REQUEST FOR QUOTES

TAXONOMIC IDENTIFICATION AND ENUMERATION OF AQUATIC MACROINVERTEBRATES

Release Date: October 12, 2009
Proposal Submission Deadline: November 20, 2009

Nevada Division of Environmental Protection
Bureau of Water Quality Planning
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This Request for Quotes consists of 6 pages (including cover sheet and Table 1). In addition and provided as an attachment is the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT Level II) Standard Taxonomic Effort Levels (Nov 28, 2006)

REQUEST FOR QUOTE

TAXONOMIC IDENTIFICATION AND ENUMERATION OF AQUATIC MACROINVERTEBRATES

Date of Announcement: October 12, 2009

Deadline for Submittal of Quote: November 20, 2009

Background

The Nevada Division of Environmental Protection, Bureau of Water Quality Planning collects aquatic macroinvertebrates on a statewide basis to assess the aquatic health of the state's streams and rivers. The field work is performed using the "reach wide/composite" field protocols developed under U.S. EPA Western EMAP and U.S. EPA National Rivers and Streams Assessment-Wadeable Streams (NRSA).

We are currently seeking one laboratory to perform a 600 count taxonomic identification and enumeration for approximately 35-50 samples per year for a 3-year period. Preference will be given to those laboratories that historically have favorably performed this service for the Nevada Division of Environmental Protection.

A. Macroinvertebrates Scope of Work and Deliverables

- The selected laboratory will receive from the NDEP approximately 35-50 preserved and site-composited macroinvertebrate samples per year over a 3 year period (105-150 samples total). Enumeration and identification shall be at a 600-organism count per sample. If 600 organisms are not contained within the sample, then the complete sample will be identified and enumerated.

- Identification levels will be, at the minimum, the taxonomic effort provided in the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) Level II (attached as separate file). In addition, Table 1 below provides an overview of the SAFFIT Level II taxonomic level of effort, however, laboratories should refer directly to the SAFFIT document attached to this proposal for bidding and macroinvertebrate identification clarification.

- The laboratory shall provide the NDEP with an updated electronically submitted Laboratory Quality Assurance and Quality Control document.

- The NDEP shall be advised immediately by email or written notification if samples posses any known "invasive" such as New Zealand mud snails and/or quagga mussels and/or zebra mussels.

- Completed identified samples are to be placed into vials (vouchers) containing 90% ethanol, separated by taxon and sample site, labeled with NDEP's site identification number, organism identification and number of organisms in the vial and the year collected. The vouchers are to be returned to NDEP before payment of services will occur.

- In addition, a reference collection for each individual year shall be supplied to NDEP upon completion of that year's identification. The reference collection shall consist of preserved specimens identified and labeled to the appropriate SAFFIT Level II.

- Sample remnants (un-analyzed) may be disposed of by the laboratory upon completion of the laboratory QAQC procedures.

- Empty macroinvertebrate sample containers originally delivered to the laboratory are to be returned to NDEP along with the vouchers, reference collections and final identification and enumeration results.

- The state is currently in the process of having laboratory macroinvertebrate identification and enumerations uploaded directly into the state's Ecological Data Application System (EDAS). Please be advised that the laboratory will be required to supply the state with an electronic format applicable (with minimal format changes) for upload into that system once it is developed. This is expected to occur within the next 1 year. Until such time, results of the enumeration and identification of all samples will be provided to the state in electronic Microsoft Excel spreadsheet format including standard index calculations, unless other arrangements are made. A hard copy to the state shall also be provided.

B. Macroinvertebrate Project Time Period for Deliverables

At a minimum, ½ of a given year samples will be identified enumerated and the results submitted to the state within the first six months of the delivery date of the samples to the laboratory. The remaining samples will be identified, enumerated and the results submitted to the state the following 3 months of the contract period for an overall laboratory process period not to exceed 9 months. Each year will follow the same progression with a total contract period of 3 years.

C. Macroinvertebrate Field Sample Collection Methodology

Samples are collected primarily in the late spring through late summer months using a D frame 500 micron net. The samples are stored in 95% ethanol. Each sample consists of a composite of 11 transects and are only slightly cleaned with the removal of large debris and rocks in the field. General sample size is approximately 1 liter including ethanol; however, this can vary depending on the sample site.

D. Macroinvertebrate Quote/Proposal Content

1. Project Title

2. Name of Organization, Address and Contact Information

3. Provide General Organization Background Information

4. Scope of Work and Deliverables:
   a. Describe each major task and each deliverable and your understanding of this proposal request.
   b. Describe and give an example of the electronic and hardcopy format of the taxonomic results that will be delivered to the state. Please state the ability of your lab to provide EDAS acceptable formatted spreadsheets to the NDEP. Metrics do not need to be included in the EDAS compatible format.
   c. Include the minimum level of taxonomic effort the applicant is willing to provide.

5. Standard Operating Procedures (SOP): Describe in detail the applicants SOP and QA/QC procedures.

6. Schedule: Provide a time schedule for deliverables to the state.

7. Budget: Include an overall budget for the entire macroinvertebrate project based on 50 macroinvertebrate samples per year. Breakdown to the cost per sample per year. The budget may include a % increase for subsequent year analysis (e.g. Year 2010-2011 samples etc.). However, show the year and the cost per sample increase per year.

8. Project Management and Key Personnel: Describe your management structure and organization.

9. Qualifications: State applicant's qualifications for both management and laboratory personnel. Identify any subcontractors and provide their qualifications, references and contact information.

10. References: Provide a list of several previous clients that the laboratory has preformed macroinvertebrate identification. Include the clients contact information including name, address, phone number and e-mail address.

11. <u>Private (non-government) Laboratories must submit verification of the following with the proposal:</u>
    a. Commercial General Liability Insurance with a standard minimum limit of $1,000,000 per occurrence and $2,000,000 general aggregate.
    b. Verification of Workers' Compensation Insurance or a statement of the organizations intent to supply an affidavit of Rejection of Workers' Compensation Insurance Coverage.

E. Selection and Notification Process

The process for selecting the applicants will be determined based on:

- The applicants' level of knowledge, experience, references and qualifications for conducting taxonomic identification of macroinvertebrates and/or periphyton.
- Laboratory Standard Operating Procedures and QA/QC protocols
- Budget based on a per sample basis and the ability to meet contract deadlines
- Taxonomic Effort
- Availability of resources and staff to successfully complete taxonomic identification to laboratory standard operating procedures
- A sample copy of the format that will be used for submittal of sample results to the state
- Previous laboratory identification contracts with the State of Nevada, Division of Environmental Protection and/or recommendations.

The selection and notification process will be completed within 20 working days following the close of the proposal deadline. Notification of the laboratories selected will be through e-mail unless a different method is requested by the laboratory. Upon notification, the applicant will submit a final copy of the proposal for the contract process. The state reserves the right to clarify items in the proposal providing both parties agrees. In the event, the applicant and the State of Nevada are unable to agree to the terms of the contract, the state reserves the right to disqualify the consultant and select another consultant or reissue the request for quote.

Once selection has occurred, the state contract process generally takes approximately 2-3 months to complete.

Quotes/proposals will be accepted by hard copy and/or electronic email to the contact person and address provided below.

