, or species) while reducing others to synonymy. Authors are encouraged to keep the number of minor variants in TJM2 to a minimum, by reserving the category only for cases in which the research necessary for resolution will not have been completed in time for inclusion in TJM2.

We encourage Authors to address further infraspecific variation, remaining problems in taxonomy and identification, and other important or interesting facts briefly after the account of minor variants. Bringing such matters to the attention of scientists and other interested users will lead to enhanced understanding of the flora of California, a primary objective of TJM2.

Synonyms, Misapplied Names, Illegitimate Names, Excluded Taxa

Synonyms

Legitimate names considered for taxonomic or nomenclatural reasons to be synonymous should also be included, with correct author citations, between square brackets after the statement of occurrence; basionyms, if included, are to be given first, and diagnostic features are not to be given at all. If synonyms have been used exclusively for a taxon with an overlapping but not identical circumscription, then the qualifier "in part" should be used following the synonym. For TJM2, lists of synonyms cannot be exhaustive, but should include names used (but not synonyms given) in TJM and other monographs and floras treating plants in California and adjacent parts of western North America that have appeared since TJM (e.g., *Flora of North America North of Mexico*).

In addition to the foregoing, it is especially critical that all names used for taxa recognized in the Inventory of Rare and Endangered Vascular Plants of California, as maintained by the California Native Plant Society (CNPS) at <http://www.cal.net/~levinel/cgi-bin/cnps/sensinv.cgi>, as well as such names in the The California Natural Diversity Database (CNDDDB), available at <http://www.dfg.ca.gov/whdab/html/cnddb.html>, be accounted for in some way in your treatment. Each and every name used (but not synonym given) for recognized taxa in these CNPS and CNDDDB resources must appear in your treatment, either as a name for a recognized taxon, or as a synonym of such a name. In a cover letter accompanying your treatment, any and all differences between your taxonomy and those employed in these resources are to be explained.

Synonymy for the online flora can and should be exhaustive. Highest priority is to be given to the names used (not the synonyms given) in Munz, *A Flora of Southern California* (1974), since they were not consistently and thoroughly addressed in TJM. In addition to the Index to California Plant Names, we have posted Fred Hrusa's "Crosswalk" on the Jepson website (ucjeps.berkeley.edu/xw.html), as an aid to developing synonymies.

Misapplied Names

Included between square brackets following the list of synonyms should be legitimate names (with correct author citations) that have been mistakenly applied to our taxa in works such as those listed above. The word "not" preceding each of these names will distinguish them from taxonomic and nomenclatural synonyms.

Illegitimate Names

Included between square brackets following the list of misapplied names should be illegitimate names (with author citations) that have been applied to our taxa in works such as those listed above. The nature of their illegitimacy may be indicated with such designations as "nom. superfl.", "orthogr. var.", "nom. illegit., not oldest epithet", etc., or the general abbreviation, "nom. illegit.", may be used.

Excluded Taxa

Names used in TJM that represent taxa that have been shown since TJM not to occur — or, for alien taxa, not to be naturalized — in California should be listed under Excluded Taxa at the end of your treatment.

Language **Abbreviations** 

The abbreviations below were selected because they save considerable space, are relatively unambiguous, and are easily remembered. They will be used throughout TJM2, with the exception of introductory material and identification keys. Words not appearing below will not be abbreviated. Abbreviations that will appear in both lowercase and capital letters are indicated. Periods are used only where their absence could cause confusion. Entries referring to parts of California are marked with asterisks and discussed more fully under Geography. United States Postal Service codes are used for state abbreviations.

Afr = Africa
Am = Americas (w hemisphere)
ann = annual

b = born
Baja CA = Baja California
B.C. = British Columbia
bien = biennial

c = central
CA-FP = California Floristic Province*
C.Am = Central America
Can = Canada
CaR = Cascade Range*
CaRF = Cascade Range Foothills*
CaRH = High Cascade Range*
CCo = Central Coast*
ChI = Channel Islands*
cm = centimeter
Co. = County
cos. = counties

cult = cultivated

CW = Central Western California*

D = Desert Province* (not abbreviated as a general term)

diam = diameter

dm = decimeter

DMoj = Mojave Desert*

DMtns = Desert Mountains*

DSon = Sonoran (Colorado) Desert*

e = east(ern)

e-c = east-central

esp = especially

Eur = Europe

exc = except, excluding

fl, fls (FL, FLS) = flower(s), floral, flowering

fld = flowered

fr (FR) = fruit

GB = Great Basin Province*

gen = generally, mostly, usually

geog = geographic(al, ally)

GV = Great Central Valley*

incl = including, included (in)

infl, infls (INFL, INFLS) = inflorescence(s)

KR = Klamath Ranges*

lf (LF) = leaf

lfless = leafless

lflet = leaflet

lvs (LVS) = leaves

m = meter

MP = Modoc Plateau*

Medit = Mediterranean

Mex = Mexico

mm = millimeter

(M)mtn(s) = (M)mountain(s)

n = north(ern)

n-c = north-central

N.Am = North America

NCo = North Coast*

NCoR = North Coast Ranges*

NCoRH = High North Coast Ranges*

NCoRI = Inner North Coast Ranges*

NCoRO = Outer North Coast Ranges*

ne = northeast(ern)

NW = Northwestern California*
nw = northwest(ern)

orn = ornamental

per (not PER) = perennial herb (abbreviation only refers to perennial herb, not to the word "perennial" alone)
pl(s) (PL) = plant(s)
PR = Peninsular Ranges*

s = south(ern)
s-c = south-central
S.Am = South America
SCo = South Coast*
SCoR = South Coast Ranges*
SCoRI = Inner South Coast Ranges*
SCoRO = Outer South Coast Ranges*
ScV = Sacramento Valley*
se = southeast(ern)
sect(s). = section(s) (abbreviated only as taxonomic rank)
SN = Sierra Nevada*
SNE = East of Sierra Nevada*
SNF = Sierra Nevada Foothills*
SNH = High Sierra Nevada*
SnBr = San Bernardino Mountains*
SnFrB = San Francisco Bay Area*
SnGb = San Gabriel Mountains*
SnJt = San Jacinto Mountains*
SnJV = San Joaquin Valley*
sp. = species (singular)
spp. = species (plural)
st(s) (ST(S)) = stem(s)
subg. = subgenus, subgenera
subsect(s). = subsection(s)
subsp. = subspecies (singular)
subsp. = subspecies (plural)
SW = Southwestern California*
sw = southwest(ern)

Teh = Tehachapi Mountain Area*
temp = temperate
TR = Transverse Ranges*
trop = tropical

US = United States

var. = variety
vars. = varieties
vs = versus

w = west(ern)
w-c = west-central

W&I = White and Inyo Mountains*
 WTR = Western Transverse Ranges*
 Wrn = Warner Mountains*

Symbols

The following symbols should be used whenever possible. Note that some or all might have broader meanings than those to which you are accustomed. Most are quantitative, referring to number, height, length, width, etc., while "±" may be qualitative as well, referring to color, fusion, symmetry, etc.

Note that "<<", "<", "=", ">", and ">>" do not include the concepts of "greatly exceeded by", "exceeded by", "held at the same level as", "exceeding", and "greatly exceeding", respectively, as defined in TJM. In TJM2, those concepts will be expressed in words. The symbols "<<", "<", "=", ">", and ">>" will be restricted in meaning to "much less than", "less than", "equal to", "greater than" and "much greater than", respectively, in number, size, length, or height. Use of these symbols to include the ideas of "exceeding" or "exceeded by" hopelessly confuses the concepts of absolute length and what it means for one structure to exceed another or not.

In TJM "<" and ">" also included the concepts of "less than or equal to" and "greater than or equal to", respectively. In TJM2, "<=" and ">=" instead will be used, respectively, for these ideas.

<<	much less than
<	less than
<=	less than or equal to
=	equal to
>=	greater than or equal to
>	greater than
>>	much greater than
0	none, absent
±	more or less, approximately, nearly, rather, slightly, somewhat; e.g., ± sessile may include sessile
°	degree of angle, compoundedness, or branching
×	multiplication sign, meaning "times" or indicating hybridity. The html code word "×", but not a lower- or upper-case x, may be substituted
–	hyphen, for: compound adjectives (e.g., 5-lobed, saucer-shaped, needle-like, red-brown, glandular-hairy, ovate-elliptic); in common names that are inconsistent with current taxonomy (e.g., Douglas-fir because <i>Pseudotsuga</i> is not currently included in <i>Abies</i> , fir), or in common names that are used as adjectives (e.g., lodgepole-pine forest, but not forest of lodgepole pine); to indicate (as a double hyphen or en-dash) quantitative ranges (e.g., "lvs 5–8 mm"); and to indicate intermediacy in condition (e.g., "lvs ovate-elliptic" means the leaves are intermediate between ovate and elliptic). Qualitative (non-quantitative) ranges are expressed with the word "to": "lvs ovate to elliptic" means the leaves range in shape from ovate to elliptic, possibly including ovate-elliptic.
[]	square brackets enclose information in descriptions pertaining only to members of a taxon (but not necessarily to all members of that taxon) occurring outside of California

Glossary

As in TJM, we have limited the number of technical terms to facilitate use of TJM2 by people who have not had formal training in botany. We have retained traditional, familiar botanical terminology primarily for concepts that are necessary in plant identification and that cannot be transmitted precisely in one or, rarely, two more commonly understood words (as compared with "one or a few more commonly understood words" in TJM). On the basis of this criterion, as well as other

considerations, a limited but substantial number of terms have been added to the glossary as used in TJM. Communicate with us if you are unsure how to proceed after consulting the glossary below and the list of "[Some Rejected Terms and Examples of Acceptable Alternatives](#)" following.

Many of the terms listed below may be used in forms other than those given (e.g., bristle, bristly; petiole, petioled). Plurals are given in parentheses following the singular when they are relevant and their formation is unusual. Illustrations will be provided (in TJM2, but not in this guide) for some terms. Note that some definitions may be narrower or broader than those to which you are accustomed.

We recommend that you read the glossary to ensure that terms are used consistently with TJM2 definitions. Comparisons of definitions in various floristic works have revealed significant differences even in cases when none was suspected.

abaxial

The side or surface of a structure away from the axis on which the structure is borne (e.g., the lower surface of a leaf, the outer surface of a petal). (see *adaxial*)

abundant

Very likely present in appropriate habitats, sometimes forming dense stands. ([see common](#) , [rare](#) , [uncommon](#))

achene

Dry, indehiscent, 1-seeded fruit from a 1-chambered ovary, sometimes winged, often appearing to be a naked seed.

acid (acidic)

Soil or water with a low pH, often found in habitats such as coniferous forests and bogs where decomposition of plant remains liberates an excess of hydrogen ions.

acroscopic

In ferns, facing or directed toward the tip of the frond (e.g., on any pinna, acroscopic pinnules are those on the side closest to the frond tip). ([see basiscopic](#), [distal](#))

acuminate

Having a long-tapered, sharp tip, the sides concave. (see *acute*, [awl-like](#))

acute

Having a short-tapered, sharp tip, the sides convex or straight and converging at less than a right angle. (see *acuminate*, [obtuse](#))

adaxial

The side or surface of a structure toward the axis on which the structure is borne (e.g., the upper surface of a leaf, the inner surface of a petal). (see [abaxial](#))

adherent

Sticking to and sometimes appearing fused to another part of like or unlike kind, but separable from it, such as "perianth adherent to fruit". (see [appressed](#), [fused](#))

adventitious

Arising at unusual times or places, such as roots on aerial stems.

aggressive

Growing or spreading rapidly or invasively, outcompeting other plants, difficult to control

alien

Not native; introduced purposely or accidentally into an area. (see [native](#), [naturalized](#), [ruderal](#), [waif](#))

alkali, alkaline

Soil or water with a high pH (i.e., basic), often found in areas where evaporation concentrates dissolved solutes.

alkali sink

Basin area in region of interior drainage characterized by soils with high salinity and high pH.

alluvial

Pertaining to sediments deposited by flowing water.

alluvial fan

Fan-shaped deposit of rocks, gravel, and finer sediments, in California generally on lower slopes of mountains.

alpine

Pertaining to the vegetational/altitudinal zone above timberline; zone above the subalpine.

alternate

1. Arranged singly, often spirally, along an axis — e.g., one leaf per node. (see opposite, whorled) 2. Occurring in different ranks, appearing to be between, not directly above or below, as "stamens alternate petals". (see rank)

angiosperm

Plant that bears flowers (hence, "flowering plant"), in which "vesselled seeds" (hence, angio-sperm) are enclosed in an ovary; woody to herbaceous.

annual

Completing life cycle (germination through death) in one year or growing season, generally non-woody. (see biennial, herb, perennial)

annulus (annuli)

On the sporangium of most ferns, a row of cells with partly thickened walls that functions in the release of spores.

anther

Pollen-bearing portion of a stamen, including one, two, or four pollen sacs. (see filament)

appressed

Parallel or nearly parallel to and often in contact with surface of origin; used to describe the disposition of hairs, leaves, pedicels, etc. (see adherent, fused)

aquatic

Growing under, in, or on water (generally fresh; if brackish, saline, or marine, so indicated), whether rooted in bottom or floating, and including plants with parts of shoots submersed but with other parts above water; excluding plants of seeps or wet rocks. (see emersed, submersed) (e.g., *Potamogeton gramineus*)

areole

1. In Cactaceae, a well-defined, axillary area bearing one to many spines and generally other, shorter structures (see glochid) (e.g., *Ferocactus cylindraceus*). 2. In general, each of many areas defined by smallest veins on a leaf.

aril

Fleshy, corky, or bony appendage arising at or near the point of seed attachment, sometimes completely covering the seed.

armed

Bearing prickles, spines, or thorns.

ascending

Curving or angling upward from base, or about 30–60° less than vertical or away from axis of attachment. (see decumbent, erect)

asymmetric

Not divisible into identical or mirror-image halves. (see bilateral, biradial, radial)

awl-like

Narrow throughout, but broader at the base and tapered to a sharp tip. (see acuminate)

awn

1. Bristle-like appendage or elongation, generally terminal. 2. Stiff, needle-like pappus element in Asteraceae.

axil

Distal, adaxial angle between an appendage or branch and a main axis (e.g., between leaf and stem, or between lateral vein and midrib on a leaf).

axile

Pertaining to an axis, as of a placenta along the central axis in a compound ovary with more than one chamber.

axillary

Pertaining to or within an axil, especially a leaf axil.

axis (axes)

Line of direction, growth, or extension; structure occupying such a position — e.g., the main stem of a plant or inflorescence, the midrib of a leaf.

banner

- Uppermost, often largest petal of many members of Fabaceae.
- bar*
A mound-like temporary deposit of sand or gravel in the channel or mouth of a waterway.
- barbed*
Having sharp, normally downward- or backward-pointing projections. Said of an awn, bristle, or other structure.
- bark*
Tough tissue (including phloem) covering the wood (hardened xylem) of subshrubs, shrubs, trees, and some vines. (see wood)
- barren*
An area in which vegetation is sparse due to harsh or limiting growing conditions, such as those associated with shallow, infertile, rocky soil.
- basal*
At or near the base of a plant or plant part. Especially said of leaves clustered near the ground or of a placenta confined to the base of an ovary.
- basiscopic*
In ferns, facing or directed toward the base of the frond (e.g., on any pinna, basiscopic pinnules are those on the side closest to the frond base). (see acrosopic, proximal)
- bell-shaped*
Widening more or less abruptly at the base and then generally more gradually toward the tip. (see urn-shaped)
- berry*
Fleshy, indehiscent fruit in which the seeds are generally more than 1 and are not encased in a stone. (see drupe, pome) (e.g., *Solanum americanum*)
- biennial*
Completing life cycle (germination through death) in two years or growing seasons (generally flowering only in the second), non-woody (at least above ground), often with a rosette the first growing season. (see annual, herb, perennial)
- bilateral*
Divisible into mirror-image halves in only one way. (see asymmetric, biradial, radial)
- biradial*
Divisible into mirror-image halves in two ways; isobilateral. (see asymmetric, bilateral, radial)
- bisexual*
Both male and female reproductive parts occurring and functional in the same plant or structure (e.g., flower, spikelet, inflorescence). (see unisexual, pistillate, staminate, dioecious, monoecious)
- blade*
Expanded portion of a leaf, petal, or other structure, generally flat but sometimes rolled, cylindrical, wavy, or cupped.
- brackish*
Somewhat salty, generally a mixture of saline and fresh water.
- bract*
Reduced, leaf- or scale-like structure subtending a branch, cone scale, peduncle, pedicel, or flower. (see bractlet)
- bractlet*
1. Relatively small, generally secondary bract within an inflorescence. 2. Bract-like structure on a pedicel that often does not directly subtend another structure. (see bract)
- bristle*
1. Relatively large, generally stiff, more or less straight hair. (e.g., *Navarretia breweri*) 2. Fine, generally cylindrical pappus element in Asteraceae. (e.g., *Calycoseris parryi*)
- bud*
1. An incompletely developed, more or less embryonic shoot, usually covered with bud scales. 2. An unopened flower, often protected by sepals.
- bulb*

Short underground stem and the fleshy leaves or leaf bases attached to and surrounding it (e.g., an onion). (see stem, corm, caudex, tuber)

bulblet

1. Small bulb generally produced at the base of a bulb. 2. Any small, bulb-like structure that propagates a plant, often in a leaf or bract axil.

bur

Fruit or fruiting inflorescence with awns or bristles, often barbed. (e.g., *Xanthium strumarium*)

callus

1. In some Poaceae, enlarged base of floret; sometimes hairy. 2. A firm protuberance.

calyx (calyces)

Collective term for sepals; outermost or lowermost whorl of flower parts, generally green and enclosing remainder of flower in bud. Sometimes indistinguishable from corolla.

canescent

Covered with dense, fine, generally grayish white hairs. (e.g., *Phoenicaulis cheiranthoides* leaf)

capsule

Dry fruit from compound pistil, nearly always dehiscent (irregularly or by pores, slits, or lines of separation). (see circumscissile, loculicidal, septicidal)

carpel

The basic female structure of a flower, evolved from a fertile leaf. Carpels are free or variously fused into a compound pistil, the number of carpels then often equal to the number of stigmas, styles, or chambers of the ovary. (see pistil)

cartilaginous

thickened, usually whitish, sometimes flexible; in ferns, applied especially to margins of blades.

catkin

Spike or spike-like (e.g., *Alnus*) inflorescence of unisexual flowers with inconspicuous perianths (generally wind-pollinated), usually pendent and often with conspicuous bracts.

caudex (caudices)

Generally short, sometimes woody, more or less vertical stem of a perennial, at or beneath ground level. (see stem, bulb, corm, tuber)

cauline

Pertaining to structures, especially leaves, borne along (i.e., not confined to the base of) an elongate, above-ground stem; not basal.

centimeter

One-hundredth of a meter; 10 millimeters (abbreviation: cm).