Nevada Division of Environmental Protection
Bureau of Water Quality Planning
Attn.: Karen Vargas, Environmental Scientist
901 S. Stewart St., Suite 4001
Carson City, NV 89701

Or e-mail proposal to:
kvargas@ndep.nv.gov
Phone: (775) 687-9457

Table 1: Taxonomic Standard Level of Effort SAFFIT Level II

Classification		Standard Effort SAFFIT Level II	Reference
Phylum Porifera		Phylum	Frost et al. (2001)
Phylum Cnidaria		Genus	Slobodkin & Bossert (2001)
Phylum Platyhelminthes		Class	Kolasa (2001)
Phylum Nemertea		Genus	Kolasa (2001)
Phylum Nemata		Excluded	
Phylum Nematomorpha		Excluded	
Phylum Entoprocta		Genus	Wood (2001)
Phylum Ectoprocta		Class	Wood (2001)
Phylum Mollusca		Genus/Species	Dillon (2006), Burch (1972) Nedeau et al (2006)
Phylum Annelida	1. Class Oligochaeta & Branchiobdella 2. Class Hirudinea 3. Class Polychaeta	1. Class 2. Genus 3. Species	See SAFFIT Pg. 29
Phylum Arthropoda: Subphylum Chelicerata,	Subclass Acari- Mites	Genus (where possible)	Smith et al. (2001)
Phylum Arthropoda: Subphylum Crustacea		Genus/Species	Rogers (2005)
Phylum Arthropoda: Subphylum Hexapoda	Class Collembola-Springtails	Excluded	
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Ephemeroptera-Mayflies	Species (where possible)	Edmunds and Waltz (1996)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Odonata-Damselflies/Dragonflies	Species (where possible)	Westfall & May (1996), Needham, Westfall & May (2000)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Plecoptera: Stoneflies	Species (where possible)	Stewart and Stark (2002)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Hemiptera (suborder Heteroptera)-True Bugs	Species	Polhemus (1996)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Megaloptera: Dobsonflies/Alderflies	Genus	Evans & Neunzig (1996)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Neuroptera: Spongillaflies	Genus	Evans & Neunzig (1996)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Trichoptera: Caddisflies	Species (where possible)	Wiggins (1996a)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Lepidoptera: Moths/Butterflies	Genus for Parapoynx & Petrophila, otherwise Order	Lange (1996)
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Coleoptera: Beetles	Species (where possible)	See SAFFIT Pg 136
Phylum Arthropoda: Subphylum Hexapoda: Class Insecta	Order Diptera	Genus (where possible)-Chironomidae to Genus	Merritt & Cummins (1996)

Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT)

List of Freshwater Macroinvertebrate Taxa from California and Adjacent States including Standard Taxonomic Effort Levels

28 November 2006

Austin Brady Richards and D. Christopher Rogers

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1.0 Introduction

The Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) is charged through its charter to develop standardized levels for the taxonomic identification of aquatic macroinvertebrates in support of bioassessment. This document defines the standard levels of taxonomic effort (STE) for bioassessment data compatible with the Surface Water Ambient Monitoring Program (SWAMP) bioassessment protocols (Ode, 2007) or similar procedures. The STE is based on our current understanding of macroinvertebrate taxonomy, and this document was prepared following the STE Rules (Rogers & Richards, 2006). This list includes aquatic taxa found in streams and lakes primarily in California as well as surrounding states and ecoregions. It must be emphasized that this document is grey literature, and does not supercede any peer-reviewed literature. This document is a compliation and distillation of data gleaned from the peer-reviewed literature, museum records, the input of various taxonomic experts, and the ABL database. Specialized references are suggested for some taxa, however this document is not a procedural guideline, but rather a list of defined, reproducible endpoints. For the latest version of the STE document and for other Bioassessment resources, visit the link on the California Aquatic Bioassessment Workgroup (CABW) website (www.dfg.ca.gov/cabw/cabwhome.html). At present, the link is under the heading "CAMLnet".

This STE list should not be interpreted as a comprehensive list of the aquatic macroinvertebrate fauna of the southwestern United States, although such a list is being developed by SAFIT. This STE list includes the macroinvertebrate taxa encountered in bioassessment samples as of the date of this revision, together with literature records from published taxonomic literature. The higher level taxa in this list (Phylum through Order) are organized hierarchically to reflect phylogenetic relationships, while Family through Species are listed alphabetically. The higher taxonomy of the Arthropoda is currently a subject of debate. Therefore, for this version of the STE List we have maintained a more traditional presentation of the superordinal tiers of the Arthropoda.

This information will be integrated into the SWAMP database and the California Environmental Data Exchange Network (CEDEN). Any suggestions for modifications of this list should comply with the STE Rules, and be sent to the attention of Austin Brady Richards, CDFG Aquatic Bioassessment Laboratory (arichards@csuchico.edu) or D. Christopher Rogers, EcoAnalysts, Inc. (crogers@ecoanalysts.com) or any member of SAFIT's Standard Taxonomic Effort committee (see STE Rules, sections 2.2 and 2.6).

For definitions of the terms used in this document, please refer to Appendix II of the Rules document.

1.1 Acknowledgments

We want to thank the SAFIT membership for their cooperation and their role with SSCWRP in formalizing SAFIT. We gratefully acknowledge SWAMP for support and funding in this endeavor. We especially would like to thank the following persons for reviewing sections of the STE list: Allison Brigham (Lepidoptera), Eric Chapman (Haliplidae), Doug Post (Dytiscidae), John Sandberg (Plecoptera), Joe Slusark (Ephemeroptera), Cheryl B. Barr (Byrrhoidea), William D. Shepard (Byrrhoidea), John T. Polhemus (Hemiptera), David E. Ruiter (Trichoptera), Andrew Rehn (Odonata), Rosser W. Garrison (Odonata), Norman Penny (Megaloptera and Neuroptera), Brian J. Krestian (Chironomidae); Rafael Mazor, Jonathan Lee, Tom King, Robert W. Wisseman, Dave Herbst and Michael Bogan of SNARL, and Peter Ode each provided detailed general reviews. We would like to thank Chris Rosamond, John Epler, Martin Spies and Peter S. Cranston for their input on the California and Nevada chironomid fauna. We would also like to thank Teresa Richards for her assistance with the formatting of this document.

2.0 Standard Taxonomic Effort

The goal of this document is to standardize levels of taxonomic effort among labs conducting the SWAMP bioassessment protocols or similar protocols. For benthic macroinvertebrate (BMI) datasets to be compatible, taxa need to be identified to a common, reproducible level, thus SAFIT defines levels of taxonomic resolution for all labs performing the SWAMP; i.e. the standard taxonomic effort or STE).

2.1 Rules for Developing a Standard Taxonomic Effort

Earlier versions of this document were developed by the predecesor of SAFIT, the California Aquatic Macroinvertebrate Laboratory Network (CAMLnet). During the recent reorganization of CAMLnet into SAFIT, SAFIT membership identified a need to formalize the rules for standardizing the reporting of taxonomic data used in bioassessment. This discussion led to the drafting of the first version of a rules document to accompany the STE (Rogers and Richards, 2006, herein after referred to as the STE Rules). This document defines SAFIT's rules for the validity of taxonomic names and provisional taxa, their use and reporting format in bioassessment datasets. The STE Rules document also outlines the procedures and criteria for subsequent revisions of the STE list with the proposed formation of an oversight committee for the STE.

2.2 Changes from the Previous Version

This STE has been entirely reconstructed since the previous version (revision 27 January 2003). Some text portions and standards have been taken from the

previous version (most notably the Acari section). Specific modifications include the format, updated taxonomy, the addition of habitat information (benthic, lotic vs. lentic and estuarine habitats), and distribution information for California and surrounding states. For many groups, this information is preliminary and is meant as supplemental to the taxonomic information given for each group. The tolerance values and functional feeding group information has been excluded from this document. Plans are underway to revise much of this work and include the information in a separate document.

2.3 The SAFIT Standard Taxonomic List

A practical level of standard effort is determined by cost-effectiveness of identification relative to effort. Obviously, cost-effectiveness is highly dependent on taxonomic skills, but it is also determined by the availability of accurate keys and peer reviewed literature, and the degree of special methodology (e.g., slide mounting) needed to identify taxa.