cespitose

Having a densely clumped, tufted, matted, or cushion-like growth form.

chaff

In some Asteraceae, collective term for generally papery or scaly, often persistent bracts on a receptacle.

chamber

Compartment or cavity within an ovary, capsule, or other hollow structure.

chaparral

Vegetation dominated by mostly evergreen shrubs with thick, leathery leaves and stiff branches.

ciliate

Having generally straight, conspicuous hairs along margins or edges.

circumboreal

Occurring around the world at northern latitudes.

circumscissile

Dehiscence, usually of a fruit (capsule), by a transverse line, the top coming off as a lid. (see loculicidal, septicidal)

claw

Stalk-like base of some free or nearly free sepals or petals. (see limb)

cleistogamous

Bud-like, unopening flowers that are generally self-fertilized.

clone

Genetically identical individuals resulting from asexual reproduction (fragmentation of rhizomes or stolons, budding, etc.); often used for an apparent population, the members of which are or were connected (e.g., aspens, cattails, duckweeds, sumacs).

closed-cone coniferous forest or woodland

Vegetation dominated by species of *Pinus* or *Cupressus* in which the seed cones persist unopened on the branches for extended periods of time.

coastal redwood forest

Vegetation dominated by *Sequoia sempervirens*, occurring on slopes and canyons of coastal mountain ranges.

coastal scrub

Coastal vegetation dominated mostly by shrubs with flexible branches, e.g., *Baccharis pilularis*, *Artemisia californica*

coastal strand

Beach and foredune habitat, characterized by sandy soils, strong winds, salt spray, and wave action.

collar

1. In Poaceae, the abaxial junction of leaf sheath and blade. [2. Raised, inflated, or wing-like, encircling projection (e.g., the seeds of *Delphinium luteum*, *D. nudicaule*)]

column

Structure at the center of an orchid flower formed by fusion of stamen(s) and style.

common

Likely present in appropriate habitats. (see abundant, rare, uncommon)

compound

1. Composed of two or more parts, as a compound leaf composed of leaflets (see compound leaf) or a compound pistil composed of fused or partly fused carpels. 2. Repeating a structural pattern (a compound umbel is an umbel of umbels). (see simple)

compound leaf

A leaf divided into distinct parts. In a 1-compound leaf, the blade is divided into primary leaflets connected by an axis but no blade material, in a 2-compound leaf, the primary leaflets are so divided into secondary leaflets, etc. (see palmate, pinnate, lobed, dissected)

compressed

Flattened side-to-side or front-to-back. (see depressed)

concave

Hollowed or indented, as the interior of a curved surface. (see convex)

cone

Reproductive structure composed of an axis, scales, and sometimes bracts. 1. Non-woody structure producing spores (e.g., clubmosses, horsetails) or pollen (e.g., male cone of conifers). 2. Generally woody structure producing seeds (e.g., female cones of most conifers). (e.g., *Abies concolor*)

conic

Three-dimensional, defined by a wide, more or less round base, the sides evenly tapered to a narrow tip.

coniferous forest

Vegetation dominated by trees belonging to various species of conifers (e.g., firs, pines, redwoods).

continuous

Having parts spaced evenly and without interruption, not clumped; pertaining especially to inflorescences in which the flowers are evenly spaced. (see interrupted)

convex

Rounded outward, as the exterior of a curved surface. (see concave)

cordate

Heart-shaped; often pertaining to a leaf in which the blade base on both sides of the petiole is rounded and convex. (see reniform)

- corm*
Short, thick, unbranched, underground stem often surrounded by dry (not fleshy) leaves or leaf bases. (see bulb, stem) (e.g., *Muilla maritima*)
- corolla*
Collective term for petals; whorl of flower parts immediately inside or above calyx, often large and brightly colored. Sometimes indistinguishable from calyx.
- costa*
In ferns, primary axis of a pinna.
- costule*
In ferns, primary axis of a pinnule.
- costulet*
In ferns, primary axis of a pinnulet.
- cotyledon*
Seed-leaf; a modified leaf present in the seed, often functioning for food storage. Persistent in some annuals and of aid in their identification. (e.g., *Lupinus microcarpus*)
- crenate*
Pertaining to margins with shallow, rounded teeth, between which are usually acute sinuses (i.e., scalloped)
- cylindric*
Elongate, with parallel sides and, at any point, round in transverse section.
- cyme*
Branched inflorescence in which the central or uppermost flower opens before the peripheral or lowermost flowers on any axis. (see panicle)
- deciduous*
Falling off naturally. 1. Pertaining to leaves that all fall seasonally, or to plants that are seasonally leafless. (see evergreen) 2. Pertaining to structures, such as hairs or flower parts, that fall early or readily.
- decimeter*
One-tenth of a meter; 10 centimeters (abbreviation: dm).
- decumbent*
Lying mostly flat on the ground but with tips curving up. (see ascending, prostrate)
- decurrent*
Pertaining to a wing-like or ridge-like extension basal to the apparent or actual point of attachment, particularly a leaf base that appears to continue onto the stem.
- dehiscent*
Opening at maturity to release contents; usually pertaining to anthers or fruits. (see indehiscent)
- deltate*
More or less equilaterally triangular, with the corners rounded or not.
- dense*
Congested or compact; especially pertaining to the disposition of flowers in an inflorescence. (see open)
- dentate*
Having margins with sharp, relatively coarse teeth pointing outward, not tipward. (see serrate)
- depressed*
Flattened from above and below, or with the center lower than the margins. (see compressed)
- desert*
Region and associated communities characterized by low and irregular precipitation and prolonged periods of drought.
- desert woodland*
Vegetation in desert region or on slopes of adjacent mountains dominated by small, drought-tolerant trees; may be classified by dominant species (e.g., Joshua tree woodland dominated by *Yucca brevifolia*, pinyon/juniper woodland dominated by *Pinus monophylla* and *Juniperus* sp.).
- dioecious*

Pertaining to a taxon in which individuals produce either male or female reproductive structures, and do not produce bisexual reproductive structures. (see monoecious) (e.g., *Salix laevigata*)

diploid

Having two sets of chromosomes (maternal and paternal); 2n. (see haploid, n, polyploid)

disciform head

In Asteraceae, a head composed of disk flowers and marginal pistillate flowers with minute or missing ligules, superficially similar to discoid head. (see discoid head, ligulate head, radiate head)

discoid head

In Asteraceae, a head composed entirely of disk flowers. (see disciform head, ligulate head, radiate head)

disk

Fleshy, often nectar-secreting structure near (often surrounding) an ovary or style base

disk flower

In Asteraceae, a generally bisexual (occasionally staminate or sterile, never pistillate), generally radial, flower with a 5- (rarely 4-) lobed corolla; appearing without other flower types (in discoid head), or with marginal ray or pistillate flowers (in radiate or disciform heads, respectively). (see ligulate flower, ray flower)

dissected

Deeply, often sharply cut but not compound; usually pertaining to leaves. (see compound leaf, leaflet, lobe, segment) (e.g., *Cymopterus deserticola*)

distal

Farther away from the base, origin, or point of attachment, or closer to the edge or tip. (see proximal)

drupe

Fleshy or pulpy, indehiscent, superficially berry-like fruit in which 1 seed is encased in a stone (as in cherries), or more than 1 seed is encased in an equal number of free or variously fused stones (as in manzanitas). (see berry, nut, pome, stone) (e.g., *Prunus emarginata* fruit)

dune

Hill or ridge of sand formed by the wind.

dune scrub

Vegetation dominated by shrubs growing on stabilized dunes.

elliptic

In the shape of a flattened circle or ellipse; wider than linear (see linear, oblong)

emergent

Pertaining to a plant normally rooted underwater and extending above the water surface, or to a part of such a plant normally held above the water surface. (see aquatic, submersed) (e.g., *Polygonum amphibium*)

endemic

Native to and restricted to a defined geographic area.

entire

Having margins that are continuous and smooth (i.e., without teeth, lobes, etc.).

ephemeral

Lasting a short time. 1. Pertaining to individual plants, completing the life cycle (germination through death) or growth cycle in much less than one year. 2. Pertaining to plant parts, falling early or remaining functional for a relatively short time (e.g., less than a day for flower parts).

epidermis

Outermost cell layer (or layers) of non-woody plant parts.

epipetalous

Pertaining to stamens that are fused to the petals to various extents and therefore appear to arise from them.

erect

Upright; vertically oriented. (see ascending)

estuarine

Pertaining to aquatic habitats where freshwater from streams mixes with sea water in a protected area, resulting in a gradation of brackish waters with varying degrees of salinity.

evergreen

Never leafless; usually pertaining to leaves that remain green and on the plant for more than one season, and that do not all fall seasonally, or to plants that are never leafless. (see deciduous)

exceeding

Surpassing tipward, due to relative orientation or length of the structures involved (e.g., lateral branches exceeding inflorescences; hoods exceeded by anther head in *Asclepias californica*; hoods slightly exceeding anther head in *Asclepias erosa*). (see exserted)

exserted

Protruding out of surrounding structure(s) (e.g., stamens exserted from corolla). (see exceeding, included)

extant

Currently existing or surviving somewhere. (see extinct, extirpated)

extinct

No longer existing or surviving anywhere. (see extant, extirpated)

extirpated

No longer existing or surviving in a defined geographic area. (see extant, extinct)

exudate

Material discharged (exuded) from a plant, often with characteristic odor, color, or texture (e.g., sticky, gummy, slippery).

fertile

Reproductively functional; pertaining to a plant or plant part that produces or is associated with the production of functional spores, pollen, ovules, or seeds (e.g., fertile frond, fertile stamen, fertile flower). (see sterile)

fibrous

1. Pertaining to structures that are composed at least in part of more or less thread-like but usually tough elements (e.g., *Yucca* leaves). 2. Pertaining to a root system composed of many roots similar in length and thickness (e.g., grass roots). (see taproot)

filament

Anther-stalk portion of a stamen, often thread-like.

fleshy

Thick and juicy; succulent. (e.g., *Sesuvium verrucosum*)

floret

In Poaceae, a single flower and its immediately subtending bracts (generally, palea and subtending lemma).

follicle

Dry fruit from a simple pistil, dehiscent on only one side, along a single suture. A single flower may develop into a simple fruit of 1 follicle or an aggregate fruit of several follicles. (see capsule)

foothill

Slope at the base of a mountain; especially applied to such features in CA-FP.

foothill woodland

Vegetation in foothills dominated by small- to medium-sized trees, composed of one or more species of *Quercus*, often mixed with *Pinus sabiniana* and/or *Aesculus californica*.

forest

Vegetation dominated by closely spaced \pm tall trees; with more canopy cover than a woodland (canopies often overlap).

forked

Pertaining to a hair or other structure that branches into two parts. (see stellate)

free

Neither fused to nor adherent to other parts; distinct, separate.

free-central

Pertaining to a placenta along the central axis in a compound ovary with only one chamber. (see axile, basal, parietal)

fringed

Having ragged or finely cut margins.

frond

In ferns, a leaf, often compound or dissected, borne on a rhizome.

fruit

An ovary or ovaries and sometimes associated structures after ovule fertilization (i.e., seed initiation). A simple fruit develops from one ovary (e.g., cherry, apple, the latter derived largely from the hypanthium); aggregate and multiple fruits develop from ovaries of one and more than one flower, respectively, that remain distinct yet held together as a unit (e.g., a strawberry is an aggregate fruit of achenes held together by a juicy, red flower receptacle; a fig is a multiple fruit of achenes surrounded by a fleshy inflorescence receptacle).

funnel-shaped

Widening from the base more or less gradually through the throat into an ascending, spreading, or recurved limb; often applied to a fused calyx or corolla.

fused

United, as the petals together into a corolla tube or stamens onto petals; neither free nor adherent.

fusiform

Elongate, widest at the middle, tapered to both ends.

glabrous

Without hairs.

gland (glandular)

A small, often spheric body, on or embedded in the epidermis or at the tip of a hair, that exudes a generally sticky substance. (e.g., *Psoralea arguta*)

glaucous

Covered with a generally whitish or bluish, waxy or powdery film that is sometimes easily rubbed off.

glume

In Poaceae, each of generally two sheathing bracts that are the lowermost parts of a spikelet. (see lemma, palea)

granular

Covered with minute bumps. (see papillate, tubercle)

grassland

Vegetation dominated by various species of grasses, often mixed with various other kinds of herbs (not grasses) and sometimes scattered, low-growing shrubs.

gymnosperm

Plant that bears woody or fleshy cones, not flowers, in which "naked seeds" (hence, gymno-sperm) are not enclosed in an ovary; woody, including e.g., pine, sequoia, ephedra, yew.

habit

Characteristic mode of growth, general form, or shape of a plant (e.g., caespitose, herb, scapose, shrub).

habitat

Natural setting or conditions under which a plant lives (e.g., saltbush scrub, vernal pool, granitic soil among pines, montane forest).

hair

Thread-like epidermal outgrowth. (see glabrous, canescent, ciliate, prickle, puberulent, scabrous, scale, strigose, tomentose)

haploid

Having one set of chromosomes (maternal or paternal); n. (see diploid, n, polyploid)

hastate

Arrowhead-shaped, with two basal lobes oriented more or less perpendicularly to the long axis. (see sagittate)

head

Dense, often spheric inflorescence of sessile or subsessile flowers.

hemispheric

Shaped like a dome or half sphere.

herb

Plant that, at least above ground, is generally non-woody and of less than one year or growing season in duration. (see annual, biennial, perennial, subshrub)

herbaceous

Lacking wood; having the characteristics of an herb.

herbage

The above-ground, non-woody parts of a plant, including especially the leaves and young stems taken together, excluding flowers and fruits.

heterostylous

Pertaining to a taxon in which individual plants produce only one of two or more flower types, each differing in style (and generally stamen) length.

hypanthium (hypanthia)

Structure generally in the shape of a tube, cup, or bowl, derived from the fused lower portions of the perianth and stamens, from which these parts seem to arise, and to which the ovary wall is fused in an inferior ovary (to which the ovary wall is partially fused in a half-inferior ovary; from which the ovary is free in a superior ovary).

included

Not protruding out of surrounding structure(s) (e.g., stamens included in corolla). (see exserted)

indehiscent

Not opening inherently to release contents; usually pertaining to fruits. (see dehiscent)

indusium (indusia)

In many ferns, a veil- or scale-like outgrowth of the leaf surface that covers a sorus.

inferior ovary

An ovary that is fused to the fused lower portions of the perianth and stamens (i.e., to the hypanthium), to the extent that these structures appear to arise at or above its summit (see superior ovary)

inflorescence

An entire cluster or aggregation of flowers and associated structures (e.g., axes, bracts, bractlets, pedicels); often difficult to determine as to type and boundaries but generally excluding full-sized foliage leaves.

infraspecific

Below the species level or within a species; pertaining to variation within a species, whether taxonomically significant (i.e., characterizing subspecies or varieties) or not (e.g., characterizing forms or minor variants).

intergrade

To merge gradually from one extreme to another through a more or less continuous series of intermediates.

intermediate

Between extremes or parental taxa in size, shape, color, flowering time, habitat preferences, geographic ranges, or other ways.

internode

Segment of an axis (generally a stem) between successive positions (nodes) from which one or more structures (especially leaves, buds, branches, or flowers) arise.

interrupted

Having parts spaced unevenly, clustered; pertaining especially to inflorescences in which the flowers are clustered. (see continuous)

intertidal

Pertaining to marine habitats that are submerged at high tide and exposed at low tide.

involucl

A secondary involucre (group of bracts) within an inflorescence (e.g., those subtending the secondary umbels in members of Apiaceae).

involucre

Group of bracts more or less held together as a unit, subtending a flower, fruit (acorn cup), or inflorescence.

keel

1. Ridge or crease more or less centrally located on the long axis of a structure, generally on the abaxial side. 2. The two lowermost, fused petals of many members of Fabaceae.

lanceolate

Narrowly elongate, widest in the basal half, often tapered to an acute tip.

lateral

Pertaining to the sides(s) of a structure; e.g., laterally compressed (flattened side-to-side), lateral branch, lateral appendage. (see [terminal](#))

leaf

Organ arising from a stem, generally composed of a stalk (petiole) and a flat, expanded, green, photosynthetic area (blade); distinguished from a leaflet by the presence in its axil of a bud, branch, thorn, or flower; sometimes with lateral, basal appendages (stipules); either simple (toothed, lobed, or dissected but not divided into leaflets) or compound (divided into leaflets).

leaflet

A leaf-like unit of a compound leaf; distinguished from a leaf by the absence in its axil of a bud, branch, thorn, or flower; lacking lateral, basal appendages (stipules); either simple (leaf 1-compound, with primary leaflets) or compound (leaf 2-compound, with primary and secondary leaflets; 3-compound, with primary, secondary, and tertiary leaflets, etc).

legume

In Fabaceae (legume family), a dry or somewhat fleshy, one- to many-seeded fruit from a simple pistil, typically dehiscent longitudinally along two sutures and splitting into halves that remain joined at the base, sometimes indehiscent or breaking crosswise into one-seeded segments; a plant with such a fruit.

lemma

In Poaceae, the lower, generally larger of two sheathing bracts subtending a flower, generally ensheathing the palea (in a sterile lemma, the flower and sometimes palea is rudimentary or absent); with the palea and flower, comprising the floret. (see [floret](#), [glume](#), [palea](#), [spikelet](#))

lenticel

Each of many spongy or calloused areas of various shapes, sizes, and colors, most commonly on surfaces of young stems (including twigs) or fruits.

lenticular

Lens- or discus-shaped, with both major sides convex.

ligulate flower

In Asteraceae, a bisexual, bilateral flower with the long, outer portion of the corolla (the ligule) 5-lobed; appearing only with other ligulate flowers in a ligulate head. (see [disk flower](#), [ray flower](#))

ligulate head

In Asteraceae, a head composed entirely of ligulate flowers. (see [disciform head](#), [discoid head](#), [radiate head](#))

ligule

1. In Asteraceae, the strap- or blade-like outer portion of the corolla in ligulate and nearly all ray flowers. 2. In Poaceae and some other grass-like plants, an appendage at the adaxial junction of leaf sheath and blade, generally with a membranous or fringed margin. 3. In *Isoetes*, a membrane that wholly or partially covers a sporangium.

limb

In calyces or corollas with fused sepals or petals, the expanded, often lobed portion distal to the tube or throat; in some free or nearly free sepals and petals, the expanded portion distal to the stalk-like base (claw).

linear

Elongate, with nearly parallel sides; narrower than elliptic or oblong.

lip

1. Upper or lower of two parts in a bilateral, unequally divided calyx or corolla. 2. In Orchidaceae, generally the largest, lowest, most highly modified perianth part.

lobe

1. A major expansion or bulge, such as on the margin of a leaf, sepal, or petal, or on the surface of an ovary. 2. The free tips of otherwise fused structures, such as sepals or petals; larger than teeth.

loculicidal

Pertaining to dehiscence of a fruit (capsule) by a longitudinal line through the wall at or near the center of each chamber, such that each resulting segment corresponds to the two adjacent halves of two adjacent chambers, usually with a placenta-bearing septum centrally. (see [circumscissile](#), [septicidal](#))

longitudinal

Pertaining to length or the lengthwise dimension; parallel to the axis. (see [transverse](#))

margin

The edge, generally of a leaf or perianth part.

marsh

Permanently or periodically inundated, mostly or completely treeless vegetation dominated by semi-aquatic herbs or subshrubs.

meadow

Open grass- or sedge-dominated vegetation more or less surrounded by woodland or forest; meadow soils are generally seasonally moist and frequently are composed of fine-grained sediments.

mericarp

One of the (generally dry, indehiscent, 1-seeded) parts into which certain fruits (e.g. those of Apiaceae) separate at maturity.

membranous

Thin, dry or moist, pliable, often more or less translucent or variously colored, sometimes green. (see scarious) (e.g., *Leymus cinereus* ligule)

meter

Basic unit of length in the metric system, equal to 39.4 inches, slightly more than a yard (abbreviation: m).

millimeter

One-thousandth of a meter; one-tenth of a centimeter (abbreviation: mm).

mixed evergreen forest

Vegetation dominated by a variable mixture of mostly or only hardwood tree species, most of which retain their leaves throughout the year.

monoecious

Pertaining to a taxon in which individuals produce both male and female reproductive structures, and do not produce bisexual reproductive structures. (see dioecious) (e.g., *Alnus rhombifolia*)

monoete spore

In spore-bearing plants, bilaterally symmetric spore on which the scar is linear and unbranched.

montane

Pertaining to mountains; vegetational/altitudinal zone between the foothill and subalpine zones.

mucro (mucronate)

An abrupt, short, sharp, narrow, terminal point, tip, or projection

n

Number of chromosomes in haploid cells. (see diploid, polyploid)

native

Occurring naturally in an area, as neither a direct nor indirect consequence of human activity; indigenous; not alien. (see naturalized, waif)

naturalized

Alien (not native) and reproducing either sexually (e.g., by spores, seeds) or vegetatively (e.g., by sprouts, suckers) in the absence of any benefit, intentional or not, direct or indirect, of human activity, and thereby persisting beyond initial generation or establishment. (see native, waif)

nectar

A sugary solution, produced in nectaries, consumed primarily as an energy source by animal visitors, usually pollinators.

nectary

Variably shaped, nectar-producing structure(s) usually at or near the base of the inside of a flower (or sometimes elsewhere, such as in a perianth spur or on a petiole). (e.g., *Symphoricarpos rotundifolius*)

needle

A narrowly linear, often waxy, generally evergreen leaf, especially of conifers.

node

Position on a stem from which one or more structures (especially leaves, buds, branches, or flowers) arise. (see internode)

nut

Mostly dry, sometimes fleshy or pulpy, usually indehiscent fruit in which a single seed is encased in a hard shell. (see drupe) (e.g., *Quercus palmeri*)

nutlet

Small, dry nut or nut-like fruit, usually several of which are produced by a single flower. (see nut, drupe) (e.g., Boraginaceae, Lamiaceae)

ob-

A prefix indicating inversion of shape — e.g., lanceolate and oblanceolate leaf blades are widest below and above the middle, respectively.

oblique

Having unequal sides or an asymmetric base.

oblong

Longer than wide, with nearly parallel sides; wider than linear. (see elliptic)

obtuse

Having a short-tapered, blunt tip or base, the sides convex or straight and converging at more than a right angle. (see acute)

open

Uncongested or diffuse; especially pertaining to the disposition of flowers in an inflorescence. (see dense)

opposite

1. Arranged in pairs along an axis — e.g., two leaves per node. (see alternate, whorled). 2. Occurring in the same rank, directly above or below, as "stamens opposite petals". 3. Located directly across from.

ovary

Ovule-bearing, usually wider, basal portion of pistil, normally developing into a fruit as ovules become seeds; may be simple (one carpel, one chamber) or compound (two or more carpels, one or more chambers).

ovary stalk (fruit stalk)

A pedestal-like, apical prolongation of a floral receptacle (often termed elsewhere a carpophore) or basal constriction of an ovary (often termed elsewhere a gynophore), above the level of perianth insertion, each with the result that the ovary or fruit appears to be stalked over and above the pedicel (whereas the demarcation between pedicel and ovary- or fruit-stalk is observable as the point of perianth insertion, carpophores generally are distinguished from gynophores only by anatomical study).

ovate

Egg-shaped (i.e., widest below the middle) in two dimensions (i.e., in one plane), as a leaf. (see ovoid)

ovoid

Egg-shaped (i.e., widest below the middle) in three dimensions, as a fruit. (see ovate)

ovule

In gymnosperms and angiosperms, structure containing an egg, and normally developing into a seed after fertilization.

palea (paleae)

In Poaceae, the distal, generally smaller of two sheathing bracts subtending a flower, generally ensheathed by the lemma; with the lemma and flower, comprising the floret. (see floret, glume, spikelet)

palmate

More than two structures or parts (e.g., veins, lobes, or leaflets) radiating from a common point in two dimensions (i.e., in one plane). (see pinnate, ternate)

panicle

Branched inflorescence in which the basal or lateral flowers (or some of them) open before the terminal or central flowers on any axis. (see cyme)

papillate

Pertaining to a surface (e.g., of a leaf, stigma, fruit) bearing small, rounded or conic protuberances (papillae).

pappus

In Asteraceae, the aggregate of structures such as awns, bristles, or scales arising from the top of the inferior ovary, in place of the calyx.

parasite

A plant that benefits by taking resources from a physical connection to a host plant of another species; green parasites (hemiparasites) derive water and dissolved inorganic substances (e.g., mineral nutrients) from the connection and often are able to survive without it, while non-green parasites (holoparasites) obtain in addition energy-rich, organic compounds (products of photosynthesis) from the connection and cannot survive without it; the connection may or may not involve a fungal intermediate, and may or may not be detrimental to the host.

parietal

Pertaining to placentas on the inside surface of the ovary wall in a compound ovary with one or more chambers.

peat

Material formed by the partial decomposition in water of plant tissues, especially mosses (*Sphagnum*) or sedges.

peatland

Moss- or herb-dominated freshwater wetland characterized by nutrient-deficient substrates and the accumulation of peat; often said (elsewhere, not in TJM2) to be bogs if acidic, fens if basic.

pedicel

Stalk of an individual flower in an inflorescence or, in Poaceae, of an individual floret, or the corresponding structure in fruit. (see peduncle, ray)

peduncle

Stalk of an individual flower borne singly, not in an inflorescence, or of an entire inflorescence, or the corresponding structure in fruit; the stalk subtending an involucre (e.g., in Asteraceae, Polygonaceae). (see pedicel, ray)

peltate

With the stalk attached toward the middle, not at a margin, of a flat structure such as an indusium, scale, or leaf.

pendent

Drooping, hanging, or suspended from a point of attachment above. (e.g., *Amelanchier utahensis* fruit)

perennial

Completing life cycle (germination through death) in more than two years or growing seasons, generally non-woody (at least above ground) to woody; includes perennial herbs as well as subshrubs to trees; the abbreviation "per" only refers to perennial herb, not to the word "perennial" alone. (see annual, biennial)

perianth

Calyx and corolla collectively, whether or not they are distinguishable.

perianth part

An individual member of a perianth; used whether or not calyx and corolla are distinguishable, but usually when they are not.

perigynium

Variably shaped, sac-like structure enclosing the ovary and achene in *Carex* and *Kobresia*.

persistent

Not falling off; remaining attached. (see deciduous, ephemeral)

petal

Individual member of the corolla, whether fused or not; if fused, often equal in number to the number of corolla lobes; often conspicuously colored. (see sepal)

petiole

Leaf stalk, connecting leaf blade to stem; sometimes more or less indistinct.

phyllary

In Asteraceae, a bract of the involucre.

pinna (pinnae)

In ferns, primary division of a compound or dissected frond blade.

pinnate

Feather-like; pertaining to veins, lobes, leaflets, or other structures arranged in two dimensions (i.e., in one plane) along either side of an axis; a leaf is odd-pinnate if there is a terminal leaflet, even-pinnate if there is not, and either odd- or even-pinnate may be 1-pinnate (blade divided into primary leaflets), 2-pinnate (primary leaflets divided into secondary leaflets), 3-pinnate (secondary leaflets divided into tertiary leaflets), etc. (see compound leaf, palmate, ternate, plumose)

pinnule

In ferns, secondary division of a compound or dissected frond blade, primary division of a pinna.

pinnulet

In ferns, tertiary division of a compound or dissected frond blade, secondary division of a pinna, primary division of a pinnule.

pistil

Female reproductive structure of a flower, composed of an ovule-containing ovary at the base, one or more pollen-receiving stigmas at the tip, and generally one or more styles between ovary and stigma. A flower may have one or more simple pistils (each a single, free carpel with a single ovary chamber, placenta, and stigma) or one compound pistil (two or more fused or partially fused carpels, the exact number often equaling the number of ovary lobes, ovary chambers, placentas, styles, or stigmas).

pistillate

Pertaining to flowers, inflorescences, or plants with fertile pistils but sterile or missing stamens. (see staminate) (e.g., *Salix laevigata* flower)

placenta

Structure or area to which ovules are attached in an ovary; variously shaped and positioned.

planoconvex

Flat or nearly so on one side, rounded on the other. (e.g., *Carex leporinella* perigynium)

pleated

Having accordion-like folds.

plumose

Plume-like, usually with the parts arrayed in three dimensions around an axis, or in tufts held together at the base; usually pertaining to small, finely divided structures, such as certain stigmas and pappus elements. (see pinnate)

pollen (pollen grain)

In gymnosperms and angiosperms, structure containing the sperm; when sperm fertilizes an egg, the egg and surrounding ovule normally develop into a seed.

pollen sac

Each of the one, two, or four pollen-bearing portion(s) of an anther.

pollination

Placement of pollen, by an insect, the wind, or other vector, on a stigmatic or ovular surface, through which pollen tube growth and fertilization may occur; self-pollination involves only one plant, cross-pollination occurs between plants.

pollinium (pollinia)

Especially in *Asclepias* and related genera, and in *Orchidaceae*, a mass of coherent pollen grains disseminated as a unit.

polyploid

Having three or more sets of chromosomes; 3n, 4n, etc. (see diploid, haploid, n)

pome

In *Rosaceae*, a fleshy, indehiscent fruit, such as an apple or pear; derived from a compound, inferior ovary (represented as 2–5 papery-walled, radiating segments alternating with fleshy material) and surrounding hypanthium (represented as outer fleshy material and skin). (see berry, drupe) (e.g., *Amelanchier utahensis* fruit)

prickle

Sharp-pointed, stiff or somewhat flexible projection, originating at the epidermis, derived from epidermal cells and therefore neither subtending an axillary bud or branch nor subtended by a leaf or leaf scar, without leaves, leaf scars, buds, or branches; loosely used for any sharp projection. (see armed, spine, thorn) (e.g., *Rosa woodsii* stem)

prostrate

Lying flat on the ground. (see ascending, decumbent)

protandrous

Pertaining to a bisexual flower in which pollen release precedes stigma receptivity, or to a plant with staminate and pistillate flowers in which this is true, with the result that cross-pollination is favored.

protogynous

Pertaining to a bisexual flower in which stigma receptivity precedes pollen release, or to a plant with staminate and pistillate flowers in which this is true, with the result that cross-pollination is favored.

proximal

Closer to the base, origin, or point of attachment, or farther away from the edge or tip. (see distal)

puberulent

Minutely hairy.

raceme

Unbranched inflorescence in which the flowers are borne on pedicels and nearly always open from the bottom to the top of the inflorescence. (see panicle, spike)

rachis

In ferns, primary axis of a compound or dissected frond blade.

radial

Divisible into mirror-image halves in three or more ways. (see asymmetric, bilateral, biradial)

radiate head

In Asteraceae, a head composed of central disk flowers and marginal ray flowers. (see disciform head, discoid head, ligulate head)

rank

1. A row or column of parts along an axis — e.g., leaves on an erect stem arranged in four vertical rows are 4-ranked. (see alternate, opposite) 2. In classification, a taxonomic level — e.g., family, genus, species, subspecies, variety. (see taxon)

rare

Extremely unlikely to be present in appropriate habitats, often restricted to a small number of sites. (see endangered, threatened, uncommon)

ray

Each of a number of radiating axes, as a primary branch in a compound umbel. (see pedicel, peduncle)

ray flower

In Asteraceae, a generally pistillate or sterile, bilateral flower with the long, outer portion of the corolla (ligule) often 3-lobed (in radiate heads) or missing (in disciform heads, the flower then pistillate); appearing marginally and only with disk flowers more centrally. (see ligulate flower, disk flower)

receptacle

1. In individual flowers, the structure to which flower parts are attached. 2. In heads or head-like inflorescences, especially in Asteraceae, the structure to which flowers or sometimes heads are attached.

recurved

Gradually curved downward or backward.

reduced

Smaller, less lobed, simpler, etc.

reflexed

Abruptly bent or curved downward or backward.

reniform

Kidney-shaped; often pertaining to a leaf in which the blade base on both sides of the petiole is rounded and concave. (see cordate)

rhizome

1. In seed plants, stem that is often elongate, more or less horizontal, usually underground; distinguished from roots by bearing of leaves, leaf scars, axillary buds, etc. (see stolon). 2. In ferns, stem that is located underground, embedded in leaf litter, on rocks or in rock crevices, or on trees or tree branches, often scaly or hairy; distinguished from roots by bearing of fronds (roots rarely bear fronds), and their greater diameter.

rib

1. Ridge, as on a fruit. 2. Raised vein, as on a leaf or perianth part. (e.g., *Carex hendersonii* perigynium)

riparian

Pertaining to communities that occupy the banks, channels, and flood plains of waterways.

- root*
Generally underground axis or axes of a plant; distinguished from stems by not bearing leaves, leaf scars, axillary buds, flowers, etc.; generally growing into the ground from the base of a stem, its functions include anchorage, absorption of water and nutrients, and food storage. (see bulb, corn, rhizome, caudex, tuber, stolon)
- rosette*
A radiating cluster of leaves generally at or near ground level.
- rotate*
Wheel-shaped, spreading, or saucer-shaped; often applied to a fused corolla with a short or nonexistent tube and a spreading limb. (see funnel-shaped, salverform)
- ruderal*
A plant, usually alien, occurring in waste areas, along roadsides, and in other places disturbed by humans; pertaining to such a plant.
- sagittate*
Arrowhead-shaped, with two basal lobes oriented nearly parallel to the long axis. (see hastate)
- salverform*
Having a slender tube and an abruptly spreading, flat limb; often applied to a fused corolla. (see funnel-shaped, rotate)
- savanna*
Vegetation dominated by various species of grasses with scattered individual trees; with less canopy cover than a woodland (canopies do not touch).
- scabrous*
Rough to the touch, generally owing to short stiff hairs. (e.g., *Brickellia pappus*)
- scale*
1. Wide, appressed, membranous, epidermal outgrowth (e.g., *Cheilanthes covillei*) (see hair). 2. Structure partially or entirely covering an over-wintering bud (bud scale) (e.g., *Salix goodingii* bud). 3. In gymnosperms, a woody, seed-bearing structure attached to the cone axis (cone scale) (e.g., *Abies magnifica*). 4. In Asteraceae, a flat, membranous pappus element (e.g., *Hymenoxys hoopesii*). Leaves or bracts may be scale-like in one or more of the preceding ways.
- scapose*
Pertaining to a plant or an inflorescence having a relatively long peduncle that arises from ground level, often from a rosette, sometimes bearing bracts but without leaves.
- scapose*
Pertaining to a plant or an inflorescence in which a relatively long peduncle (scape) arises, sometimes with leaf- or scale-like bracts but without true foliage leaves, from a rosette or other arrangement of leaves at ground level.
- scar*
Mark left by the natural separation of two structures, as a leaf scar on a stem.
- scarious*
Thin, dry, pliable, translucent or variously colored but not green. (see membranous) (e.g., *Carex incurviformis* pistillate flower bract)
- scree*
Relatively unstable, sloping accumulation of small rock fragments, often at a cliff base. (see talus)
- scrub*
Vegetation dominated by shrubs; may be classified by habitat type or by dominant species; shrubland.
- sculpture*
Surface ornamentation or topography, often visible only when magnified, as on a seed or pollen grain. (e.g., *Plagiobothrys nothofulvus* nutlet)
- seed*
Any fertilized ovule, but in descriptions pertaining to the fully mature condition (i.e., at full cone or fruit maturation), unless noted otherwise.
- segment*

1. An ultimate or smallest division of a compound leaf (then the segment is also a leaflet) or dissected leaf — not a marginal lobe, tooth, bristle, etc. 2. A part into which an organ is naturally or apparently divisible, such as of a calyx, corolla, fruit, etc. 3. A specified length, such as of a stem, root, style, etc.

sepal

Individual member of the calyx, whether fused or not; if fused, often equal in number to the number of calyx lobes; generally green. (see petal)

septicidal

Pertaining to dehiscence of a fruit (capsule) by a longitudinal line through the wall at or near the center of each septum, such that each resulting segment corresponds to a single chamber, with placentas placed variously. (see circumscissile, loculicidal)

septum (septa)

Wall between chambers in a compound ovary.

series

A group of structures of one kind (e.g., involucre bracts, sepals, petals, stamens) of similar size or shape, usually more or less in a row or whorl.

serpentine (serpentinic)

Pertaining to rocks, or soils derived from them, with generally low levels of calcium and other nutrients, and high levels of magnesium, iron, and certain toxic metals; many plant taxa are restricted to or excluded from serpentine.

serrate

Having margins with sharp, fine to coarse teeth generally pointing tipward, not outward; margins with such teeth on such primary teeth are doubly serrate. (see dentate)

sessile

Without a petiole, peduncle, pedicel, or other kind of stalk.

sheath

A surrounding or partially surrounding, often tubular structure or part of a structure, such as a leaf base in Apiaceae or Poaceae.

shoot

Pertaining collectively to a young stem or twig and its appendages (e.g., new growth in the spring), or to all above-ground parts of a plant (i.e., shoot system).

shrub

1. A woody plant of relatively short maximum height, with generally many branches from the base. (see tree, subshrub, perennial)

simple

Composed of a single part; undivided; unbranched. (see compound)

sinus

Usually pertaining to margins of leaves, sepals, petals, or other parts, an indentation between adjacent lobes or teeth

sorus (sori)

In many ferns, a distinct cluster of sporangia.

spheric

Globe- or ball-shaped; circular in three dimensions.