Some bioassessment programs use the availability of species keys to establish standard levels of effort, and for some taxonomic groups we do provide references to species keys where they exist and if they meet the requirements of the STE Rules. However, under the SWAMP, the objective is to identify all taxa to a relatively even level of taxonomic effort. At the time of the previous revision of this list, two levels of standard effort were defined. Level I roughly corresponds to genus level identifications for all groups (where possible) except for the Chironomidae which are taken only to family and monotypic taxa which may be taken to species. Level II roughly corresponds to species level identifications for most groups and genus level identification for the Chironomidae. Taxonomic levels of effort (and exceptions) are listed for each group.

3.0 Methods and Materials

We prepared a list of the benthic macroinvertebrates relevant to the SWAMP bioassessment protocols or similar procedures. All data was compiled based upon the standards presented in the Rules document. All accessible pertinent peer-reviewed literature was reviewed for relevant taxa and distributional records.

This document is grey literature, and does not supercede any peer-reviewed literature. It is a compliation and distillation of the peer-reviewed literature, museum records, the input of various taxonomic experts, and the ABL database, as follows the standards in the Rules document.

3.1 Habitat Information

The primary focus of this list is benthic macroinvertebrates. A few non-benthic taxa have been included and are marked as such. In future versions of this list, it is hoped that guidance on the taxonomy of all aquatic and semiaquatic invertebrates can be included. Basic habitat association (lotic, lentic and estuarine) has been include for the various taxa. This section is still under construction and will be further developed in subsequent revisions.

3.2 Geographic Scope

The STE began as a guidance document for California only. As the California Aquatic Macroinvertebrate Laboratory Network (CAMLNet) evolved into SAFIT, the area of coverage increased to include the Southwest in general. The STE has been expanded to include California and adjacent states. Washington was also included since many aquatic invertebrates have distributions ranging from California to Washington in the Cascade and Coastal Ranges. Some information has been given for distributions in Baja California as well. It is hoped that future revisions of this list will flesh out these distributions and add other sections of the southwest. All distribution information has been gathered from the peer-reviewed literature, museum records and the ABL database. Thus, this list is not meant to be a checklist for any of the groups therein, but simply a summary of available distributional information. Future revisions of the STE may include distributional updates based on bioassessment surveys and should not be taken as peer-reviewed published data by itself. This document is grey literature. We also stress that identifications should not be based solely on distribution.

3.3 Abbreviations in the STE list

CA=California, OR=Oregon, WA=Washington, NV=Nevada, AZ=Arizona, Baja=Baja California (at present this term doesn't distinguish between Baja California Norte and Baja California Sur); "X"=published distributional or habitat records, "?" unpublished, but known distributional or habitat records.

3.4 Life Stage Terminology

The information in the STE list primarily deals with those life stages of invertebrates that are aquatic. Some additional information is given for the terrestrial life stages. The term "larva" (plural: larvae) has historically been applied only to the immature, pre-pupal stage of holometabolous insects. However, in recent years, the term larva has also been applied to the immature or "nymph" stage of hemimetabolous insects. Both terms may appear in this document, although the compilers of this present edition prefer to reserve the name nymph for the immatures of hemimetabolous insect orders (Ephemeroptera,

Odonata, Plecoptera, Hemiptera) and use the name larva in association with the holometabolous orders (Megaloptera, Trichoptera, Lepidoptera, Coleoptera, Diptera).

4.0 Rare, Threatened and Endangered Species

Rare, threatened and endangered species are defined to include aquatic macroinvertebrate species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species), the California Endangered Species Act (CESA), and the California Environmental Quality Act (CEQA). This does not cover aquatic macroinvertebrate species listed under state law in adjacent states. Rare, threatened and endangered species are afforded various levels of protection under the aforementioned laws. Any individual, private company or agency that violates these laws may be subject to substantial fines, imprisonment, or both. Inclusion of names of rare, threatened and endangered aquatic macroinvertebrates in this document and the STE list is meant to be strictly informative and in no way authorizes collecting or harming these taxa without proper permits.

Rare species are species that may be given some protection under CEQA depending upon the action being reviewed under a specific CEQA document. These species typically are not protected, however they may at any time become listed under CESA or ESA.

Threatened species are species that are partially protected under CESA and ESA. While it is illegal to collect, harm, harass, or kill threatened species, some activities may still be legal (varying depending on the species) without the requirement of permits.

Endangered species are fully protected under CESA, CEQA and ESA. It is illegal to collect, harm, harass, or kill endangered species without the appropriate state Memorandum of Understanding and/or federal 10(A) 1(a) permits.

5.0 Literature Cited

Aquatic Bioassessment Laboratory. 2003. CAMLnet list of Californian macroinvertebrate taxa and standard taxonomic effort. Revision date: 27 January 2003. California Department of Fish and Game.

Rogers, D. C. and A. B. Richards. 2006. Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) Rules for Developing a Standard Level of Taxonomic Effort Draft Version I, 30 June 2006.

California Department of Fish and Game (DFG). June 2005. Special Animals. 53 pp.

Ode, P.R. 2007. Standard operating procedures for collecting benthic macroinvertebrate samples and associated physical and chemical data for ambient bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001. 45pp.

APPENDIX I

THE SAFIT STANDARD TAXONOMIC EFFORT LIST

Phylum: Porifera
Standard Effort Level I: Phylum
Standard Effort Level II: Phylum
Standard Taxonomic Reference: Frost et al. (2001)
Reviewed by:

The Porifera are generally identified using Frost et al. (2001). Poriferans are not typically enumerated as a quantitative part of benthic samples, as they are colonial and sessile. However, their presence in samples should be noted, as most species are indicators of clean, well oxygenated water.

Taxonomic Hierarchy	Habitat				Distribution						Literature Cited	Comments
Phylum	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Porifera	X	X	X	X	X	X	X	X	X	X	Frost et al. (2001)	

Literature Cited

Frost, T. M., H. M. Reiswig, and A. Ricciardi. 2001. Porifera. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press.

Phylum: Cnidaria
Standard Effort Level I: Genus
Standard Effort Level II: Genus
Standard Taxonomic Reference: Slobodkin and Bossert (2001)
Reviewed by:

Cnidarians are generally identified using Slobodkin and Bossert (2001). Fuller et al. (2006) and Mills and Sommer (1995) provide ecological information on *Cordylophora*.

	Taxonomic Hierarchy						Habitat				Distribution							
Phylum	Class	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
Cnidaria																		
	Hydrozoa																Slobodkin and Bossert (2001)	
		Hydroida															Slobodkin and Bossert (2001)	
			Hydrida														Slobodkin and Bossert (2001)	
				Hydridae													Slobodkin and Bossert (2001)	
					Hydra		X	X	X		X	X	X	X	X	X	Slobodkin and Bossert (2001)	
			Anthomedusae														Slobodkin and Bossert (2001)	
				Clavidae													Slobodkin and Bossert (2001)	
					Cordylophora		X	X	X	X	X	X	X			X	Fuller et al. (2006); Mills and Sommer (1995); Ruiz et al. (1997)	Non-native invasive species, in brackish and coastal freshwaters, but spreading inland
			Limnomedusae														Slobodkin and Bossert (2001)	
				Olindiadidae													Slobodkin and Bossert (2001)	
					Craspedacusta												Slobodkin and Bossert (2001)	
						Craspedacusta sowerbyi Lankester, 1880	X	X	X		X	X	X	X	X	X	Slobodkin and Bossert (2001)	

Literature Cited

Mills, C.E., and F. Sommer. 1995. Invertebrate introductions in marine habitats: two species of hydromedusae (Cnidaria) native to the Black Sea, *Maeotias inexspectata* and *Blackfordia virginica*, invade San Francisco Bay. Marine Biology 122:279-288.