spike

Unbranched inflorescence in which the flowers are sessile and nearly always open from the bottom to the top of the inflorescence. (see panicle, raceme, head)

spikelet

1. In Poaceae, the smallest aggregation of florets (each a flower with subtending palea and lemma) and any (generally 2) subtending glumes. 2. In Cyperaceae, the smallest aggregation of flowers (generally more than 2) and associated bracts.

spine

Sharp-pointed, usually stiff projection, originating below the epidermis, derived from a leaf or leaf part (e.g., stipule, vein tip), and therefore often subtending an axillary bud or branch, without buds of its own; loosely used

for any sharp projection. (see armed, prickle, thorn) (e.g., *Cirsium arvense* leaf)

sporangium (sporangia)

In non–seed plants, a case or sac in which spores are produced, and from which they are released.

spore

In non–seed plants, one of very many minute, haploid cells (in mass, often appearing dust–like) dispersed from sporangia on a diploid parent plant (sporophyte), normally developing into a small haploid plant (gametophyte) that produces eggs, sperm, or both, the fusion of which results in new diploid offspring.

spreading

Oriented more or less perpendicularly to the axis of attachment; often, more or less horizontal.

spur

Hollow projection or expansion, generally of a perianth part and containing nectar. (e.g., petals of *Aquilegia formosa*)

stamen

Male reproductive structure of a flower, typically composed of a stalk–like filament and a terminal, pollen–producing anther. Filaments sometimes partly fuse to the corolla, or to other filaments to form a tube. (see anther, filament, pistil)

staminate

Pertaining to flowers, inflorescences, or plants with fertile stamens but sterile or missing pistils. (see pistillate) (e.g., *Salix laevigata* flower)

staminode

Sterile stamen, usually modified in appearance, sometimes petal–like or elaborate in structure. (e.g., *Penstemon palmeri*)

stellate

Pertaining to a hair or other structure with three or more branches radiating in two or three dimensions from a common point. (see forked)

stem

Generally above–ground but sometimes below–ground axis or axes of a plant; distinguished from roots by bearing leaves, leaf scars, axillary buds, flowers, etc. (see bulb, caudex, corm, rhizome, root, stolon, tuber)

sterile

Not reproductively functional; pertaining to a plant or plant part that does not produce or is not associated with the production of functional spores, pollen, ovules, or seeds (e.g., sterile frond, sterile stamen, sterile flower). (see fertile)

stigma

The part of a pistil on which pollen germinates, generally terminal and elevated above the ovary on a style, usually sticky or hairy, sometimes lobed.

stipe

In ferns, a frond stalk (analogous to a petiole of a leaf), connecting blade to rhizome.

stipule

Appendage at base of petiole, generally paired, variable in form but often leaf– or scale–like, sometimes a spine.

stolon

A normally thin, elongate stem lying more or less flat on the ground and forming roots as well as erect stems or shoots (which become new, clonal plants) at generally widely spaced nodes; runner. (see rhizome)

stomate (stoma, stomata)

A minute pore on a leaf (less often, stem or other structure) through which gases pass into or out of a plant (generally, carbon dioxide in, oxygen and water vapor out); generally closed during times of water stress; sometimes used in identification.

stone

In a drupe, the very hard inner ovary wall and the generally single seed it surrounds; occurring one or more per flower, free or variously fused. (e.g., *Prunus emarginata* fruit)

stout

Thick, sturdy, not slender.

striate

With fine, longitudinal channels, lines, or ridges.

strigose

With stiff, straight, sharp, appressed hairs.

style

In many but not all pistils, the stalk–like part that connects ovary to stigma.

sub–

A prefix meaning almost, just below, or somewhat imperfectly.

subalpine

Pertaining to the vegetational/altitudinal zone just below timberline, between the montane and the alpine.

submersed

Pertaining to a plant normally rooted and remaining underwater, or to a part of such a plant normally held underwater. (see [aquatic](#), [emergent](#))

subshrub

A plant with the lower stems woody, the upper stems and twigs not woody (or less so) and dying back seasonally. (see [perennial](#), [shrub](#))

subtend

Occurring immediately below, as sepals subtending petals or leaves subtending axillary buds.

subtidal

Pertaining to marine aquatic habitats that are continuously submerged, even at low tide.

superior ovary

An ovary that is free from the perianth and stamens, or free from the fused lower portions of these structures (i.e., free from the hypanthium), to the extent that these structures appear to arise at its base, and it appears to arise from the top of the receptacle (see [hypanthium](#), [inferior ovary](#))

suture

Groove or line of dehiscence or fusion.

swamp

Shrub– or tree–dominated vegetation that occurs in permanently wet soils with standing water.

talus

Relatively stable, sloping accumulation of large rock fragments, often at a cliff base. (see [scree](#))

tapered

Gradually (not abruptly) narrower or smaller at base or tip. (see [truncate](#))

taproot

A primary root that grows more or less straight down into soil, is tapered to the end, and has smaller, lateral branches (e.g., carrot). (see [fibrous](#))

taxon (taxa)

In classification, a group of organisms (such as plants) at any rank (e.g., species, genus, family); taxonomy is the science of classifying organisms. (see [rank](#))

tendrils

A slender, generally coiling structure (generally stem, stipule, or leaf tip) by which a climbing plant becomes attached to its support. (e.g., *Lathyrus lanszwertii* leaf)

terminal

Pertaining to the tip of a structure (e.g., terminal bud). (see [lateral](#))

ternate

Lobed or compound into three parts, once, as a clover leaf (e.g., *Trifolium wormskioldii*), or more than once; in a ternate–pinnate leaf, the leaf is divided into three leaflets, each of which is pinnately compound (e.g., *Aralia californica*); three structures or parts (e.g., veins, lobes, or leaflets) radiating from a common point. (see [palmate](#), [pinnate](#))

thorn

Sharp–pointed, usually stiff projection, originating below the epidermis, derived from a branch and therefore often subtended by a leaf or leaf scar, sometimes with leaf scars and buds of its own; loosely used for any sharp

- projection. (see armed, prickle, spine) (e.g., *Castela emoryi*)
- throat*
In calyces or corollas with fused sepals or petals, the expanded, fused portion distal to the tube and proximal to the limb.
- timberline*
Region in high mountains where subalpine forests give way to treeless alpine vegetation.
- tomentose*
Covered with densely interwoven, generally matted hairs.
- tooth (teeth)*
1. A small, pointed projection, such as on the margin of a leaf, sepal, or petal. 2. The free tips of otherwise fused structures, such as sepals or petals (somewhat archaic usage); smaller than lobes. (see dentate, serrate)
- transverse*
Pertaining to width or the widthwise dimension; perpendicular to the axis. (see longitudinal)
- tree*
A woody plant of medium to tall maximum height, with generally one trunk from the base. (see shrub, perennial) (e.g., *Carnegiea gigantea*)
- trilete spore*
In spore-bearing plants, radially symmetric spore on which the scar comprises three radiating branches.
- truncate*
Abruptly (not gradually) narrower or smaller at base or tip, as if cut straight across or nearly so. (see tapered)
- tube*
In calyces or corollas with fused sepals or petals, the often more or less cylindrical, fused portion at the base, proximal to the throat and limb.
- tuber*
Short, thickened, fleshy, usually starchy, underground stem for storage (of water, food, or both) and sometimes propagation (e.g., potato). (see stem)
- tubercle*
Small, wart-like projection. (e.g., *Cryptantha muricata* nutlet)
- twig*
In woody plants, a terminal stem segment, produced during the current or most recent growth period.
- twining*
Climbing by the twisting or coiling of stems, tendrils, or other structures. (e.g., *Antirrhinum filipes*)
- ultimate*
Last, most distal, or smallest, as all the tips of a branching stem or the smallest divisions (segments) of a compound leaf or dissected leaf.
- umbel*
Inflorescence in which three to many pedicels and, if compound, branches (rays) radiate from a common point; characteristic of but not confined to Apiaceae. (see ray)
- uncommon*
Unlikely to be encountered; sometimes not present in appropriate habitats. (see abundant, common, rare)
- understory*
Layer of vegetation growing beneath a canopy of taller plants.
- unisexual*
Either male or female reproductive parts occurring and functional in the same plant or structure (e.g., flower, spikelet, inflorescence). (see bisexual, pistillate, staminate, dioecious, monoecious)
- urn-shaped*
Widening more or less abruptly at the base and then gradually or abruptly narrowed toward the tip. (see bell-shaped)
- utricle*
Mostly dry, generally indehiscent fruit from a generally compound pistil in which a single seed is loosely enclosed by a balloon- or bladder-like ovary wall.

- valve*
One of the parts into which a capsule or legume splits.
- vascular*
Pertaining to plant veins or to plants with veins.
- vein*
1. Tissue specialized for transport of substances within a plant, water and dissolved inorganic substances (e.g., mineral nutrients) through the xylem, energy-rich, organic compounds (products of photosynthesis) through the phloem. 2. A strand of such tissue, often seen as a bundle in transverse section.
- vernal*
Pertaining to the spring season.
- vernal pool*
Shallow, ephemeral (becoming dry by spring or early summer) body of water that occupies a depression, with underlying hardpan, in a grassland, foothill woodland, or chaparral.
- vestigial*
Rudimentary; pertaining to a structure that is undeveloped, poorly developed, or degenerate and therefore non-functional.
- vine*
A trailing, twining, or climbing plant, usually attached to its support by the twisting or coiling of stems, tendrils, or other structures. (e.g., *Phaseolus filiformis*)
- waif*
Alien, adventive; reproducing neither sexually (e.g., by spores, seeds) nor vegetatively (e.g., by sprouts, suckers) in the absence of any benefit, intentional or not, direct or indirect, of human activity, and therefore not persisting beyond initial generation or establishment, or reproducing to some extent but not persisting for more than a few generations or well beyond initial establishment and therefore not completely naturalized; generally not considered to be part of the flora, but of interest because of their potential to become naturalized, and thereby to have become so. (see [alien](#), [naturalized](#))
- wash*
Normally dry drainage channel with only occasional surface flow (e.g., flash floods), in some cases with water movement and availability below in times of no surface flow.
- whorled (whorl)*
Arranged in groups of three or more at nodes or positions along an axis (e.g., three leaves per node). (see [alternate](#), [opposite](#)).
- wing*
1. Thin, flat extension or appendage of a surface or margin. 2. In many members of Fabaceae and in some other groups, each of two lateral petals.
- wiry*
Pertaining to roots, stems, hairs, and other structures that are slender, stiff, and tough.
- wood*
Hardened, thickened, vascular tissue (xylem) under the bark of subshrubs, shrubs, trees, and some vines; number of concentric rings in wood often corresponds to years or growing seasons. (see [bark](#))
- woodland*
Vegetation dominated by small- to medium-sized trees, often with less continuous canopy cover than a forest and more than a savanna (canopies do not always touch).

Some Rejected Terms and Examples of Acceptable Alternatives

In alphabetical order below are some example of the hundreds of botanical terms that will not be used in TJM2, with some but not necessarily all acceptable alternatives to the right. This list should help you develop a philosophical basis for translation of specialized terms that will not be used in TJM2, including some that may be in more or less wide use in other botanical works. In general, we have rejected terms that 1) are only familiar to people who have been formally trained in botany, and 2) have meanings that can be conveyed precisely in one (or rarely two) more widely understood

words.

actinomorphic ~ radial
aculeate ~ spiny
adventive ~ waif
apex ~ tip
apical ~ at tip; near tip
apiculate ~ abruptly soft-pointed
arachnoid ~ cobwebby
aristate ~ awned; long-acuminate
attenuate ~ long-tapered
barbellate ~ minutely barbed
bracteole ~ bractlet
campanulate ~ bell-shaped
capillate ~ hair-like
capitate ~ head-like
carpophore ~ ovary stalk
castaneous ~ dark brown
ciliolate ~ minutely ciliate
clavate ~ club-like
crisped ~ very wavy; curled
cuneate ~ wedge-shaped
digitate ~ palmate
disarticulate ~ break apart
falcate ~ sickle-shaped
filiform ~ thread-like
fimbriate ~ fringed
floccose ~ with tufted, woolly hairs
floral tube ~ hypanthium
foliaceous ~ leaf-like
globose ~ spheric
hirsute ~ with rough, coarse hairs
hispid ~ with sharp bristles
hispidulous ~ with small, sharp bristles
hyaline ~ translucent
imbricate ~ overlapping
infundibuliform ~ funnelform
introduced ~ alien
lamina ~ blade
lanate ~ woolly
lepidote ~ scaly
locule ~ chamber
mucilaginous ~ gelatinous
nerve ~ vein; rib
ocrea ~ sheathing stipules
orbicular ~ spheric
pannose ~ felt-like
pilose ~ with soft, shaggy hairs
pinnatifid ~ pinnately lobed
procumbent ~ prostrate
pubescent ~ hairy

punctate ~ dotted
punctulate ~ finely dotted
reticulate ~ net-like
retuse ~ notched
revolute ~ rolled under
scaberulous ~ minutely scabrous
scandent ~ climbing
sericeous ~ silky
setaceous ~ bristle-like
shrubland ~ scrub
standard ~ banner
stipe ~ stalk; petiole
stipitate ~ stalked
subulate ~ awl-like
succulent ~ fleshy
tepal ~ perianth part
terete ~ cylindrical
umbellet ~ secondary umbel
uncinate ~ hooked at tip
undulate ~ wavy
velutinous ~ velvety
villous ~ with long, soft, wavy hairs
zygomorphic ~ bilateral

Geography

As in TJM, a four-tiered hierarchical system of geographic units will be used in TJM2 to convey distributional information. In this system, California is divided into three provinces. Each province is divided into regions, all but one of which are further divided into subregions; some subregions are even further divided into districts.

The geographic units to be used are based on physiographical as well as biological considerations, including the community analysis of Kuchler (1977, *The Map of the Natural Vegetation of California*, pp. 909–938 in Barbour & Major, eds., *Terrestrial Vegetation of California*), and are designed to accommodate various levels of precision in describing plant distributions. Nearly all of these units are elongate in a more or less north–south direction, reflecting the great east–west differences in growth conditions that characterize the state.

In most cases this system is both more efficient and more precise than the more traditional practice of merely listing the counties in which the plants have been found (e.g., Kern County includes portions of all three provinces and six of the regions, in addition to a number of subregions and districts). Areas smaller than the finest units in this system should be indicated, in parentheses, for narrow endemics or for taxa that occur only in one specific area within the finest units; e.g., c CCo (Monterey Bay). Geographic ranges will always be presented with ranges of elevation and habitat; together the three will provide a reliable and precise indication of occurrence within the state.

Authors should use the geographic units in ways that conserve space without sacrificing precision. For example, if a species occurs in all six subregions of the California Floristic Province and nowhere else in the state, CA–FP will suffice (see also below). If a species is known only from the San Jacinto Mountains, SnJt is to be used, whereas if it occurs there and elsewhere in the Peninsular Ranges, PR is to be indicated.

Consult the map while studying the descriptions of the provinces, regions, subregions, and districts below. In citing these units, follow the order in which they are described; for easy reference, use the outline.

Some suggestions — with convincing arguments — have been made to change the boundaries of some of the geographic units we employ. We seriously considered such proposals but in the end decided, with the exception of the Caliente Range (now included in SCoRI, see below), that the costs involved in reconsidering distributional information for a flora of this size far outweighed any benefits that might result from having boundaries that make more sense to some people. Despite the fact that the boundaries are intended to reflect physiographical as well as biological considerations, the exact positions of such lines necessarily are somewhat arbitrary (e.g., where broad transition zones occur between units). We intend to include concerns that have been raised about boundaries in our discussion of geography in TJM2.

Authors should be conservative in their depictions of geographical distribution. A taxon should not be indicated for a particular area merely because it is expected there, even if the motivation for doing this is to protect a treatment from early obsolescence in this regard. Instead, Authors should indicate that it is expected there (e.g., "expected in GV"): this indication may motivate efforts to find and collect the taxon in that area. In general, presence in an area should be indicated only in cases where the Author has personal knowledge — from herbarium specimens, photographs, or field observations — that the taxon occurs there. Unvouchered reports by others, whether in print, online, or from personal communications, should not qualify as personal knowledge. For taxa that are very common, widespread, and under-collected, the Authors should exercise judgement. In constructing a statement of geographic range for a species, subspecies, or variety, the distribution should be considered at the finest level of geographic resolution possible using the four-tier hierarchical system and should not be "rounded up"; for example, if a taxon is known from all of CA–FP except n ChI, the distribution should be indicated as "CA–FP (exc n ChI)", not as "CA–FP". Similarly, for species in which there are infraspecific taxa, the statements for the infraspecific taxa are to be "added up" but not "rounded up"; for example, if the ranges for the infraspecific taxa combined "add up" to SCo, n ChI, TR, and PR, the range for the species to which they belong is not to be "rounded up" to SW, since that action would involve adding a unit (s ChI) to the range when in fact the species is not known from that unit.

As noted above, many of the boundaries between geographic subunits are broad and/or imprecisely defined. Presence of a taxon in such areas may be indicated by the "slash method"; that is, by use of a "/" between the adjacent subunits involved. For example, the distribution of a plant that occurs in ScV and also in an area that is in a transition zone between ScV and n SNF could be indicated as "ScV, ScV/n SNF". If more than two adjacent subunits are involved, they could all be listed, each pair separated with a "/".

Taxa that have been extirpated should be indicated as such, either for the whole state or for subunits thereof. Taxa that are notably absent from an area, for reasons other than extirpation, should be so indicated: for example, "SW (exc ChI)". Taxa that are rare may also be indicated in this way: for example, "SW (rare in ChI)".

In TJM, some confusion resulted in cases where a geographic unit includes only one named subunit (e.g, MP includes only Wrn), because in such cases the remaining area within the unit is not a named subunit (e.g., there is no subunit for MP excluding Wrn). To depict a taxon that occurs throughout MP but not in Wrn, the method described in the preceding paragraph should be used: "MP (exc Wrn)". The same convention applies to three other cases: plants distributed in DMoj but not in DMtns [indicated as "DMoj (exc DMtns)"], in SNE but not in W&I [indicated as "SNE (exc W&I)"], and in PR but not in SnJt [indicated as "PR (exc SnJt)"].

Space constraints in TJM2, as in TJM, will not allow detailed, thorough depictions of geographic range outside of CA (which are to be given for taxa below the rank of genus after the statement of range in CA and a semicolon). For taxa that occur outside of CA only in bordering states, for example OR, the statement "to OR" is to be used when the distribution extends from CA more or less continuously into OR. If there is a significant gap between the range in CA and the range in OR, only "OR" is to be indicated (after the semicolon). Interpretation of "significant gap" may be left up to the Authors, for the most part, but in the case of the OR example, certainly a "significant gap" would be represented by a taxon that occurs in CA and OR, but does not occur in the geographic subunits (or counties) bordering OR (i.e, it does not occur in NCo, KR, CaRH, or MP). Descriptions of geographic range outside of CA are to address areas or places in the following order: those to the north, those to the northeast, those to the east, those to the southeast, etc. (i.e., "clockwise").

For taxa that occur, for example, in CA as well as more or less continuously to OR, WA, and B.C., the statement "to B.C." is to be used; "to B.C., WY, CO" means "to B.C.", "to WY", "to CO" and, in fact, means to a line roughly defined by these "points" (thus, it probably means to MT as well). If "to B.C., also in WY, CO" is intended (i.e., the taxon occurs in OR, WA, B.C., WY, and CO), it is to be stated that way. For the online flora, in which space is not an issue, each state or province in which the taxon occurs is to be listed.

The four-tiered hierarchical system of geographic units described here is to be used only for the California portion of the geographic ranges expressed, even in cases where the unit involved extends outside of California in other systems or according to other definitions. For example, CA-FP is to be used only for the California portion of the California Floristic Province, even though, as defined elsewhere, the California Floristic Province extends into southwestern Oregon as well as northwestern Baja California; guidelines for expressing the portion of a geographic range outside of California are given above.

For ranges outside of North America, only continents, or parts thereof (e.g., w Eur) are to be indicated, in the directional order given above. For the online flora, much more detailed accounts may be given.

California Floristic Province (CA-FP)

The largest and in many ways most important geographic unit is the California Floristic Province (CA-FP). It comprises all of the state west of the two other provinces, the Great Basin Province (GB) in about the northern two-thirds and the Desert Province (D) south of that. CA-FP on the one hand, and GB and D together on the other, are essentially equal to the "cismontane" and "transmontane" concepts, respectively, as used by Jepson, Munz, and others.

The border between the "cismontane" west (CA-FP) and the "transmontane" east (GB and D) is the main phytogeographic boundary in the state. North of Lake Tahoe, it lies between the Cascade Ranges (CaR) and the Sierra Nevada (SN) regions to the west, with their montane forests, and the Modoc Plateau Region (MP) of GB to the east, with its juniper savanna and sagebrush steppe. Vegetational, topographic and geologic boundaries are all indistinct in the north; there are inclusions of sagebrush steppe in the Cascades (there is an especially large one in Shasta Valley in north-central Siskiyou County) and of montane forest at higher elevations in GB. In CaR, volcanic cones and mountains are more numerous, while in GB the land is generally flatter, with a greater predominance of lava flows that have been faulted into small mountains with intervening basins.

The boundary between CA-FP and GB runs south from the Oregon border at US Highway 97, along the south side of Lava Beds National Monument, and around Glass Mountain and Black Mountain (barely in Modoc County); it curves west again around the Burnt Lava Flow area, and (from the Shasta County border) approximately follows Highways 89, 44, 36 (through Susanville), and 395 south, along the northeastern base of the Diamond Mountains. There is a floristically interesting indentation of the boundary at Sierra Valley (Plumas and Sierra counties). CA-FP extends slightly into Nevada east of Lake Tahoe (e.g., in the Mount Rose area), with the boundary between CA-FP and GB nearly following Highways 395 and 88 through Nevada.

South of Lake Tahoe, the boundary between CA-FP and GB follows the east slope of SN, generally defined by the indefinite break between either upper montane (red-fir/lodgepole-pine) forest or Jeffrey-pine forest on the CA-FP side and either pinyon/juniper woodland or sagebrush steppe on the GB side; there also is Jeffrey-pine forest in GB (e.g., in the Mono Craters area). In some places, the boundary between CA-FP and GB is approximated by Highway 395, but south of Bishop it lies to the west of Highway 395, farther up the east slope of the Sierra Nevada.

South of Owens Valley, the provincial boundary lies between chaparral or pinyon/juniper woodland on the CA-FP side, and vegetation dominated by Joshua-tree or creosote-bush and burro-weed on the D side. Montane vegetation of adjacent areas in the southeastern Sierra Nevada (se SN), northeastern Transverse Ranges (ne TR), and eastern Peninsular Ranges (e PR) tends to grade into desert vegetation on the lower slopes of these mountains. Some taxa are limited to this interface, which may be specified by use of the "slash method", as described under Geography. For example, the

distribution of a plant that occurs in DMOj and also in an area that is as much in Teh as DMOj could be indicated as "DMoj, DMOj/Teh" (in TJM, such a distribution would have been given as "DMoj, w edge DMOj". If more than two adjacent subunits are involved, they could all be listed, each pair separated with a "/". Indications such as "w edge D", "w edge DMOj", or "w edge DSon", as used in TJM, will not be used in TJM2, although, for example, "w DMOj" may be used for a plant is restricted to the western part of DMOj,

In Riverside County, San Diego County, and southwesternmost Imperial County, the Santa Rosa, Volcan, Laguna, and Jacumba mountains make up the eastern edge of, and are included within, CA–FP.

In California, CA–FP is divided into six regions, 17 subregions, and 17 districts.

Northwestern California Region (NW). This region has the wettest and most predictable climate in California. The boundary between NW and CaR, the two northernmost regions of CA–FP, is marked by geological as well as (less distinct) vegetational differences. Substrates derived from metamorphic rock support oak woodland or montane fir/pine forest with hemlock on the NW side, while those developed from volcanic material occur under Sierran montane forest (with sugar pine but without hemlock) or sagebrush scrub on the CaR side. The boundary between NW and CaR is approximated by Interstate 5 and the Sacramento River south to the Great Valley Region (GV), which begins near Red Bluff.

From this point near Red Bluff south to southwestern Solano County, NW abuts GV and the boundary is defined primarily by blue oak/foothill–pine woods on the NW side, and prairie (or agricultural land) on the GV side. From southwestern Solano County, the southern boundary of NW jogs westward along a vegetational boundary that excludes salt marsh, coastal prairie, and other maritime communities of the Central Western California Region (CW) to the south, and then proceeds through southern Sonoma County to the Pacific Ocean at Bodega Bay. NW is divided into three subregions.

North Coast Subregion (NCo). This subregion extends along the Pacific coast the full length of NW, from the Oregon border south to Bodega Bay. It is a strip of land of variable width that supports truly coastal communities, including a predominance of coastal prairie, along with coastal marsh, coastal scrub, closed–cone–pine/cypress forest, and grand–fir/Sitka–spruce forest.

Klamath Ranges Subregion (KR). The California portion of this geologically old and distinct subregion, in which there is an abundance of serpentine, is bounded to the north by Oregon and in the northwest corner by the coastal communities of NCo. Its southwestern and southeastern boundaries divide it from the North Coast Ranges Subregion (NCoR). In the southwestern portion, the boundary has a pronounced geological basis, with the mostly sedimentary Franciscan Complex of NCoR faulted against the older, plutonic and metamorphic rocks of KR. This fault boundary coincides almost exactly with the northwest–flowing Klamath and South Fork of the Trinity rivers.

In the east, the boundary between the predominantly metamorphic KR and the volcanic Cascade Ranges (CaR) lies for the most part just west of Interstate 5. In the southeast, the boundary excludes the chaparral and pine/oak woodland communities of the Inner North Coast Ranges (NCoRI) in western Shasta and Tehama counties.

The transition in forest types across the boundary between KR and NCoR is gradual: KR includes the Marble, Salmon, Scott, Scott Bar, Siskiyou, and Trinity mountains, the Trinity Alps, and Mount Eddy. Red Mountain, near the point where Trinity, Shasta, and Tehama counties meet, is the southernmost peak in KR that exceeds 1500 m.

North Coast Ranges Subregion (NCoR). NCoR, the largest subregion of NW, includes widespread serpentine. It is divided into three districts:

Outer North Coast Ranges District (NCoRO). This district, the largest in NCoR, is characterized by very high rainfall, as well as by redwood, mixed–evergreen, and mixed–hardwood forests. Notable mountain peaks include Mount Lassic,

Grouse Mountain, and Horse Mountain, all of which are exceeded in elevation by peaks to the east in NCoRH.

High North Coast Ranges District (NCoRH). This district is characterized by heavy snow cover, as well as by montane and subalpine coniferous forests, treeless high peaks, and floristic similarities to the High Sierra Nevada Subregion (SNH). Its major peaks all rise above 1500 m (most are above 2000 m), and extend from South Fork Mountain in Humboldt County southeast to the Yolla Bolly Mountains, and from there south to Goat Mountain near the Colusa–Lake county line. Somewhat lower, more western, and more isolated peaks similar in vegetation to South Fork Mountain (e.g., Mount Lassic, Grouse Mountain, Horse Mountain) are included instead in NCoRO. Snow Mountain and Mt. Sanhedrin are in NCoRH.

Inner North Coast Ranges District (NCoRI). This district is characterized by low rainfall and hot, dry summers, as well as by chaparral and pine/oak woodland. It ranges from the Anderson area in southwestern Shasta County, southward along the east slope of the North Coast Ranges, with a conspicuous westward bulge near the southern end of NCoRH, to an area west of the Russian River (from north of Ukiah south to Mount St. Helena). Serpentine is widespread in NCoR, but especially common in this district.

Cascade Ranges Region (CaR). This region, characterized by volcanics, is bounded as follows: to the north by Oregon; to the west by the predominantly metamorphic NW (more or less along Interstate 5), including NCoRI (along the Sacramento River between Redding and Red Bluff); to the southwest by agricultural land or prairie of the Great Central Valley Region (GV), as opposed to the chaparral and oak/pine woodland of the Cascade Range Foothills Subregion (CaRF); to the southeast by the Sierra Nevada Region (SN); and to the east by the juniper savanna of the Great Basin Province (GB), in contrast to the montane coniferous forests of CaR.

The boundary between CaR and the Modoc Plateau Region (MP) of GB is especially unclear vegetationally. In fact, a major island of GB communities (sagebrush steppe and juniper savanna) occurs well within CaR, in Shasta Valley (east of Yreka, near the boundary between CaR and KR).

The interface between CaR and the Sierra Nevada Region (SN) is defined geologically by the contact between the relatively recent volcanics of CaR and the predominant metamorphics (with both granitic intrusions and volcanics) of the northern Sierra Nevada Region (n SN). This contact, located slightly northwest of the canyon of the North Fork of the Feather River, serves as a reasonably distinct topographic marker as well. The geologic and topographic aspects to the interface between CaR and SN are not reflected in any vegetational change; rather, the forests of these regions change gradually with latitude. CaR is divided into two subregions.

Cascade Range Foothills Subregion (CaRF). This subregion, in the southwestern part of CaR, is characterized by chaparral and blue–oak/foothill–pine woodland at about 100–500 m in elevation. CaRF and the adjacent NCoRI and northern Sierra Nevada Foothills District (nSNF) comprise a horseshoe–shaped area of similar foothill communities around the northern boundaries of GV.

High Cascade Range Subregion (CaRH). This subregion (generally above 500 m) comprises the remainder of CaR and is characterized by ponderosa–pine, montane fir/pine, and lodgepole–pine forests, with treeless alpine communities on Mount Shasta and Lassen Peak.

Sierra Nevada Region (SN). This primarily igneous region abuts the volcanic CaR to the north. To the west it shares a long north–south border with GV (California prairie on the GV side versus foothill communities on the SN side), and meets the Southwestern California Region (SW) at Tejon Pass (on Interstate 5). On the east, SN ends at the provincial boundaries with GB and D.

SN is divided into three subregions, the two larger of which (SNF, SNH) comprise all but the southernmost extremity (Teh) of the region. Each of the two larger subregions is divided into three districts (northern, central, southern) along contiguous, more or less east–west lines. Although communities change more or less gradually with latitude in SN, the

lines between the northern, central, and southern districts were chosen, somewhat arbitrarily, to coincide with areas of more or less abrupt floristic transition and with major rivers or drainage systems.

Sierra Nevada Foothills Subregion (SNF). This subregion comprises a lower (upper limit of elevation about 500–800 m), mostly narrow, north–south strip in the western one–third to one–fifth of SN, with GV to the west, the High Sierra Nevada Subregion (SNH) or Desert Province (D) to the east, and the Tehachapi Mountain Subregion (Teh) to the south. Throughout most of its area, SNF is characterized by blue–oak/foothill–pine woodlands (versus ponderosa–pine forest of higher elevations in SNH) and scattered serpentine. It is best differentiated from SNH and the Great Central Valley Region (GV) by community type, as opposed to climatic, topographic, geologic, or other considerations. SNF is divided into northern, central, and southern districts, as discussed under SN, and as defined under each.

Northern Sierra Nevada Foothills District (n SNF). This district abuts on CaRF to the north (northwest of Oroville) and is bounded more or less arbitrarily in the south, where it meets c SNF, by the Stanislaus River, which corresponds to the Calaveras–Tuolumne county line. Oroville, Auburn, and Placerville are all well within n SNF, whereas Grass Valley, at about 800 m, is near the border with n SNH.

Central Sierra Nevada Foothills District (c SNF). This district meets n SNF to the north and is bounded in the south by the divide (in Fresno County) between the San Joaquin and Kings river drainages, which is approximated by State Highway 168. Sonora, Incline, and Mariposa are all within c SNF.

Southern Sierra Nevada Foothills District (s SNF). This district abuts on c SNF to the northwest and the Tehachapi Mountain Subregion (Teh) to the south, at Highway 58 through Tehachapi Pass, which approximates the division between the Tehachapi Creek and Cache Creek drainages. The district runs the width of SN at its southern end (i.e., SNH does not extend all the way to the southern end of SN). Like Teh, s SNF is complex, with gradual transitions into surrounding areas of GV, s SNH, and D.

High Sierra Nevada Subregion (SNH). This large subregion is elongate in a north–south direction, extending from Lassen and Plumas counties in the north to Kern County in the south, and is bounded by SNF to the west and the Great Basin Province (GB) and Desert Province (D), including parts of Nevada, to the east. It is vegetationally complex, with ponderosa–pine, white–fir, and giant–sequoia forests in lower montane areas, red–fir, Jeffrey–pine, and lodgepole–pine forests in upper montane areas, mountain–hemlock and whitebark–pine forests in subalpine areas, and treeless communities in alpine areas at the highest elevations (about 3000–4400+ m).

The long border between SNH to the west and GB and D to the east, extending more than half the length of California, is in places difficult to define (see CA–FP, above). SNH is divided (as is SNF) into northern, central, and southern districts, as discussed under SN.

Northern High Sierra Nevada District (n SNH). This district in the north abuts on CaRH of CA–FP and the Modoc Plateau Region of GB; the boundary with CaRH more or less coincides with the North Fork of the Feather River, from northeastern Butte County to southwestern Lassen County. In the south, the border with c SNH follows the Calaveras–Tuolumne, Alpine–Tuolumne, and Alpine–Mono county lines to the border with GB. Quincy, Downieville, Truckee, and Markleeville are within n SNH.

Central High Sierra Nevada District (c SNH). This district abuts on n SNH to the north, as defined above. The southern boundary, west of the Sierran crest, is the divide between the San Joaquin and Kings river drainages (as it is in c SNF). This divide winds to the south in eastern Fresno County, reaching the Sierran crest along the Goddard Divide, near Mount Darwin (4200 m). East of the Sierran crest, the boundary with s SNH follows Bishop Creek, down to the border with GB at about 2000 m. Yosemite National Park and Mammoth Lakes are within c SNH.

Southern High Sierra Nevada District (s SNH). This district abuts on c SNH to the north–northwest and with s SNF in the south, as defined under those districts. All but the northern tip of Kings Canyon National Park and all of Sequoia

National Park are included in s SNH. In the northern part of this district are the highest mountains in California, including Mount Whitney at 4000+ m. Farther south, the "domelands" northeast of Lake Isabella are notable for their endemism. In this area, peaks average about 3000 m, while in the southernmost part of the district this figure is 2000–2500 m. The boundary with s SNF in the south, defined by vegetation, is convoluted and relatively indistinct. The higher mountains of the southern part of this district (e.g., Piute Mountains, Kiavah Mountains, Scody Mountains, Breckenridge Mountain) support yellow or pinyon pines, but not the oak/pine woodlands, chaparral, or desert scrub of neighboring geographic units.

Note: To save space, it is useful and desirable to combine districts in the Sierra Nevada Region (SN) by latitude (i.e., northern, central, southern), whether or not they belong to the same subregion. For example, "c&s SNF" indicates that a taxon occurs in c SNF and s SNF, while "c&s SN" indicates that a taxon occurs in c SNF, c SNH, s SNF, and s SNH.

Tehachapi Mountain Area Subregion (Teh). This small foothill and montane subregion, in which elevations rarely exceed 2000 m, has floristic elements of all surrounding geographic units. Highway 58 through Tehachapi Pass constitutes the boundary between this subregion and s SNF. In the west, the subregion is bounded by the Great Central Valley Region (GV), where included foothill and mixed-woodland communities meet grassland and agricultural land. To the southwest, the subregion ends at Tejon Pass on Interstate 5, where it abuts on the northern part of the Western Transverse Range District (WTR). The eastern-southeastern boundary with the Desert Province (D) is indistinct, as discussed under CA-FP, with chaparral or pinyon/juniper woodland on the Tehachapi Mountain Area side and creosote-bush scrub on the Desert side.

Great Central Valley Region (GV). This region is an elongate, north-south oriented lowland surrounded by all other regions of CA-FP, but bordered mostly by coast ranges to the west and SN to the east. On all borders (i.e., those with NW, CW, SW, SN, and CaR) it ends where oak-pine woodlands or mixed hardwood forests begin. Although now predominantly agricultural, GV once supported grassland, marshes, extensive riparian woodlands, and (especially in southern SnJV, see below) islands of valley oak savanna. The region is divided into two subregions.

Sacramento Valley Subregion (ScV). This subregion comprises the northern, smaller, wetter, cooler area of GV, extending from Red Bluff in Tehama County to the salt marshes of Suisun Slough in southwestern Solano County. The western portion of the boundary between ScV and the San Joaquin Valley (SnJV) follows the northern borders of Contra Costa and San Joaquin counties, which approximately bisect "the delta" area of the Sacramento and San Joaquin rivers; in the eastern portion, this boundary corresponds to the Sacramento-San Joaquin county line, approximating the very low divide between the drainage systems of the Cosumnes and Mokelumne rivers.

San Joaquin Valley Subregion (SnJV). This subregion comprises the southern, larger, drier, hotter area of GV; its northern limits are defined under ScV, while its other boundaries equal those of GV. SnJV supports islands of valley oak savanna and, in the south, some desert elements. Islands of higher (\pm 800 m), moister habitats in the Temblor Range and on associated ridges, located geographically in sw SnJV, are included instead in the Inner South Coast Ranges District (SCoRI) of CW. The Caliente Range, included in s SnJV in TJM, is now included in SCoRI because it is, floristically and topographically, more similar to that district.

Note: Occurrences that are restricted to "the delta" of the Sacramento and San Joaquin rivers, and that include areas both north and south of the boundary between ScV and SnJV, are cited in treatments as "deltaic GV".