Ruiz, G. M., P. Fofonoff, and A.H. Hines. 1999. Non-indigenous species as stressors in estuarine and marine communities: assessing invasion impacts and interactions. Journal of Limnology and Oceanography **44**(3, part 2): 950-972.

Slobodkin, L. B. and P. E. Bossert. 2001. Cnidaria. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 135-154.

Additional Sources of Information on Cnidaria

Fuller, P., E. Maynard, & D. Raikow. 2006. *Cordylophora caspia*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. Revision Date: 4/3/2006. Accessed 20 September 2006 at URL: http://nas.er.usgs.gov/queries/FactSheet.asp?SpeciesID=1060

Phylum: Platyhelminthes
Standard Effort Level I: Class
Standard Effort Level II: Class
Standard Taxonomic Reference: Kolasa (2001)
Reviewed by:

Platyhelminthes are identified only to class level using Kolasa (2001). Most characters for separating taxa are internal, and there is some confusion regarding the identity of many taxa. Many turbellarians cannot be accurately placed to order even by experts (Dr. John Holleman, personal communication).

Taxonomic Hierarchy		Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Platyhelminthes		X	X	X	X	X	X	X	X	X	X	Kolasa (2001)	
	Turbellaria	X	X	X	X	X	X	X	X	X	X	Kolasa (2001)	

Literature Cited

Kolasa, J. 2001. Flatworms: Turbellaria and Nemertea. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 155-180.

Phylum: Nemertea
Standard Effort Level I: Genus
Standard Effort Level II: Genus
Standard Taxonomic Reference: Kolasa (2001)
Reviewed by:

Freshwater nemerteans are monogeneric, and are identified using Kolasa (2001).

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Order	Family	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Nemertea					X	X	X		X	X	X	X	X	X	Kolasa (2001)	
	Enopla				X	X	X		X	X	X	X	X	X	Kolasa (2001)	
		Hoplonemertea			X	X	X		X	X	X	X	X	X	Kolasa (2001)	
			Tetrastemmatidae		X	X	X		X	X	X	X	X	X	Kolasa (2001)	
				Prostoma	X	X	X		X	X	X	X	X	X	Kolasa (2001)	

Literature Cited

Kolasa, J. 2001. Flatworms: Turbellaria and Nemertea. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 155-180.

Phylum: Nemata
Standard Effort Level I: excluded from benthic datasets
Standard Effort Level II: excluded from benthic datasets
Standard Taxonomic Reference: Poinar (2001)
Reviewed by:

Nematoda is now considered to be a junior synonym of Nemata Cobb, 1919 (Brusca and Brusca, 2003). Nematodes are typically left at phylum. The vast majority of freshwater nematodes are not large enough to be considered "macroinvertebrates". Typically, the only "macro" nematodes encountered in benthic samples are in the family Mermithidae, which are parasitic on dipterans and ephemeropterans. As they are parasites, they are of little ecological importance. (See STE Rules section 3.4.3)

Taxonomic Hierarchy	Habitat				Distribution						Literature Cited	Comments
Phylum	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Nemata	X	X	X	X	X	X	X	X	X	X	Poinar (2001)	Fresh and brackish; excluded from benthic datasets

Literature Cited

Brusca, R.C. and G.J. Brusca. 2003. Invertebrates, 2nd ed. Sinauer Associates, Sunderland, MA. 936 pp.

Poinar, G. O., Jr. 2001. Nematoda and Nematomorpha. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press: 255-295.

Phylum: Nematomorpha
Standard Effort Level I: excluded from benthic datasets
Standard Effort Level II: excluded from benthic datasets
Standard Taxonomic Reference: Poinar (2001)
Reviewed by:

Nematomorphans are typically excluded from CSBP bioassessment datasets. As they are parasites of terrestrial insects, and do not feed as free living adults, they are of little ecological importance (See STE Rules Section 3.4.3).

Taxonomic Hierarchy	Habitat				Distribution						Literature Cited	Comments
Phylum	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Nematomorpha	X	X	X		X	X	X	X	X	X	Poinar (2001)	excluded from benthic datasets

Literature Cited

Poinar, G. O., Jr. 2001. Nematoda and Nematomorpha. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 255-295.

Phylum: Entoprocta
Standard Effort Level I: Genus
Standard Effort Level II: Genus
Standard Taxonomic Reference: Wood (2001)
Reviewed by:

Entoprocta are generally identified using Wood (2001). Entoprocts are not typically enumerated as a quantitative part of benthic samples, as they are colonial and sessile. However, their presence in samples should be noted, as they are non-native invasive species in the western US (Eng, 1977), and are tolerant to a variety of organic pollutants, low oxygen, and high TDS (Wood, 2001).

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Phylum	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Entoprocta															Wood (2001)	Generally excluded from benthic datasets
	Urnatellida														Eng (1977)	
		Urnatellidae													Eng (1977)	
			Urnatella												Eng (1977)	
				Urnatella gracilis Leidy, 1851	X	X	X		X			X			Eng (1977)	

Literature Cited

Eng, L.L. 1977. The freshwater entoproct *Urnatella gracilis* Leidy, in the Delta-Mendota Canal, California. Wasmann Journal of Biology 39:56-62

Wood, T. S. 2001. Bryozoans. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 505-525.

Phylum: Ectoprocta
Standard Effort Level I: Class
Standard Effort Level II: Class
Standard Taxonomic Reference: Wood (2001)
Reviewed by:

Ectoprocta (formerly Bryozoa) are generally identified using Wood (2001). Ectoprocts are not typically enumerated as a quantitative part of benthic samples, as they are colonial and most taxa are sessile. However, their presence in samples should be noted, as they are indicators of clean, well oxygenated water.

Taxonomic Hierarchy		Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Ectoprocta												Wood (2001)	
	Phylactolaemata	X	X	X	X	X	X	X	X	X		Wood (2001)	

Literature Cited

Wood, T. S. 2001. Bryozoans. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press: 505-525.

Phylum: Mollusca
Standard Effort Level I: Genus
Standard Effort Level II: Genus/ Species
Standard Taxonomic Reference: Dillon (2006), Burch (1972), Nedeau et al. (2006)
Reviewed by:

The freshwater mollusks of western North America have a long and convoluted taxonomic history, with much confusion in the literature. Snails should be identified using Dillon (2006). Since the 1980s most workers have followed Burch's (1982, and various iterations thereafter) book on freshwater gastropods, wherein he made many taxonomic changes. However, Burch's work was not peer reviewed, nor published in the peer reviewed literature. For that reason, we follow Hubendick (1951) for the genus *Lymnaea*, Clarke (1981) for *Valvata*, Henderson (1929) for *Juga*, and Baker (1945) for the Planorbidae.

For the bivalves, the Burch (1972) keys remain the best available for the sphaericean clams. Freshwater mussels west of the continental divide are easily separated using Nedeau et al. (2006).

The freshwater snails, clams and mussels are ecologically significant, and their taxonomic relationships are poorly understood. Immature animals are not identifiable due to the tremendous amount of convergence in juvenile forms, and many groups cannot be identified beyond genus level without dissection. Non-native invasive species, particularly the asian clam, *Corbicula*, and the New Zealand Mudsnail, *Potamopyrgus* are ecological threats. Montana State University provides a webpage with useful information on the taxonomy and ecology of *Potamopyrgus*.