Central Western California Region (CW). This north-south oriented region is bounded by NW to the north, the Pacific Ocean to the west, SW to the south, and GV to the east. The boundary between CW and SW follows the crest of the Santa Ynez Mountains from Point Conception to just north of Santa Barbara, where it jogs northeast and east along Mono Creek and beyond; the region thus includes most of the San Rafael Mountains but excludes Mt. Pinos, which is in SW. Many, often small outcrops of serpentine are scattered throughout the region. CW is divided into three subregions, one of which comprises two districts.

Central Coast Subregion (CCo). This subregion extends along the Pacific Coast (and the shores of San Francisco Bay) the full length of CW, from Bodega Bay in the north to Point Conception in the south. Like NCo in NW, it is variable in width and supports only communities that are truly coastal. Salt marshes and coastal prairie predominate around the San Francisco Bay; coastal–sage scrub is prevalent in the south. The Monterey Bay area is notable for its endemism.

San Francisco Bay Area Subregion (SnFrB). This subregion occupies the northern one–third of CW, east of CCo. It is reasonably well defined physiographically, by features such as Mt. Tamalpais, the Santa Cruz Mountains, and the northern Diablo Range, including Mt. Diablo and Mt. Hamilton. The southern boundary is somewhat arbitrary, following Highways 156 and 152 from CCo east of Castroville, through Hollister and Pacheco Pass, to GV near San Luis Reservoir. The subregion is less well defined vegetationally, encompassing a diversity of community types, from very wet redwood forest to dry oak–pine woodland and chaparral.

South Coast Ranges Subregion (SCoR). This subregion is bounded by SnFrB to the north (boundary defined under SnFrB), CCo to the west, SW to the south, and SnJV to the east. It is divided into two districts.

Outer South Coast Ranges District (SCoRO). The boundary between this district and the Inner South Coast Ranges District (SCoRI) to the east runs along the Salinas River (approximated by Highway 101), from Salinas south to about San Miguel in northern San Luis Obispo County, and from there up the Estrella River to the western edge of SnJV near Shandon. SCoRO includes Sierra de Salinas, the Santa Lucia Range, and the San Rafael Mountains, and extends to as far south as the boundary between CW and SW, which corresponds to the crest of the Santa Ynez Mountains and Mono Creek. Near the coast, there are small stands of redwood and mixed hardwood forests in the north, and southern oak forests in the south. Hotter, drier, more inland slopes support primarily blue–oak/foothill–pine woodland and chaparral.

Inner South Coast Ranges District (SCoRI). Located east of SCoRO, this district includes the southern Diablo Range from Hollister and Pacheco Pass south to (and including) San Benito Mountain, the Gabilan Range, Cholame Hills, and the higher elevations of the Temblor Range and associated ridges (isolated within the southern part of SnJV, as discussed under that subregion). SCoRI supports a mosaic primarily of summer–dry blue–oak/foothill–pine woodland and chaparral. The Caliente Range, included in s SnJV in TJM, is now included in SCoRI because it is, floristically and topographically, more similar to this district.

Southwestern California Region (SW). This region is a wide band, oriented northwest to southeast, that is bounded by the Pacific Ocean (except that it includes the Channel Islands) to the west and Mexico to the south. It is separated from CW to the northwest by the crest of the Santa Ynez Mountains, Mono Creek, and most of the San Rafael Mountains, from GV to the north at the woodland/grassland interface, from Teh to the northeast at Tejon Pass along Interstate 5, and from D to the northeast and east where chaparral or pinyon/juniper woodland on the CA–FP side meets Joshua–tree or creosote–bush scrub on the D side (and otherwise as defined under CA–FP). It is divided into four subregions and six districts.

South Coast Subregion (SCo). This subregion extends along the Pacific Coast, from Point Conception of CCo (CW) to Mexico. It is comparable to NCo and CCo of the NW and CW regions, respectively, but is hotter and drier and extends much farther inland — to San Geronimo Pass at Banning, which marks the boundary between CA–FP and D. Coastal sage scrub and chaparral communities with many endemic species predominated in SCo before massive urbanization and corresponding loss of natural habitats occurred throughout most of the region from Santa Barbara to the Mexican border.

Channel Islands Subregion (ChI). The eight major islands in the Pacific Ocean off the coast of southern California are floristically similar to SCo, but include enough endemics to justify recognition of ChI as a separate geographic unit. The subregion is divided into two districts. Counties are indicated for each of the eight major islands because information on this subject is commonly incorrect and/or not readily verified. Evidently, Santa Barbara Island was originally in Santa Barbara County, placed in Ventura County for a period, and is presently back in Santa Barbara County.

Northern Channel Islands District (nChI). This district includes the islands of San Miguel (Santa Barbara Co.), Santa Rosa (Santa Barbara Co.), Santa Cruz (Santa Barbara Co.), and Anacapa (Ventura Co.), which are separated from the

mainland by the Santa Barbara Channel. These islands are geologically related to (and probably represent the westernmost peaks of) the Santa Monica Mountains, located in the southern part of the Western Transverse Ranges District (WTR).

Southern Channel Islands District (s ChI). This district includes the islands of Santa Barbara (Santa Barbara Co.), Santa Catalina (Los Angeles Co.), San Clemente (Los Angeles Co.), and San Nicolas (Ventura Co.). These islands are geologically and floristically more isolated and more diverse among themselves than those of the northern group, probably in part because they were not as readily colonized from the mainland during periods of lowered sea levels that accompanied various glaciations.

Transverse Ranges Subregion (TR). This subregion, the northernmost in SW, is unusual in that the included mountain ranges are oriented in an east–west (as opposed to north–south) direction. It shares nearly all of its long, winding southern boundary with SCo; in the easternmost extreme of this boundary it is separated from the Peninsular Ranges Subregion (PR) by San Gorgonio Pass (Interstate 10), which lies between the San Bernardino Mountains (TR) to the north and the San Jacinto Mountains (PR) to the south. San Gorgonio Pass, at Banning, also marks the division between SCo (CA–FP) to the west and D to the east. TR is characterized at lower elevations by chaparral and at higher elevations by southern oak forest and dry montane forests of white fir or Jeffrey, sugar, or lodgepole pines. The boundary between TR and D lies between these communities and Joshua–tree or creosote–bush scrub on the D side. Some high peaks in TR are treeless, even though none evidently exceeds climatic timberline for their latitudes. TR is divided into three districts that are progressively higher, hotter, and drier eastward.

Western Transverse Ranges District (WTR). This district abuts on SN, GV, and CW to the north, SCo to the south (a narrow strip of which separates WTR from the Pacific Ocean), and D and the San Gabriel Mountains District (SnGb) to the east. It includes Mt. Pinos (at 2700 m, the highest point in WTR), the Santa Ynez Mountains (south of its crest and Mono Creek), Sierra Pelona, and the Topatopa, Santa Susanna, Santa Monica, and Liebre mountains. At the north end of the San Fernando Valley, a topographic boundary with the San Gabriel Mountains District (SnGb) follows Interstate 5 north to the Santa Clara River, and from there east through Soledad Canyon and Soledad Pass to the boundary between WTR and D south of Palmdale.

San Gabriel Mountains District (SnGb). This is a topographically well–defined mountain range situated northeast of Los Angeles. It is bounded by D to the north and northeast, WTR to the northwest and west, SCo to the south, and the San Bernardino Mountains District (SnBr) to the east. SnGb is separated from SnBr by the northwest–southeast oriented Cajon Canyon, which is occupied by Highways 138 and 15. Mount San Antonio ("Old Baldy"), at 3070 m, is the highest point in SnGb. Straddling the Los Angeles–San Bernardino county line, it supports a few alpine taxa near its summit.

San Bernardino Mountains District (SnBr). This is a topographically well–defined mountain range, east of SnGb. This district is adjacent to D on its north, east, and southeast boundaries, SCo to the southwest, and the San Jacinto Mountains District (SnJt) of PR to the south, from which it is separated by San Gorgonio Pass (see TR). The highest point in SnBr is San Gorgonio Mountain (3500 m), which has the most well–developed alpine communities in California south of SN. The Big Bear/Lake Baldwin area, notable for its many endemic species, is undergoing rapid urbanization and associated habitat destruction. The Little San Bernardino Mountains to the southeast of SnBr, across Morongo and Yucca valleys and mostly included in Joshua Tree National Park, are here considered part of the Desert Mountains Subregion (DMtns) because the vegetation is more similar to D than to SnBr.

Peninsular Ranges Subregion (PR). This subregion occupies approximately the southeastern one–third of SW. It includes Mt. Palomar, as well as the Santa Ana, Cuyamaca, Santa Rosa, Laguna, Jacumba, and San Jacinto mountains. The last range comprises its own district within PR.

San Jacinto Mountains District (SnJt). The only district recognized in PR, this is an area with a high level of local endemism. The San Jacinto Mountains include the highest elevations in PR, with San Jacinto Peak at about 3300 m. The Santa Rosa Mountains to the southeast, with elevations to 2650 m, is the only other range in PR that supports well–developed montane to subalpine forests.

Great Basin Province (GB)

The Great Basin Province lies to the east of the California Floristic Province (CA–FP) in the northern two-thirds of California and abuts the Desert Province (D) at its southern margin. The boundary with CA–FP is described above; it follows the high eastern margin of CaR and SN. The boundary with D in the north is the transition from sagebrush steppe or pinyon/juniper woodland on the GB side to creosote–bush scrub on the D side. Deep Springs and Fish Lake valleys are in GB, Eureka and Saline valleys are in D. Southward, the mixed vegetation of the Owens Valley is included in GB. This province is characterized by low rainfall and hot to very hot summers. It is divided into two regions and two subregions.

Modoc Plateau Region (MP). This region, entirely north of Lake Tahoe, is a high plateau (mostly about 1300–1800 m) in the northeastern corner of California, occupying most of Modoc and Lassen counties and parts of Plumas, Shasta, Sierra, and Siskiyou counties. MP is characterized primarily by juniper savanna and sagebrush steppe, but also has extensive areas of ponderosa–pine and Jeffrey–pine forests, and lesser areas of montane pine/fir forest. Substrates are volcanic, with faulted lava flows predominating over cones (see CaR, above). A single subregion is recognized within MP.

Warner Mountains Subregion (Wrn). The Warner Mountains, a faulted volcanic range situated mostly in eastern Modoc County, is the most outstanding topographic feature of MP. Its highest point is Eagle Peak, which exceeds 3000 m. Wrn is recognized as a distinct subregion because it supports a unique flora that includes an alpine component at the higher elevations.

East of the Sierra Nevada Region (SNE). This region, entirely south of Lake Tahoe, has a wide elevational range, from Owens Lake at 1100 m to White Mountain Peak at 4330 m. The part of SNE excluding the White–Inyo Mountains Subregion (W&I) supports primarily a mosaic of sagebrush steppe, pinyon/juniper woodland, and cottonwood–dominated riparian vegetation. There are also extensive areas of Jeffrey–pine forest in the Mono Craters area, subalpine fir/pine forest on Glass Mountain (3400 m), and alpine vegetation at the top of the Sweetwater Mountains (3550 m). SNE extends along the eastern edge of the Sierra Nevada Region (SN) to the southern limit of Owens Valley and W&I, where there is a gradual transition to the Mojave Desert Region (DMoj) and its scrub vegetation dominated by creosote–bush and burro–weed. To the east of the junction of the White and Inyo mountains at Westgard Pass lies a low (1500–2000 m) outlier of SNE that includes the Deep Springs and Fish Lake valleys.

The boundary between SNE and CA–FP along the eastern edge of the Sierra Nevada Region (SN) is generally defined by an indefinite break between either upper montane (red–fir/lodgepole–pine) forest or Jeffrey–pine forest on the CA–FP side and either pinyon/juniper woodland or sagebrush scrub on the SNE side. As noted above, there is also Jeffrey–pine forest in SNE, e.g., Mono Craters area. In some places the boundary is indefinite and is approximated by U.S. Highway 395; south of Bishop, the boundary lies to the west of that highway, farther up the east slope of the Sierra Nevada.

White and Inyo Mountains Subregion (W&I). The White–Inyo Range is considered a separate subregion because it supports subalpine bristlecone–pine and limber–pine woodlands as well as unique, treeless, alpine vegetation. (White Mountain Peak 4330 m; Inyo and Waucoba peaks both \pm 3400 m).

Desert Province (D)

The Desert Province of southeastern California encompasses the Mojave Desert Region (DMoj) and Sonoran Desert Region (DSon). This province lies east of CA–FP and south of GB. A matrix of scrub vegetation dominated by creosote–bush and burro–weed occurs throughout much of the lowlands, with saltbush scrub characteristic of alkaline basins.

The boundary of D with SNE, in the north, is the transition from sagebrush scrub or pinyon/juniper woodland (GB) to scrub vegetation dominated by creosote–bush and burro–weed (D). Deep Springs and Fish Lake valleys are in GB; Eureka and Saline valleys are in D. Southward, the mixed vegetation of Owens Valley is included in SNE. South of Owens Valley, the provincial boundary lies between chaparral or pinyon/juniper woodland on the CA–FP side, and

vegetation dominated by Joshua–tree or creosote–bush and burro–weed on the D side. Montane vegetation of adjacent areas in the southeastern Sierra Nevada (se SN), northeastern Transverse Ranges (ne TR), and eastern Peninsular Ranges (e PR) tends to grade into desert vegetation on the lower slopes of these mountains. Some taxa are limited to this interface, which may be specified as "w edge D", "w edge DMoj", or "w edge DSon", as appropriate. In Riverside County, San Diego County, and southwesternmost Imperial County, the Santa Rosa, Volcan, Laguna, and Jacumba mountains make up the eastern edge of, and are included within, CA–FP.

Mojave Desert Region (DMoj). This region, occupying the northern two–thirds of the Desert Province (D), exhibits greater temperature ranges and more extreme elevational relief than the Sonoran Desert (DSon) to the south. Joshua tree and Mojave yucca are conspicuous, widespread members of Mojave Desert (DMoj) vegetation that are absent from the Sonoran Desert (DSon).

Desert Mountains Subregion (DMtns). Although the entire Mojave Desert Region (DMoj) is a series of mountains and intervening (often wide) valleys, some ranges reach sufficient elevation to support pinyon/juniper woodland vegetation and are therefore recognized as a distinct subregion, the Desert Mountains (DMtns). These high ranges include the Last Chance, Grapevine, Panamint, Coso, Argus, Kingston, Clark, Ivanpah, New York, Providence, Granite, Old Woman, and Little San Bernardino (discussed below) mountains. Four of these ranges (Panamint, Kingston, Clark, and New York mountains) also support white fir or limber pine at their highest elevations. The Desert Mountains (DMtns) have unique elements but also overlap floristically with pinyon/juniper woodland vegetation of the adjacent California Floristic Province (CA–FP). Some of the eastern Desert Mountains (e DMtns) support taxa that occur more widely, in the Desert Province (D) or Great Basin Province (GB) outside of the state, but are otherwise unknown in California.

The Little San Bernardino Mountains, across Morongo and Yucca valleys from SnBr (of TR, CA–FP) and mostly included in Joshua Tree National Park, are included as part of the Desert Mountains Subregion (DMtns) of D because the vegetation in this range is more similar to D than to SnBr.

Sonoran Desert Region (DSon). The Sonoran Desert, the California portion of which is also known as the Colorado Desert, occupies the southern one–third of D, south of DMoj. The physiographic line separating the two desert regions is not always clear, but overall DSon is lower, warmer, and somewhat distinct floristically. Conspicuous members of the flora in DSon that are absent from DMoj or confined to the southeastern limits of DMoj include blue palo verde, ocotillo, chuparosa, and ironwood.

The approximate boundary between DMoj and DSon, from west to east, is along the south edge of the Little San Bernardino, Cottonwood, and Eagle mountains (all in DMoj), then north along the eastern edge of the Coxcomb Mountains (DMoj) and around the Old Woman, Turtle, and Chemehuevi mountains (all in DMoj) to the Colorado River. The Chuckwalla and Whipple mountains are in DSon.

Outline of Hierarchical System

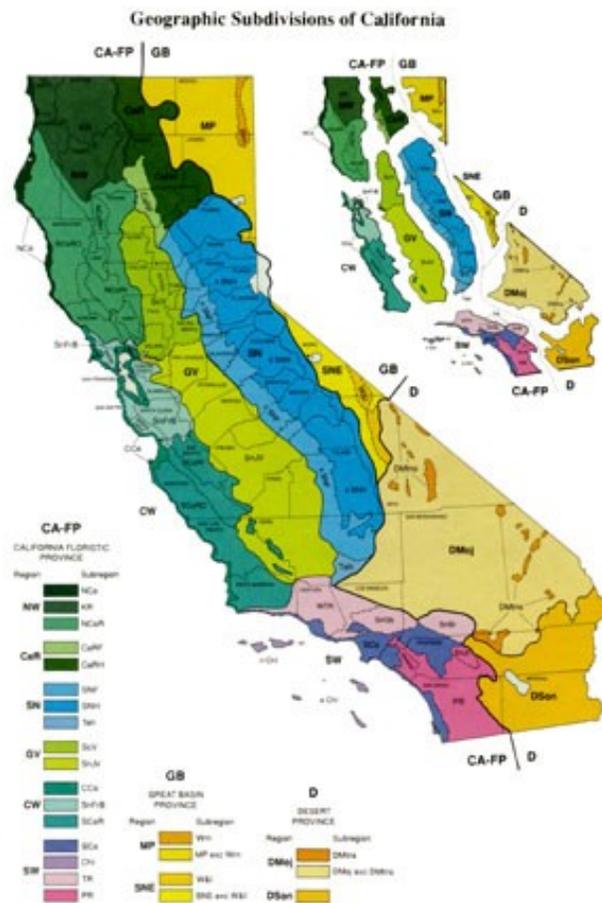
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Provinces
  Regions
    Subregions
      Districts

CA–FP CALIFORNIA FLORISTIC PROVINCE
  NW Northwestern California
    NCo North Coast
    KR Klamath Ranges
    NCoR North Coast Ranges
    NCoRO Outer North Coast Ranges
    NCoRH High North Coast Ranges
    NCoRI Inner North Coast Ranges
  CaR Cascade Ranges
    CaRF Cascade Range Foothills
  
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- CaRH High Cascade Range
- SN Sierra Nevada
 - SNF Sierra Nevada Foothills
 - n SNF northern Sierra Nevada Foothills
 - c SNF central Sierra Nevada Foothills
 - s SNF southern Sierra Nevada Foothills
 - SNH High Sierra Nevada
 - n SNH northern High Sierra Nevada
 - c SNH central High Sierra Nevada
 - s SNH southern High Sierra Nevada
- Teh Tehachapi Mountain Area
- GV Great Central Valley
 - ScV Sacramento Valley
 - SnJV San Joaquin Valley
- CW Central Western California
 - CCo Central Coast
 - SnFrB San Francisco Bay Area
 - SCoR South Coast Ranges
 - SCoRO Outer South Coast Ranges
 - SCoRI Inner South Coast Ranges
- SW Southwestern California
 - SCo South Coast
 - ChI Channel Islands
 - n ChI northern Channel Islands
 - s ChI southern Channel Islands
 - TR Transverse Ranges
 - WTR Western Transverse Ranges
 - SnGb San Gabriel Mountains
 - SnBr San Bernardino Mountains
 - PR Peninsular Ranges
 - SnJt San Jacinto Mountains
- GB GREAT BASIN PROVINCE
 - MP Modoc Plateau
 - Wrn Warner Mountains
 - SNE East of Sierra Nevada
 - W&I White and Inyo Mountains
- D DESERT PROVINCE
 - DMoj Mojave Desert
 - DMtns Desert Mountains
 - DSon Sonoran Desert (also known as Colorado Desert)

Map with Unit Boundaries 



(click map to enlarge)
[Bigger version](#)

Herbarium Material

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Because most of the research associated with production of TJM2 is being undertaken more or less simultaneously by a large number of Contributors, it may not be possible for Authors to borrow all pertinent material from the major herbaria in California. Since the three largest herbaria in California are at the California Academy of Sciences (CAS) in San Francisco, Rancho Santa Ana Botanic Garden (RSA) in Claremont, and the University of California, Berkeley (UC/JEPS), we ask that you visit Claremont and/or the Bay Area during preparation of your treatment to personally consult specimens. We can help with arrangements to visit the Bay Area.

You should also consider visiting or borrowing specimens from the following herbaria, with special areas of coverage indicated: Humboldt State University (HSC), for northwestern California; California State University, Chico (CHSC), for northern and central California; UC Riverside (UCR), San Diego State University (SDSU), and San Diego Natural History Museum (SD) for southern California, including the deserts; and UC Santa Barbara (UCSB), Santa Barbara Botanic Garden (SBBG), and California Polytechnic State University, San Luis Obispo (OBI) for central California.

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University and Jepson Herbaria
1001 Valley Life Sciences Building, #2465
The University of California, Berkeley
Berkeley, CA 94720-2465

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California Academy of Sciences
Golden Gate Park
San Francisco, California 94118-4599
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RSA
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1500 North College Avenue
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HSC
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CHSC
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California State University
Chico, California 95929-0515
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Contact Phone: [1] 530/ 898-5381.
Fax: [1] 530/ 898-4363.
URL: <http://www.scuchico.edu/biol/Herb/index.html>; www.scuchico.edu/biol/Herb/database.html
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UCR

Address Herbarium, Botany and Plant Sciences Department
University of California
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SD

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UCSB

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Contact Phone: [1] 805/ 893-2506.
Fax: [1] 805/ 893-4724.
Correspondents Jennifer Thorsch, thorsch@lifesci.ucsb.edu

SBBG

Address Herbarium
Santa Barbara Botanic Garden
1212 Mission Canyon Road

Santa Barbara, California 93105
U.S.A.

Contact Phone: [1] 805/ 682-4726.

Fax: [1] 805/ 563-0352.

URL: <http://www.sbbg.org>

Correspondents Steven A. Junak, [1] 805/ 682-4726.

OBI

Address Robert F. Hoover Herbarium, Biological Sciences Department
California Polytechnic State University
San Luis Obispo, California 93407
U.S.A.

Location: 352/359 Fisher Hall.

Contact Phone: [1] 805/ 756-2043.

Fax: [1] 805/ 756-1419.

Correspondents David J. Keil, dkeil@calpoly.edu

Annotations

All herbarium specimens examined in the preparation of treatments should be properly annotated. Labels should be of archival quality, and should indicate that data from the specimen were included in TJM2.

Illustrations

Instructions concerning illustrations will be available in fall of 2004.

Taxa of Notable Occurrence

In designating taxa of notable occurrence in TJM2, reference will be made to the presence of that taxon on a formal list (federal, state, or CNPS) by use of one of two general symbols (except for toxic plants, discussed below) placed immediately after the morphological description in your treatment, one ("SYMBOL 1" in your manuscript) for plants of restricted occurrence (e.g., endangered or threatened plants) and another ("SYMBOL 2" in your manuscript) for those of troublesome occurrence (e.g., aggressive or noxious plants). Indications of specific legal status will not be made in print because of the frequency with which such designations change. Instead, the presence of a symbol will direct users to online, frequently updated versions of the [Inventory of Rare and Endangered Vascular Plants of California \(California Native Plant Society\)](#), and the [California Natural Diversity Database](#), for plants of restricted occurrence, or to the [Noxious Weed Information Project \(California Department of Food and Agriculture\)](#), and the [California Invasive Plant Council](#) for plants of troublesome occurrence. Consider carefully and bring to the attention of the relevant agency/organization instances in which your research suggests changes in or additions to these resources. A copy of correspondence should also be submitted along with your treatment.

Regarding plants of troublesome occurrence, it should be noted that not all taxa included in your treatments that are problematic or that have the potential to become so will be listed by the Noxious Weed Information Project or the California Invasive Plant Council (referenced above). Whereas we are including in TJM2 plants that are naturalized outside of cultivation in California, in general a taxon has to have invaded wildlands to be included in these lists. Therefore, taxa in your treatments that occur in disturbed places, such as roadsides, railroad embankments, and construction sites, but that have not yet been documented for relatively natural habitats, may be aggressive, noxious, or potentially invasive and yet not formally listed as such. For these taxa, instead of indicating "SYMBOL 2" (as instructed under "Descriptions and Associated Matter") for formally listed taxa, a note should be included instead: for example, for

Dittrichia graveolens, "Increasingly problematic, potentially threatening to agriculture, livestock, and wildlands; noxious, possibly causing contact dermatitis; under consideration for listing by CDFA and Cal-IPC (as of 27 October 2004)".

Designations used in TJM (e.g., "**PRESUMED EXTINCT**", "**PRESUMED EXTIRPATED in CA**", "**RARE**", "**ENDANGERED CA, US**", "**THREATENED CA**", "**RARE CA**", "**RARE in CA**", "**UNCOMMON**", **NOXIOUS WEED**) will not be used in TJM2. However, as in TJM, plants that are known or strongly suspected to be toxic to humans, livestock, or pets will be designated as "**TOXIC**" in TJM2.

In TJM2, the following terms are to be used (in lower-case typeface) to indicate taxa for which the likelihood of encounter in California is substantially less than or greater than average: extinct, extirpated, rare, uncommon, common, abundant (see also "Species" under "Descriptions and Associated Matter").

Computer and Network Issues

To eliminate the need to re-type parts of treatments that will not be changed from TJM1 to TJM2, we are providing to Authors extracted versions of the keys and descriptions from TJM1 (with subsequent additions, e.g., flowering times, distributions, from the Desert Manual and the Interchange), to be modified or augmented as necessary. We are providing a separate file (keys and descriptions) for each genus. Some Authors will be writing treatments for taxa that were not included in TJM1. It may be most efficient for them to use as a template one of the descriptions that we provide (see also the description for *Lonicera* taxa below).

Software requirements.

Any editing program that has the ability to save a document as text may be used. The treatments that we provide are text files with explicit tags marking logical sections. This procedure will allow us to use the same source document for both the printed Manual and the online Manual and will allow us to identify changes relative to TJM1.

Keys:

See the example for *Lonicera* below.

- Put each key lead on its own line (end of line defined by a hard carriage return).
- Do not break lines internally with hard carriage returns. You may indent the leads if you wish. Indicate the taxon name with 5 dots, a dash and a greater-than symbol (e.g.,-> *L. subspicata*).
- If a taxon appears in more than one place in a key, the total number of such places is to be indicated in parentheses immediately following the name of the taxon each time that name appears in the key (e.g.,-> *L. subspicata*(2)).

Descriptions:

See the example for *Lonicera* below.

- Each treatment for genus, species, or infraspecific taxon is placed in a separate paragraph (separated by a blank line).
- Each sentence in a paragraph is placed on a separate line (end of line defined by a hard carriage return).
- The first line of specific and infraspecific taxon paragraphs contains the words "native" or "introduced". The second line (first line of generic treatments) contains the name of the taxon, without the author.
- Subsequent lines are preceded by tags in upper case. These tags are crucial to the interpretation and subsequent printing of the file --- do not remove them. Some of the tags (e.g., LEAVES, INFLORESCENCE, FLOWER) will be abbreviated and incorporated into the printed treatment. Others (e.g., COMMON NAME:, TAXON AUTHOR:, DESCRIPTION:) serve as content markers and will not be printed, but they are necessary to properly interpret the text.

Formatting:

- Abbreviations: Note that certain common words are abbreviated in the keys and descriptions. Consult the section on abbreviations above for guidance.
- Font: Do not use font face or size to convey meaning.
- Italics: You may indicate italics for scientific names with underscore characters before and after the name: e.g., Lonicera. Do not italicize other words. It is not necessary to indicate boldface
- Blank lines: Use blank lines between descriptions of different taxa and between keys and descriptions. Don't use blank lines otherwise.

Symbols: If you use symbols, check to see that the symbols are preserved when the file is saved as text, and then provide a key explaining the symbols that you use, e.g.,

± = plus or minus

° = degree

× = times

— = em dash

- = en dash

If you do not use symbols, use the following characters:

+− (plus followed by hyphen) = plus or minus

° (ampersand followed by deg followed by semicolon) = degree

× (ampersand followed by times followed by semicolon) = times

--- (three hyphens) = em dash

-- (two hyphens) = en dash

Use straight quotation marks rather than "smart" or curly quotation marks.

Use a straight single quotation mark for single quotation marks, apostrophes, and prime signs.

EXAMPLES

LONICERA

COMMON NAME: HONEYSUCKLE

DESCRIPTION: Shrub, erect or twining.

LEAVES simple, entire, short-petioled; 1--2 pairs beneath infl often fused around st.

INFLORESCENCE: spikes, interrupted, at ends of branches, or fls paired on axillary peduncles and subtended by 0--2 sets of bracts.

FLOWER: calyx-limb 0 or gen 5-toothed, gen persistent; corolla 5-lobed, +- radial or strongly 2-lipped (4 upper lobes, 1 lower), tube pouched at base; ovary chambers 2--3.

FRUIT: berry, gen round.

SPECIES IN GENUS: +- 200 spp.: temp, subtrop N.Am, Eur, Asia, n Afr.

ETYMOLOGY: (Adam Lonitzer, German herbalist, 16th century)

REFERENCE: [Rehder 1903 Rep Missouri Bot Gard 14:27--231] 2 collections (Del Norte Co., Eldorado Co.) have purplish, apparently sterile, variously distorted fls with long, slender ovary/hypanthium; probably alien (key 7.).

NATIVE

LONICERA cauriana

TAXON AUTHOR: Fernald

DESCRIPTION: Shrub, erect, 3--9 dm; herbage puberulent (lvs ciliate).

LEAF 2--5 cm; blade oblong-ovate, ciliate, base tapered to petiole, tip round or obtuse.

INFLORESCENCE: fls paired; peduncles +- 2 mm, axillary; bracts 1—3, narrowly lanceolate, inner fused, tightly enclosing ovaries.

FLOWER: calyx-limb exerted from sheathing bracts; corolla 6—9 mm, yellowish, bell-shaped, weakly 2-lipped, divided halfway; anthers exerted; ovaries appearing fused because of sheathing bracts, style +- = corolla, glabrous.

FRUIT +- 8 mm, red; 2 calyces apparent in fr.

ECOLOGY: Uncommon. Bogs, wet meadows;

ELEVATION: 2200—3200 m.

BIOREGIONAL DISTRIBUTION: c&s SNH;

DISTRIBUTION OUTSIDE CALIFORNIA: also OR to AK, ID.

HORTICULTURAL INFORMATION: WET: 1, 2 & SHD: 15, 16.

NATURALIZED

LONICERA japonica

TAXON AUTHOR: Thunb.

COMMON NAME: JAPANESE HONEYSUCKLE

DESCRIPTION: Vine, climbing; herbage glabrous or soft-hairy.

LEAF gen 3—8 cm; blade oblong to ovate, base rounded, tip +- acute.

INFLORESCENCE: fls paired, each pair subtended by 2 lf-like bracts and 4 +- round bractlets that are +- 1/2 ovary length; peduncles short, axillary.

FLOWER: corolla 25—40 mm, strongly 2-lipped, white turning yellow, often tinged purplish, tube hairy; stamens, style and stigma exerted.

FRUIT black.

CHROMOSOMES: 2n=18.

ECOLOGY: Disturbed places;

ELEVATION: gen < 1000 m.

BIOREGIONAL DISTRIBUTION: CA;

DISTRIBUTION OUTSIDE CALIFORNIA: abundant in se US; native to Asia.

FLOWERING TIME: Spring and summer

Sporadic escape from cult.

LONICERA

1. Infl a peduncled pair of fls

2. Corolla > 25 mm; climbing vine.....-> *L. japonica*

2' Corolla < 20 mm; erect shrub

3. Ovaries of fl pair fused or appearing so

4. Corolla yellowish, weakly 2-lipped; bracts gen 1—3, narrowly lanceolate; ovaries and berries tightly enclosed by fused inner bracts, appearing fully fused.....-> *L. cauriana*

4' Corolla dark red, strongly 2-lipped; bracts 0 or minute; ovaries and berries fused +- 2/3.....-> *L. conjugialis*

3' Ovaries of fl pair obviously free

5. Bracts not leafy, not obscuring ovaries.....-> *L. tatarica*

5' Bracts leafy, forming a conspicuous involucre, +- enveloping ovaries.....-> *L. involucrata*

6. Pl gen < 9 dm; corolla yellow, tube +- wider upward; style and stigma well exerted; montane-> var. *involucrata*

6' Pl gen > 15 dm; corolla yellow, strongly tinged orange or red, tube cylindrical; stigma rarely exerted; coastal.....-> var. *ledebourii*

1' Infl a spike, gen +- interrupted --- twining or trailing shrubs

7. Ovary/hypanthium long, slender, gen sterile --- see note after generic description

7' Ovary/hypanthium short, round, fertile

8. Lf 5—10 cm; corolla 15—40 mm; infl a dense, short spike; upper lf pair fused around st; NW, CaR

9. Corolla orange, weakly 2-lipped; stamens and style little exerted.....-> *L. ciliosa*

9' Corolla +- yellowish white, strongly 2-lipped; stamens and style well exerted.....-> *L. etrusca*

- 8' Lf 1—8 cm; corolla gen < 15 mm; infl a +- long, interrupted spike; upper lf pair fused around st or not; widespread
10. Upper lf pairs fused around st; corolla hairy or not
11. Lvs gen with +- obvious stipules, at least toward infl; corolla glandular-hairy.....-> *L. hispidula* var. *vacillans*
- 11' Lvs without stipules; corolla glabrous.....-> *L. interrupta*
- 10' Upper lf pairs not fused around st; corolla often hairy.....-> *L. subspicata*
12. Lf < 2 × longer than wide; widespread (incl Santa Barbara Co.).....-> var. *denudata*
- 12' Lf 3—4 × longer than wide; WTR (Santa Barbara Co.).....-> var. *subspicata*

How to send in treatments

1. Save the file as text. In Microsoft Word, this means choosing "Save as" from the "File" menu panel, and then choosing "Plain text" or "Text only" (depending on the Word version) from the file type drop down menu.
2. After you have saved the treatment as a text file, examine the text file to ensure that it contains what you expect. In particular, are all symbols that you used properly represented?
3. Send in each treatment for a genus in a separate e-mail addressed to jepson_manual@lists.berkeley.edu.
4. Attach the file to the e-mail message.
5. In the subject line put "TJM2 " followed by the name of the family and the name of the genus: e.g., TJM2 Asteraceae Baccharis.

If these guidelines pose a problem, please contact Richard Moe (rlmoe@uclink4.berkeley.edu; 510-642-2465).

Review and Editing of Treatments

Treatments will be e-mailed to the Flora Project at jepson_manual@lists.berkeley.edu (contact Margriet Wetherwax, 510-643-7008, for arranging non-electronic submissions). Submissions will be acknowledged, and then reviewed and edited by JFP Editors, JFP Staff, or Family Editors for content as well as format. Treatments will be tested against specimens, and any resulting difficulties will be resolved with the Authors. Treatments of groups that have undergone substantial taxonomic change since TJM will be evaluated externally, by reviewers selected by Jepson Flora Project Editors.

Part II. Specific, Detailed Instructions about Treatments

Overall Guidelines

It is crucial that you study these instructions carefully, particularly treatments already published. Success of TJM2 depends on strict adherence to this design.

Common Problems

There were three common and serious problems with the draft manuscripts we received in preparing TJM. These had to do with:

1. Length. Length is of special concern because of the great number of taxa that we are committed to treating in a single volume (many more than were treated in TJM). Thus, it is absolutely necessary to be very selective about what is included. It is usually best to err on the side of inclusiveness initially, and then eliminate less important information after completing a first draft when you can better evaluate how data compare in this regard. You will have more control over what is included, and your treatment will therefore be better, if your treatments are of acceptable length before you send us the final manuscript.

Length of descriptions necessarily will vary from one group to another, depending on levels of complexity and difficulty of taxa. As a guide, consider the length of descriptions for your taxa as they were treated in TJM, together with the fact that we will be faced with the challenge of treating a greater number of taxa in essentially the same space.

Please consider the possibility of preparing and submitting detailed, thorough keys and descriptions for the online, floristic accounts first, without regard for length per se, and then reduced versions for publication in TJM2. This approach is not required but would benefit our development of expanded, on-line floristic materials to supplement TJM2.

2. Sequence and Comparability. There are a number of equally logical sequences that can be employed in presenting descriptive information. However, consistency is as important as logic; keys and descriptions of parallel construction (i.e., those employing exactly the same sequence of elements) are vastly superior to less organized ones because they facilitate comparison of key leads and descriptions of similar taxa, and so are much more easily and effectively used for identification (the primary function of this — or any — manual). The sequence you employ in your keys should depend on the relative importance of various characters, as well as on other factors, and will therefore differ to some extent from group to group. However, each of the two leads at any one dichotomy must be strictly parallel.

The sequence to be employed in descriptions (see "Descriptions and Associated Matter") will be uniform throughout TJM2, although the characters addressed will necessarily vary from group to group. An appreciation for the rationale used to develop an adopted sequence will enhance your ability to remember it; for example, descriptions of structures or parts of structures proceed from proximally to distally, and information about a whole structure is followed by that pertaining to its parts ("leaves opposite, petioled, blades cordate"). In using a computer to prepare your treatment, you might find it helpful to simply copy one properly constructed description for all taxa at a given position and rank (e.g., all genera within a family, all species within a genus), and then modify each of these templates as needed. This will also help insure that your descriptions are completely comparable (see below).

Within the limits indicated under "Length", as many key characters as possible should be addressed in the descriptions (for guidelines to be used in deciding what to include, see "Descriptions and Associated Matter").