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Mollusca							X	X										
	Bivalvia						X	X										
		Palaeoheterodonta					X	X										
			Unionoida				X	X										
				Unionidae			X	X										

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	**Class**	**Subclass**	**Order**	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
					Anodonta		X	X										
						Anodonta californiensis Lea, 1852	X	X			X	X	X	X	X	X	Burch (1975); Nedeau et al. (2006)	
						Anodonta dejecta Lewis, 1875	X		X			X	X	X			Burch (1975); Nedeau et al. (2006)	Nedeau et al. (2006) treat this species as a form of A. californiensis
						Anodonta kennerlyi Lea, 1860	X	X				X	X				Burch (1975); Nedeau et al. (2006)	
						Anodonta nuttaliana Lea, 1838	X	X			X	X	X				Burch (1975); Nedeau et al. (2006)	
						Anodonta oregonense Lea, 1838	X		X		X	X	X	X			Burch (1975); Nedeau et al. (2006)	
					Gonidea		X	X										
						Gonidea angulata (Lea, 1838)	X	X			X	X	X	X			Burch (1975); Nedeau et al. (2006)	
				Margaritiferidae			X	X										
					Margaritifera		X	X										
						Margaritifera falcata (Gould, 1850)	X	X			X	X	X	X	X		Burch (1975); Nedeau et al. (2006)	
		Heterodonta					X	X										
			Veneroida				X	X										
				Corbiculidae			X	X										
					Corbicula		X	X			X	X	X	X	X	X	Hanna (1966)	Non-native invasive species
				Sphaeriidae			X	X	X									
					Musculium		X	X	X									
						Musulium lacustre (Müller, 1774)	X	X	X		X	X	X				Burch (1972)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	**Class**	**Subclass**	**Order**	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
						Musulium partumeium (Say, 1822)	X	X	X		X	X	X	X	X		Burch (1972)	
						Musulium secuirs Prime, 1851	X	X	X		X	X	X				Burch (1972)	
					Pisidium		X	X	X									
						Pisidium casertanum (Poli, 1795)	X	X	X		X	X	X	X	X	X	Burch (1972)	
						Pisidium compressum Prime, 1852	X	X	X		X	X	X	X	X	X	Burch (1972)	
						Pisidium conventus Clessin, 1877	X	X	X				X				Burch (1972)	
						Pisidium ferrugineum Prime, 1852	X	X	X				X				Burch (1972)	
						Pisidium idahoense Roper, 1890	X	X	X		X		X				Burch (1972)	
						Pisidium insigne Gabb, 1868	X	X	X				X				Burch (1972)	
						Pisidium lilljeborgi Clessin, 1886	X	X	X		X	X	X				Burch (1972)	
						Pisidium nitidum Jenyns, 1832	X	X	X		X	X	X	X	X		Burch (1972)	
						Pisidium rotundatum Prime, 1851	X	X	X				X				Burch (1972)	
						Pisidium subtruncatum Malam, 1855	X	X	X		X	X	X				Burch (1972)	
						Pisidium ultramontanum Prime, 1865	X	X	X			X	X				Burch (1972)	
						Pisidium variabile Prime, 1852	X	X	X		X	X	X	X	X		Burch (1972)	
						Pisidium ventricosum Prime, 1851	X	X	X				X				Burch (1972)	
						Pisidium walkeri Sterki, 1895	X	X	X						X		Burch (1972)	
					Sphaerium		X	X	X									
						Sphaerium nitidum Clessin, 1876	X	X	X				X				Burch (1972)	
						Sphaerium occidentale (Gould, 1850)	X	X	X			X	X				Burch (1972)	
						Sphaerium patella (Gould, 1850)	X	X	X		X	X	X				Burch (1972)	
						Sphaerium striatum (Lamarck, 1818)	X	X	X		X	X	X	X	X	X	Burch (1972)	
	Gastropoda						X	X	X									
		Prosobranchia					X	X	X									
			Architaenioglossa				X	X	X									
				Viviparidae			X	X	X									
					Bellamya		X	X	X									
						Bellamya chinensis (Gray, 1817)	X	X	X		X	X	X	X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
						Bellamya japonica (von Martens, 1861)	X	X	X		X	X	X	X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	**Class**	**Subclass**	**Order**	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
				Ampullariidae			X	X	X									
					Marisa		X	X	X									
						Marisa cornuarietis (Linnaeus, 1758)	X	X	X		X			X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
					Pomacea		X	X	X									
						Pomacea bridgesii (Reeve, 1856)	X	X	X		X			X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
						Pomacea canaliculata (Lamarck, 1828)	X	X	X		X			X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
						Pomacea paludosa (Say, 1829)	X	X	X		X			X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
			Neotaenioglossa				X	X	X									
				Thiaridae			X	X	X									
					Melanoides		X	X	X									
						Melanoides tuberculatus (Müller, 1774)	X	X	X		X			X	X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
					Tarebia		X	X	X									
						Tarebia granifera (Lamarck, 1822)	X	X	X		X				X		Perez et al. (2004)	Non-native invasive species
			Sorbeoconcha				X	X										
				Pleuroceridae			X	X										
					Juga		X	X										
						Juga acutifilosa (Stearns, 1890)	X	X			X	X	X				Perez et al. (2004); Dillon (2006)	
						Juga bulbosa (Gould, 1847)	X	X			X	X					Perez et al. (2004); Dillon (2006)	
						Juga nigrina (Lea, 1856)	X	X			X	X					Perez et al. (2004); Dillon	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2006)	
						Juga plicifera (Lea, 1838)	X	X			X	X	X				Perez et al. (2004); Dillon (2006)	
						Juga silicula (Gould, 1847)	X	X			X	X	X				Perez et al. (2004); Dillon (2006)	
					Goniobasis		X	X										
						Goniobasis hemphilli Henderson, 1935	X	X				X	X				Perez et al. (2004); Dillon (2006)	
			Hypsogastropoda				X	X										
				Hydrobiidae			X	X										
					Amnicola		X	X										
						Amnicola limosa (Say, 1817)	X	X			X	X	X	X			Perez et al. (2004)	
					Colligyrus		X	X										
						Colligyrus greggi (Pilsbry, 1935)	X	X				X					Perez et al. (2004); Dillon (2006)	
					Eremopyrgus		X	X										
						Eremopyrgus eganensis Hershler, 1999	X	X						X			Perez et al. (2004)	
					Fluminicola		X	X			X	X	X	X			Perez et al. (2004); Dillon (2006)	
					Ipnobius		X	X										
						Ipnobius robustus (Hershler, 1989)	X	X			X						Perez et al. (2004)	
					Potamopyrgus		X	X										
						Potamopyrgus antipodarum (Gray, 1843)	X	X			X				X		Perez et al. (2004); Dillon (2006)	Non-native invasive species
					Pristinicola		X	X										

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Pristinicola hemphilli (Pilsbry, 1890)	X	X			X	X	X				Perez et al. (2004); Dillon (2006)	
					Pyrgulopsis		X	X			X	X	X	X	X		Perez et al. (2004); Dillon (2006)	
					Tryonia		X	X	X	X	X			X	X		Perez et al. (2004)	
				Assimineidae			X			X	X							
					Assiminea		X			X	X							
						Assiminea californica (Tryon, 1875)	X			X	X						Perez et al. (2004)	
						Assiminea infima Berry, 1947	X			X	X						Perez et al. (2004)	
				Pomatiopsidae			X			X	X	X	X					
					Pomatiopsis		X			X	X	X	X				Perez et al. (2004)	
			Heterostropha				X	X	X		X	X	X					
				Valvatidae			X	X	X		X	X	X					
					Valvata		X	X	X		X	X	X					
						Valvata humeralis Say, 1829	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
						Valvata tricarinata (Say, 1817)	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
						Valvata virens Tryon, 1863	X	X	X		X						Perez et al. (2004); Dillon (2006)	
		Pulmonata																
			Basommatophora															
				Lymnaeidae			X	X	X		X	X	X	X	X	X		
					Fisherola		X	X	X									
						Fisherola nuttalli (Haldeman, 1841)	X	X	X			X	X				Perez et al. (2004); Dillon	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2006)	
					Lanx		X	X	X									
						Lanx patelloides (Lea, 1856)	X	X	X		X	X					Perez et al. (2004); Dillon (2006)	
					Lymnaea		X	X	X		X	X	X	X	X	X	Perez et al. (2004); Dillon (2006)	
				Physidae			X	X	X		X	X	X	X	X	X		
					Aplexa		X		X				X					
						Aplexa elongata (Say, 1821)	X		X				X				Wethington (2004); Dillon (2006)	
					Physa		X	X	X		X	X	X	X	X	X		
						Physa acuta Draparnaud, 1805	X	X	X		X	X	X	X	X	X	Wethington (2004); Dillon (2006)	
						Physa gyrina Say 1821	X	X	X		X	X	X	X	X	X	Wethington (2004); Dillon (2006)	
						Physa pomilia (Conrad, 1834)	X	X	X		X	X	X	X	X	X	Wethington (2004); Dillon (2006)	
				Ellobiidae			X	X	X		X	X	X					
					Ovatella		X	X	X		X	X	X					
						Ovatella myosotis (Draparnaud, 1801)	X	X	X		X	X	X				Hanna (1966)	Non-native invasive species
				Planorbidae			X	X	X		X	X	X	X	X	X		
					Biomphalaria		X	X	X						X			
						Biompholaria havanensis (Pfieffer, 1839)	X	X	X						X		Perez et al. (2004); Dillon (2006)	
					Gyraulus		X	X	X									

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Gyraulus circumstriatus (Tryon, 1866)	X	X	X		X	X	X	X	X		Perez et al. (2004); Dillon (2006)	
						Gyraulus crista (Linnaeus, 1758)	X	X	X		X	X	X	X			Perez et al. (2004); Dillon (2006)	
						Gyraulus deflectus (Say, 1824)	X	X	X		X	X	X	X	X		Perez et al. (2004); Dillon (2006)	
						Gyraulus parvus (Say, 1817)	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
					Helisoma		X	X	X									
						Helisoma anceps (Menke, 1830)	X	X	X		X	X	X	X	X	X	Perez et al. (2004); Dillon (2006)	
						Helisoma newberryi (Lea, 1858)	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
						Helisoma subcrenatum (Carpenter, 1857)	X	X	X		X	X					Perez et al. (2004); Dillon (2006)	Non-native invasive species
					Menetus		X	X	X									
						Menetus opercularis (Gould, 1847)	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
					Micromenetus		X	X	X									
						Micromenetus dilatatus (Gould, 1841)	X	X	X		X	X	X				Perez et al. (2004); Dillon (2006)	
					Promenetus		X	X	X									
						Promenetus exacuous (Say, 1821)	X	X	X			X	X				Perez et al. (2004); Dillon (2006)	
						Promenetus umbilicatellus (Cockerell, 1887)	X	X	X			X	X				Perez et al. (2004); Dillon	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Phylum	Class	Subclass	Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2006)	
					Vorticifex		X	X	X									
						Vorticifex effusa (Lea, 1856)	X	X	X		X	X					Perez et al. (2004); Dillon (2006)	
						Vorticifex solida (Dall 1870)	X	X	X		X			X			Perez et al. (2004); Dillon (2006)	may be a synonym of *V. effusa* (Lea)
				Ancylidae														
					Ferrissia		X	X	X		X	X	X	X			Perez et al. (2004); Dillon (2006)	

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New Zealand Mudsnails in the Western USA. Maintained by David Richards at Montana State University. Accessed 1 September 2006 at URL: http://www.esg.montana.edu/aim/mollusca/nzms/

Perez, K. E., S. A. Clark, and C. Lydeard. 2004. Showing your shells; a primer to freshwater gastropod identification. Freshwater gastropod identification workshop manual**:** 60 pp.

Phylum: Annelida
Standard Effort Level I: Class
Standard Effort Level II: Oligochaeta and Branchiobdella to class, Hirudinea to genus, Polychaeta to species.
Standard Taxonomic References: Kathman and Brinkhurst (1998), Brinkhurst and Gelder (2001), Klemm (1972), Foster (1972)
Reviewed by:

Annelids are generally identified using Kathman and Brinkhurst (1998) or Brinkhurst and Gelder (2001). Hirudinea can be identified using Davies and Govedich (2001), Klemm (1972) and Klemm (1995). Polychaetes are best identified using Foster (1972). Branchiobdella are typically excluded from CSBP bioassessment samples as they are commensals on crayfish (see STE Rules section 3.4.3).

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Subfamily	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Annelida																					
		Hirudinea																			
				Arhynchobdellida																	
						Haemopidae/Hirudinidae				X	X	X		X	X	X	X	X	X	Klemm (1972); Klemm (1995)	
						Erpobdellidae				X	X	X		X	X	X	X	X	X	Klemm (1972); Klemm (1995)	
								Dina						X	X						
								Erpobdella						X	X	X					
								Mooreobdella						X							
				Rhynchobdelida																	
						Glossiphoniidae				X	X	X		X	X	X	X	X	X	Klemm (1972); Klemm (1995)	
								Helobdella													

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Phylum	Subphylum	Class	Subclass	Order	Suborder	Family	Subfamily	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Placobdella													
						Piscicolidae				X	X	X		X	X	X	X	X	X	Klemm (1972); Klemm (1995)	
		Branchiobdella								X	X	X		X	X	X	X	X			
		Polychaeta																			
				Canalipalpata																	
						Serpulidae															
								Ficopomatus													
									Ficopotamus enigmaticus (Fauvel, 1922)	X	X	X	X	X					X	Foster (1972)	Fresh and brackish
						Sabellidae															
								Manayunkia													
									Manayunkia speciosa Leidy, 1858	X	X	X		X	X	X				Foster (1972)	
			Palpata																		
				Aciculata																	
					Phylodocida																
						Nereidae															
								Lycastoides													
									Lycastoides alticola Johnston, 1903	X	X			X						Foster (1972)	Only known from a single mountain stream in Sierra Laguna.
								Neanthes													
									Neanthes limnicola (Johnson, 1901)	X	X	X		X	X	X				Foster (1972)	
								Nereis													
									Nereis succinea Frey & Leuckart, 1847	X	X	X	X	X	X	X				Foster (1972)	Fresh and brackish

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Phylum	**Subphylum**	**Class**	**Subclass**	**Order**	**Suborder**	**Family**	**Subfamily**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
								Namanereis													
									Namanereis hawaiiensis (Johnson, 1903)	X	X	X		X						Foster (1972)	Native to Hawai'i, found in a pond in southern CA
			Scolecida																		
						Aeolosomatidae															
								Aeolosoma		X	X	X		X	X	X					
	Clitellata									X	X	X	X	X	X	X	X	X	X		
		Oligochaeta								X	X	X	X	X	X	X	X	X	X	Kathman and Brinkhurst (1998); Brinkhurst and Gelder (2001)	

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Klemm, D. 1972. Biota of Freshwater Ecosystems. Identification Manual No. 8. Freshwater Leeches (Annelida: Hirudinea) of North America. US Government Printing Office, Washington DC.

Klemm, D. 1995. Identification Guide to the Freshwater Leeches (Annelida: Hirudinea) of Florida and other Southern States. State of Florida, Department of Environmental Protection, Division of Water Facilities, Tallahassee.