3. Terms. As in the case of TJM, we are committed to producing a manual that is comprehensible to people who have not been formally trained in botany, and therefore we continue to avoid the use of obscure, highly technical terminology wherever possible. However, experience has shown that the concepts represented by some words not permitted in TJM simply cannot be efficiently and accurately conveyed any other way. Our general rule of thumb for the glossary to be used in TJM2 — as compared to the glossary used in TJM — has been to add a term only if the concept involved cannot be conveyed with one (or, rarely, two) other, more commonly understood words (as opposed to "one or a few" other, more commonly understood words in TJM). In TJM2, as in TJM, some special terms used in groups with unique or complex morphological structures (e.g., filament-column appendages in Asclepiadaceae in TJM) are to be defined in the descriptions at their first occurrence and not included in the glossary.

Keys

Success or failure of TJM2 will be dependent largely on the keys, which must allow for accurate identification without excessive expenditure of time and effort. The more distinguishing and easily determined a character is, the earlier in the key it should be addressed. Characters requiring detailed or destructive examination of the plants should be avoided or de-emphasized except where there is no other recourse. Vegetative and obvious floral characters should be included wherever possible.

Insofar as possible identification should not depend on possession of flowering and fruiting material simultaneously (unless both flowers and fruits are normally present simultaneously); that is, dependence should not shift from characters

of the flower in one lead to those of the fruit in another, or vice versa. In contrast to TJM, taxa requiring microscopic or submicroscopic examination to differentiate will be fully treated, as long as they represent biologically meaningful entities (see "Taxonomic Concepts").

Taxa will be arranged alphabetically, so information about relationships between them generally will have to be gleaned from the keys (one reason why keys should be as "natural" as possible). This will be especially true for subfamilies, tribes, subgenera, and sections, which will be included in keys to genera whenever appropriate (and only if their inclusion does not detract from easy identification), but which will not be formally described.

Because the best key characters are sometimes of little taxonomic importance, it will not always be possible in keys to satisfy the goals of identification and to convey information about relationships simultaneously. Conflicts between the two in construction of keys always must be resolved in favor of identification, since this is the primary concern in the construction of identification keys. This consideration does not extend to taxonomic concepts, wherein conflicts between ease of identification and "naturalness" (monophyly) of groups must be resolved in favor of adopting the most scientifically rigorous classification.

If a taxon appears in more than one place in a key, the total number of such places is to be indicated in parentheses immediately following the name of the taxon each time that name appears in the key. This number will be typeset, as in TJM1, as a superscript before the name. If a taxon appears in more than one group key, those group key numbers are to be indicated in parentheses immediately following the name of that taxon each time that the name appears in the key, e.g., (G1, G2). If both conditions prevail, the number of times a taxon appears in a key is to precede the numbers of groups in which the taxon appears, within the same parentheses. For example, in Asteraceae in TJM, *Lessingia* appears twice in the key to genera of Group 5, and once in the key to Group 6. Thus, in Group 5, "*Lessingia* (2; G6)" would be indicated, while in Group 6 "(G5)" would be indicated. The fact that a taxon appears in keys to more than one group was not indicated in TJM.

Taxa outside the group being keyed that are commonly confused with those plants may be included. In keys to species, the full species name (binomial) of a taxon from a different genus is to be spelled out.

If one of the leads of a dichotomy is shorter than the other, it is to be given first. To facilitate comparison, each pair of leads must be completely comparable as well as exactly parallel (i.e., the same features must be compared and contrasted, and they must be compared and contrasted in exactly the same order); the leads also should be as mutually exclusive as possible. As in TJM, unilateral statements (those included in one lead but without a comparable statement in the other) may be included at the end of the lead, and are to be set off with an em dash (or 3 hyphens). Characters should be treated in the order of decreasing importance to identification; those of equal importance should reflect the sequence used in the descriptions. In general, nouns will be followed by their modifiers.

In the foregoing and in other details (such as numbering, indenting, and punctuation) make your keys as much like those in existing treatments as possible. As in TJM, abbreviations will be used in the keys. In keys (and in descriptions as well), use the singular form of nouns whenever possible, but use plural when necessary. For example, in the phrase "If simple", "If" is being used in a general, conceptual sense, even though what is being described is the leaf of a taxon, and a taxon generally comprises many individual plants, each of which generally has multiple leaves. However, "If opposite" or "If alternate" is unclear, so the plural "lvs" is to be used instead. Bear in mind that relative terms, such as "large" versus "small", are unlikely to be useful to those unfamiliar with the taxa being compared; absolute, unambiguous descriptors should be used instead. Wherever possible, avoid use of words such as "generally" or "mostly", if necessary, by using additional couplets. If such words must be used, explain what is meant (e.g., whether "generally" means most taxa or most individuals; or whether "mostly" means most taxa, most individuals, or most of the surface of an individual plant or plant part). List any exceptional taxa.

Descriptions and Associated Matter

Authors of plant names will be cited only for taxa at the level of species and below. Citations will conform to the abbreviations used in the Author Index in the International Plant Names Index

(http://www.ipni.org/ipni/query_author.html). If the author's name you are citing does not appear in this Author Index, give the full name (including middle initials) in your treatments, indicating that the name does not appear in this Author Index, and we will provide the abbreviation. Only initials and abbreviated surnames will be followed by periods. In citations involving two or more authors the word "and" should be represented by an ampersand (&).

Vernacular or common names should be cited if they are in common use; they will not be invented for TJM2. Include only those that are well known or that have been listed in the Inventory of Rare and Endangered Vascular Plants of California (CNPS). As in TJM, more than one vernacular or common name may be included, as long as each satisfies the foregoing requirements (e.g., box-thorn and wolf-berry for *Lycium* species; rabbitfoot grass and annual beard grass for *Polygonum monspeliensis*). Format of common names will be verified and made consistent in the editing process.

Each sentence in a description, except the first, is to begin with a word or abbreviation entirely in upper case (e.g., ST, LF, INFL, FL, FR, SEED); use the singular form whenever possible (see above). With rare exceptions, nouns are to be followed by their modifiers. Information in descriptions pertaining only to members of a taxon (but not necessarily to all members of that taxon) occurring outside of California should be included between square brackets []. Characters should be addressed at the highest rank at which a particular condition is uniformly or nearly uniformly applicable. For example, if a condition applies to each member of a genus, it is to be included in the description of that genus and is not to be repeated in those of the included species.

Descriptions of all genera in the same family, of all species in the same genus, and of all infraspecific taxa in the same species must be completely comparable as well as exactly parallel, with two major exceptions. The first major exception is that if a particular character state occurs in the majority of lower-rank taxa (e.g., genera or species in a family), that state is to be indicated as generally applicable in the description of a higher-rank taxon (e.g., "LVS gen basal" for the family), and then the character involved needs to be addressed in descriptions of lower-rank taxa only in cases where the general character state is not applicable (e.g., "LVS basal and cauline" for a minority of included genera or species).

The second major exception to the rule stated above has to do with the repetition of key characters in descriptions. Characters addressed in keys, whether for all or only some taxa, should be addressed in the descriptions of all included taxa, except in larger, more complex taxa when doing so would result in descriptions that would exceed our limits (see "Length"). In deciding what to include in large, complex taxa, top priority should be given to including characters that distinguish similar, easily confused taxa, whether those characters are addressed in the key or not. Once this has been accomplished, decisions about what else to include and exclude in order to reach our limits are up to individual Authors, with one exception. Data that are not addressed in the keys or that do not otherwise convey diagnostic information, that simply "fill out" the descriptions or that would be included for the sole purpose of making each description at a given taxonomic level completely comparable to every other, should not be included in the treatments to be published in TJM2, but can be included in the online, floristic accounts. In fact, for the online accounts, any character addressed for any taxon at a given rank should be addressed for all taxa at that rank within the same, next higher-level taxon (e.g., all genera in a family, all species in a genus).

Descriptions of families should be as comparable and as parallel as possible, especially in cases of close relationship or morphological similarity.

A single reference to the literature may be given in square brackets as the last element in a paragraph containing the morphological description of a family or genus, but not of taxa at the level of species and below. In choosing a book or paper to cite, consider that the year of its publication and the number of relevant entries in its bibliography may be more informative than the actual subject matter of the work itself. For example, instead of citing a monograph of a particular genus that was published in 1940 (a common way of indicating a taxonomy with which an Author most closely agrees), it

would be more helpful to cite a paper on molecular phylogenetics published in 2004 that includes references to the 1940 monograph as well as to other taxonomic works, including ones more recent than 1940. Abbreviations of journal titles should conform to those adopted in BPH, except that periods will not be used. Refer to TJM for citation format.

Limited space will be given to items of special interest or importance, such as those having to do with chemistry, cytology, medicinal uses, and positive or negative economic significance; it is especially important that remaining taxonomic problems are noted, so as to maximize the extent to which they are resolved for future editions of The Jepson Manual. All such information should be included as the last item, but preceding any literature citation, in the paragraph containing the description.

Present material associated with the morphological descriptions in the order and manner given below (for details, especially those having to do with punctuation, refer to TJM).

Families

Scientific name. Common name. Contributor's name. Morphological description. Worldwide number of genera and species, distribution, and cultivated members. Reference, in square brackets.

Genera of more than one species, even if only one occurs in California

Scientific name. Common name (if one exists). Contributor's name (if different than family). Morphological description. Worldwide number of species and distribution. Etymology (e.g., person for whom genus was named, short biographical phrase, such as "Spanish botanist", years of birth, death, as appropriate; or Greek or Latin source words), in parentheses. Reference, in square brackets. Items of special interest or note (e.g., economic value, horticultural uses, taxonomic problems).

Genera of only one species

Scientific name. Common name (if one exists). Contributor's name (if different than family). No morphological description. "1 sp.". Etymology (e.g., person for whom genus was named, short biographical phrase, such as "Spanish botanist", years of birth, death, as appropriate; or Greek or Latin source words), in parentheses. Reference, in square brackets. Items of special interest or note (e.g., economic value, horticultural uses, taxonomic problems), unless more appropriate under species.

Species

Scientific name, with genus name abbreviated to initial letter, capitalized, and specific epithet, never capitalized. Author citation, abbreviated in conformance with the Author Index in the International Plant Names Index (http://www.ipni.org/ipni/query_author.html). "Naturalized", if appropriate, spelled out. Common name (if one exists). Morphological description. Chromosome number(s) (2n, including polyploids). Reference to presence on federal or state lists of taxa of restricted occurrence (use the phrase "SYMBOL 1")(indicated only for extremes or near extremes; see abundant, common, uncommon, rare, endemic, extinct, and extirpated), or an indication that the taxon is aggressive, invasive, or noxious (use the phrase "SYMBOL 2"). (see "[Taxa of Notable Occurrence](#)"). Habitat and range of elevation. Geographic distribution, in California and elsewhere (see "Abbreviations" and "Geography"). Flowering time (should be indicated for all angiosperms). Synonyms, in square brackets. Minor variants, intermediate individuals or specimens, and other items of special interest or note (e.g., economic value, horticultural uses, taxonomic problems). The horticultural information in TJM has been used to construct a horticultural database (http://ucjeps.berkeley.edu/interchange/hort_form.html). No horticultural information will appear in TJM2. If a taxon is included in the horticultural database, the horticulture symbol will appear at the end of the taxonomic treatment. Authors are encouraged to submit horticultural information; it will be included in the online database.

Infraspecific Taxa

If only one in California, "subsp." or "var." after species name and author citation, followed by epithet, in bold, author citation (if the taxon does not include type of the species), "Naturalized", if appropriate, spelled out, morphological description (of species and of characters distinguishing infraspecific taxon), and other associated matter in same manner and in same sequence as under species. If more than one infraspecific taxon in California, a separate paragraph for each, indented five spaces to "subsp." or "var." and followed by epithet and other matter as indicated above for single infraspecific taxon, except morphological description limited to characters diagnostic for infraspecific taxa.

Hybrids

True-breeding, stable hybrids (for definition, see "[Hybrids](#)" under Taxonomic Ranks) should be recognized and treated fully as taxa, following the format described for species. A hybrid name, if available, should be used. For example, \times Agropogon littoralis (Sm.) C. E. Hubb., for an intergeneric hybrid, and Q. \times acutidens Torrey for an interspecific (infrageneric) hybrid, with a multiplication sign (see [Symbols](#)) placed without a space before the name of an intergeneric hybrid, and before the epithet in the name of an interspecific (infrageneric) hybrid. If a hybrid name is not available, a hybrid formula, complete with author citations but otherwise abbreviated, as appropriate, and alphabetized, is to be used (e.g., *Salix aurita* L. \times *S. caprea* L.; *Polypodium vulgare* subsp. *prionodes* (Asch.) Rothm. \times subsp. *vulgare*).

Intergeneric hybrids indicated with hybrid names (e.g., \times Agropogon littoralis (Sm.) C. E. Hubb.) are to be treated under that name and reference to that treatment is to be indicated under each of the parental species.

Intergeneric hybrids indicated with hybrid formulas (e.g., *Agrostis stolonifera* L. \times *Polypogon monspeliensis* (L.) Desf.) are to be included in the genus of each parent; the first one alphabetically is to appear with the full treatment; the others with only a reference to the first one (e.g., "For treatment, see *Agrostis*").

Spontaneous, unstable hybrids that are not true breeding are not to be treated as taxa. If no discussion of them is to be included, they are to be indicated under each of the parents involved, whether they are in the same genus or not. For example, under *Quercus douglasii*, "Hybridizes with *Q. garryana*, *Q. john-tuckeri*, *Q. lobata*.", and under *Quercus garryana* "Hybridizes with *Q. berberidifolia*, *Q. douglasii*, *Q. lobata*." If some discussion is warranted, it is to be included under the parent appearing earliest in the book (the first one alphabetically, by genus name for intergeneric hybrids, or specific epithet for interspecific, or infrageneric, hybrids), and only a reference to that parent is to be included under the other parent(s). For example, under *Salix breweri*, "Hybrids with *S. lasiolepis* in Yolo Co. have lvs less hairy...", and then, under *Salix lasiolepis*, "Hybridizes with *S. breweri*."

Expected Taxa

Taxa that are expected in California, either as native or naturalized plants, but that have not yet been documented with properly deposited and curated herbarium specimens, are to be included in keys to terminal taxa but not treated otherwise. If the plant in question belongs to a genus not otherwise represented in California, it should be included in the key to genera; if it belongs to a family not so represented, it should be included in the key to families. Expected taxa are to be placed within square brackets. If comments are required, for example because the plant in question poses a serious threat, they are to be given as a numbered footnote at the end of the key involved.

Sequence of Characters

Listed in this section is the sequence of characters to be employed in morphological descriptions of flowering plants appearing in TJM2. Not all of the characters listed below will be addressed in each description. Some will be excluded by limitations discussed above (see "[Sequence and Comparability](#)" and "[Descriptions and Associated Matter](#)"). Within these limitations, all descriptions of genera within a family, species within a genus, and infraspecific taxa within a species should be as completely comparable as possible — the same characters, in the same order, should be addressed in each.

Each of the numbered headings below corresponds to one "sentence" in the description, the included elements may be separated by commas or, if necessary, semicolons. Examples are included in parentheses. Characters not mentioned below may be added to descriptions, at the end of the appropriate element. Minor adjustments to improve clarity or to save space, particularly in groups with special structures, may be made in the sequence below. However, they must be consistently applied. Measurements in meters, decimeters, centimeters, or millimeters refer to height or length if unspecified; measurements of width, diameter, or other dimensions are to be specified.

1. General

Habit (annual, perennial, shrub, tree)
 Size (height, size of mat)
 Shape (whole plant, crown)
 Density (whole plant, crown)
 Nutrition (green parasite, non-green parasite, saprophyte)
 Sexual system (monoecious, dioecious)
 Sap (milky, yellow)
 Surfaces (glabrous, hairy, glandular-hairy)
 Roots (tap, fibrous)
 Underground Stems (caudex, rhizome)

2. Whole Plant and/or Stems

Deployment (twining; prostrate, decumbent, ascending, erect)
 Number (branches from ground or above)
 Size (height, length; diameter)
 Shape (round, angled, winged)
 Texture (smooth, rough, sticky, waxy, chalky)
 Color
 Surfaces (glabrous, hairy, glandular-hairy)
 Shrub
 Number (branches from ground or above)
 Deployment (twining; prostrate, decumbent, ascending, erect)
 Size (height, length; diameter)
 Bark (texture, including patterns; color)
 Twigs (shape, texture, color, surfaces—all as above)
 Tree
 Trunk (number, if more than one; height; diam)
 Bark (texture, including patterns; color)
 Twigs (shape, texture, color, surfaces—all as above)

3. Leaves

Overall
 Number
 Compoundedness (simple; pinnately, palmately compound)
 Deployment (basal, cauline; orientation)
 Arrangement (alternate, opposite, whorled)
 Stipules
 Petioles
 Simple blades
 Size
 Overall shape
 Texture
 Base shape
 Tip shape
 Margins
 Depth of deepest divisions (relative to entire blade)
 Lobes (pinnate or palmate, number, shape)
 Teeth (number, coarseness, shape, orientation)
 Surface (hairiness, waxiness, color of upper, lower)
 Venation

Compound blades
 Size
 Overall shape
 Base shape
 Leaflets
 Size
 Overall shape
 Texture
 Base shape
 Tip shape
 Margins (as simple blades)
 Surface (as simple blades)
 Venation

4. Inflorescence

Scapose (indicate only if so)
 Type (cyme, panicle, raceme, spike, umbel, head)
 Time of appearance (relative to that of leaves)
 Length (including peduncle)
 Overall shape (flat-topped, round-topped)
 Flower number
 Flower distribution around axis (1 side, all sides)
 Blooming direction (bottom to top, top to bottom)
 Bulblets in bract axils (indicate only if so)
 Congestion (open, dense, open between dense clusters)
 Continuity (continuous, interrupted)
 Overall hairiness
 Peduncle
 Bracts
 Bractlets
 Pedicels

5. Flower

Sexuality
 Symmetry
 Receptacle or hypanthium (size, shape, degree of fusion to ovary)
 Sepals (number, fusion, orientation, size, shape, texture, margins, color, surface, venation, duration)
 Petals (as sepals)
 Stamens (as sepals)
 Filaments (as sepals)
 Anthers (as sepals)
 Pollen (only characters observable with naked eye or hand lens)
 Pistils
 Number
 Fusion (simple, compound)
 Ovary
 Position (superior, half inferior, inferior)
 Size
 Shape (including lobing)
 Chambers (number)
 Placentas (number, type)
 Ovules (number)
 Styles (number, fusion, orientation, size, shape, texture, margins, color, surface, venation, duration)
 Stigmas (as styles)

6. Fruit

Number per flower (unless 1)
 Type (follicle, capsule, berry, drupe)
 Dehiscence (circumscissile, septicidal; valve number)

Orientation
Size
Shape
Surface
Color

7. Seeds

Number, size, shape, surface, color

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