Acari: Mites
Standard Effort Level I&II: Genus (where possible)
Standard Taxonomic Reference: Smith et al. (2001)
Reviewed by:

This section remains relatively unchanged since the previous revision of the STE. The standard text is the chapter in Thorp and Covich (Smith et al., 2001), which provides keys to mature and immature specimens. Cook (1974) is an excellent source for detailed illustrations to supplement the newer key. The information in the table below reflects material identified from benthic samples from California streams (primarily by the ABL and SNARL), and should not be taken as an authoritative list.

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Family	Subfamily	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Chelicerata						X										Smith et al. (2001), Cook (1974)	
	Arachnida					X										Smith et al. (2001), Cook (1974)	
		Acari				X										Smith et al. (2001), Cook (1974)	
			Anisitsiellidae			X										Smith et al. (2001), Cook (1974)	
					Bandakia	X										Smith et al. (2001), Cook (1974)	
					Utaxatax	X										Smith et al. (2001), Cook (1974)	
			Arrenuridae			X										Smith et al. (2001), Cook (1974)	
					Arrenurus	X										Smith et al. (2001), Cook (1974)	
			Aturidae			X										Smith et al. (2001), Cook (1974)	
					Aturus	X										Smith et al. (2001), Cook (1974)	
					Ljania	X										Smith et al. (2001), Cook (1974)	
					Woolastookia	X										Smith et al. (2001),	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Family	Subfamily	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																Cook (1974)	
			Eylaidae			X										Smith et al. (2001), Cook (1974)	
					Eylais	X										Smith et al. (2001), Cook (1974)	
			Feltriidae			X										Smith et al. (2001), Cook (1974)	
					Feltria	X										Smith et al. (2001), Cook (1974)	
			Frontipodopsidae			X										Smith et al. (2001), Cook (1974)	
					Frontipodopsis	X										Smith et al. (2001), Cook (1974)	
			Hydrodromidae			X										Smith et al. (2001), Cook (1974)	
					Hydrodroma	X										Smith et al. (2001), Cook (1974)	
			Hydrovolzidae			X										Smith et al. (2001), Cook (1974)	
					Hydrovolzia	X										Smith et al. (2001), Cook (1974)	
			Hydryphantidae			X										Smith et al. (2001), Cook (1974)	
					Cyclothyas	X										Smith et al. (2001), Cook (1974)	
					Partunia	X										Smith et al. (2001), Cook (1974)	
					Protzia	X										Smith et al. (2001), Cook (1974)	
					Thyas	X										Smith et al. (2001), Cook (1974)	
					Thyopsoides	X										Smith et al. (2001), Cook (1974)	
					Wandesia	X										Smith et al. (2001), Cook (1974)	
			Hygrobatidae			X										Smith et al. (2001), Cook (1974)	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Family	Subfamily	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Atractides	X										Smith et al. (2001), Cook (1974)	
					Corticacarus	X										Smith et al. (2001), Cook (1974)	
					Hygrobates	X										Smith et al. (2001), Cook (1974)	
			Lebertiidae			X										Smith et al. (2001), Cook (1974)	
					Estelloxus	X										Smith et al. (2001), Cook (1974)	
					Lebertia	X										Smith et al. (2001), Cook (1974)	
					Scutolebertia	X										Smith et al. (2001), Cook (1974)	
			Limnesiidae			X										Smith et al. (2001), Cook (1974)	
					Limnesia	X										Smith et al. (2001), Cook (1974)	
					Neotyrrellia	X										Smith et al. (2001), Cook (1974)	
					Tyrellia	X										Smith et al. (2001), Cook (1974)	
			Limnocharidae			X										Smith et al. (2001), Cook (1974)	
					Limnochares	X										Smith et al. (2001), Cook (1974)	
					Neolimnochares	X										Smith et al. (2001), Cook (1974)	
			Mideopsidae			X										Smith et al. (2001), Cook (1974)	
					Mideopsis	X										Smith et al. (2001), Cook (1974)	
			Momoniidae			X										Smith et al. (2001), Cook (1974)	
					Momonia	X										Smith et al. (2001), Cook (1974)	
					Stygomomonia	X										Smith et al. (2001),	

Acari

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Family	Subfamily	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																Cook (1974)	
			Nudomideopsidae			X										Smith et al. (2001), Cook (1974)	
					Nudomideopsis	X										Smith et al. (2001), Cook (1974)	
					Paramideopsis	X										Smith et al. (2001), Cook (1974)	
			Oxidae			X										Smith et al. (2001), Cook (1974)	
					Frontipoda	X										Smith et al. (2001), Cook (1974)	
			Sperchontidae			X										Smith et al. (2001), Cook (1974)	
					Sperchon	X										Smith et al. (2001), Cook (1974)	
					Sperchonopsis	X										Smith et al. (2001), Cook (1974)	
			Torrenticolidae			X										Smith et al. (2001), Cook (1974)	
					Pseudotorrenticola	X										Smith et al. (2001), Cook (1974)	
					Testudacarus	X										Smith et al. (2001), Cook (1974)	
					Torrenticola	X										Smith et al. (2001), Cook (1974)	
			Unionicolidae			X										Smith et al. (2001), Cook (1974)	
					Neumania	X										Smith et al. (2001), Cook (1974)	
					Unionicola	X										Smith et al. (2001), Cook (1974)	

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Smith, I. M., B. P. Smith, D.R. Cook. 2001. Water mites (Hydrachnidia) and other arachnids. Ecology and classification of North American freshwater invertebrates, second edition, xvi + 1056 pp. J. H. Thorp and A. P. Covich. San Diego, CA, Academic Press**:** 551-659.

Additional Sources of Information on Acari

Smith, Ian M., Evert E. Lingquist and Valerie Behan-Pelletier. 1998. Mites (Acari) in Smith, I.M., and GG. Scudder, Eds. Assessment of species diversity in the Montane Cordillera Ecozone. Burlington: Ecological Monitoring and Assessment Network, 1998. Accessed on-line 6 February 2007 at URL:
http://www.naturewatch.ca/eman/reports/publications/99_montane/mites/intro.html

Subphylum: Crustacea
Standard Effort Level I: Genus
Standard Effort Level II: Genus/Species
Standard Taxonomic Reference: Rogers (2005)
Reviewed by:

The Crustacea are best separated using the keys in Rogers (2005) and literature cited therein. Crustaceans are important in bioassessment: mysids, amphipods and isopods are sensitive to many pollutants and heavy metals, most crayfish and freshwater crabs are invasive species, and there are several state and federally protected species.

In Napa, Sonoma and Marin counties in California, many streams and rivers are occupied by the California Freshwater Shrimp (*Syncaris pacifica*), which is both a state and federally protected species. In temporary pools and streams in the Agate Desert area in southern Oregon, and California's Great Central Valley and the southern California coastal counties are five federally protected fairy shrimp and one federally protected tadpole shrimp. These animals are protected under the state and federal Endangered Species Acts and the California Environmental Quality Act. Any individual, private company or agency that violates these laws may be subject to substantial fines, imprisonment, or both.

Taxonomic Hierarchy									**Habitat**				**Distribution**						**Literature Cited**	**Comments**
Subphylum	**Class**	**Subclass**	**Superorder**	**Order**	**Suborder**	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
Crustacea																				
	Branchiopoda										X									
		Sarsostraca																		
				Anostraca							X								Eriksen and Belk (1999); Rogers (2002)	
					Artemina						X									
						Artemiidae					X									
							Artemia				X									
								Artemia franciscana Kellogg, 1906			X		X	X	X	X	X	X	Eriksen and Belk (1999)	Salt lakes

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Artemia monica Verrill, 1869			X		X						Eriksen and Belk (1999)	Reported only from Mono Lake
							Branchinecta				X		X	X	X	X	X	X	Eriksen and Belk (1999)	
								Branchinecta campestris Lynch, 1960			X		X	X	X				Rogers (2006)	Freshwater layers on salt lakes
								Branchinecta coloradensis Packard, 1874			X		X	X	X	X	X		Belk and Rogers (2002)	Temporary wetlands
								Branchinecta conservatio Eng et al., 1990			X		X						Eriksen and Belk (1999)	Listed under the Federal Endangered Species Act; Temporary wetlands
								Branchinecta cornigera Lynch, 1958			X			X	X					Temporary wetlands
								Branchinecta dissimilis Lynch, 1972			X		X	X					Belk and Rogers (2002)	Temporary wetlands
								Branchinecta gigas Lynch, 1937			X		X	X	X	X				Temporary wetlands
								Branchinecta hiberna Rogers and Fugate, 2001			X		X	X					Rogers and Fugate (2001)	Temporary wetlands
								Branchinecta lindahli Packard, 1883			X		X	X	X	X	X	X	Eriksen and Belk (1999)	Temporary wetlands
								Branchinecta longiantenna Eng et al., 1990			X		X						Eriksen and Belk (1999)	Listed under the Federal Endangered Species Act; Temporary wetlands
								Branchinecta lynchi Eng et al., 1990			X		X	X					Eriksen and Belk (1999)	Listed under the Federal Endangered Species Act; Temporary

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				wetlands
								Branchinecta mackini Dexter, 1956			X		X	X	X	X		X	Eriksen and Belk (1999)	Temporary wetlands
								Branchinecta mesovallensis Belk and Fugate, 2000			X		X						Eriksen and Belk (1999)	Temporary wetlands
								Branchinecta oriena Belk and Rogers, 2002			X		X			X			Belk and Rogers (2002)	Temporary wetlands
								Branchinecta oterosanvinceti Obregon-Barboza et al, 2002			X							X		Temporary wetlands
								Branchinecta packardi Pearse, 1912			X						X	X		Temporary wetlands
								Branchinecta sandiegonensis Fugate, 1993			X		X					X	Eriksen and Belk (1999)	Listed under the Federal Endangered Species Act; Temporary wetlands
						Chirocephalidae					X		X	X	X	X	X			Temporary wetlands
							Eubranchipus				X		X	X	X		X			Temporary wetlands
								Eubranchipus bundyi Forbes, 1876			X		X	X	X		X		Eriksen and Belk (1999); Hill et al. (1997)	Temporary wetlands
								Eubranchipus oregonus Creaser, 1930			X		X	X					Eriksen and Belk (1999); Hill et al. (1997)	Temporary wetlands
								Eubranchipus serratus Forbes, 1976			X		X	X	X	X			Eriksen and Belk (1999); Hill et al. (1997)	Temporary wetlands
							Linderiella				X		X						Eriksen and Belk (1999)	Temporary wetlands
								Linderiella occidentalis (Dodds, 1923)			X		X						Eriksen and Belk (1999)	Temporary wetlands
								Linderiella santarosae Thiery and Fugate,			X		X						Eriksen and	Temporary

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								1994											Belk (1999)	wetlands
						Streptocephalidae					X		X	X	X	X	X	X	Eriksen and Belk (1999)	Temporary wetlands
							Streptocephalus				X		X	X	X	X	X	X	Eriksen and Belk (1999)	Temporary wetlands
								Streptocephalus dorothae Mackin, 1942			X		X				X	X	Eriksen and Belk (1999)	Temporary wetlands
								Streptocephalus mackini Moore, 1966			X						X	X	Eriksen and Belk (1999)	Temporary wetlands
								Streptocephalus sealii Ryder, 1879			X		X	X	X		X		Eriksen and Belk (1999)	Temporary wetlands
								Streptocephalus texanus Packard, 1871			X		X			X	X	X	Eriksen and Belk (1999)	Temporary wetlands
								Streptocephalus wootomi Eng et al., 1990			X		X						Eriksen and Belk (1999)	Listed under the Federal Endangered Species Act; Temporary wetlands
						Thamnocephalidae					X		X			X	X	X		Temporary wetlands
							Thamnocephalus				X		X			X	X	X		Temporary wetlands
								Thamnocephalus mexicanus Linder, 1941			X						X	X		Temporary wetlands
								Thamnocephalus platyurus Packard, 1877			X		X			X	X	X	Eriksen and Belk (1999)	Temporary wetlands
		Phylopoda									X		X	X	X	X	X	X	Rogers (2005)	Temporary wetlands
				Notostraca							X		X	X	X	X	X	X	Rogers (2001)	Temporary wetlands and temporary streams
						Triopsidae					X		X			X	X	X	Rogers (2001)	Temporary wetlands and temporary streams

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Lepidurus				X		X	X	X	X	X	X	Rogers (2001)	Temporary wetlands and temporary streams
								Lepidurus bilobatus Packard, 1883			X		X	X		X			Rogers (2001)	Temporary wetlands and temporary streams
								Lepidurus couesei Packard, 1875			X			X	X				Rogers (2001)	Temporary wetlands and temporary streams
								Lepidurus cryptus Rogers, 2001			X		X	X		X			Rogers (2001)	Temporary wetlands and temporary streams
								Lepidurus lemmoni Holmes, 1894			X		X	X	X	X	X	X	Rogers (2001)	Temporary wetlands and temporary streams
								Lepidurus packardi Simon, 1886			X		X						Rogers (2001)	Listed under the Federal Endangered Species Act; temporary wetlands and temporary streams
							Triops				X		X	X	X	X	X	X	Rogers (2005)	Temporary wetlands
								Triops longicaudatus (LeConte, 1846)			X		X	X	X	X	X	X	Rogers (2005)	Temporary wetlands
				Diplostraca							X		X	X	X	X	X	X	Rogers (2005)	Temporary wetlands
					Laevicaudata						X		X	X	X	X	X	X	Martin and Belk (1988)	Temporary wetlands
						Lynceidae					X		X	X	X	X	X	X	Martin and Belk	Temporary

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																			(1988)	wetlands
							Lynceus				X		X	X	X	X	X	X	Martin and Belk (1988)	Temporary wetlands
								Lynceus brachyurus Muller, 1776			X		X	X	X	X	X	X	Martin and Belk (1988)	Temporary wetlands
								Lynceus brevifrons (Packard, 1877)			X						X	X	Martin and Belk (1988)	Temporary wetlands
								Lynceus mucronatus (Packard, 1875)			X				X				Martin and Belk (1988)	Temporary wetlands
					Spinicaudata						X		X	X	X	X	X	X	Wootton and Mattox (1958)	Temporary wetlands
						Cyzicidae					X		X	X	X	X	X	X	Wootton and Mattox (1958)	Temporary wetlands
							Cyzicus				X		X	X	X	X	X	X	Wootton and Mattox (1958)	Temporary wetlands
							Eocyzicus				X		X			X	X	X	Wootton and Mattox (1958)	Temporary wetlands
								Eocyzicus digueti (Richard, 1895)			X		X			X	X	X	Wootton and Mattox (1958)	Temporary wetlands
						Leptestheriidae					X		X			X	X	X	Martin and Cash-Clark (1993)	Temporary wetlands
							Leptestheria				X		X			X	X	X	Martin and Cash-Clark (1993)	Temporary wetlands
								Leptestheria compleximanus (Packard, 1877)			X		X			X	X	X	Martin and Cash-Clark (1993)	Temporary wetlands
					Cladocera				X	X	X		X	X	X	X	X	X		
	Maxillopoda								X	X	X	X	X	X	X	X	X	X		
		Branchiura							X	X	X	X	X	X	X	X	X	X	Cressey (1972)	Parasites
				Arguloida					X	X	X	X	X	X	X	X	X	X	Cressey (1972)	Parasites
						Argulidae			X	X	X	X	X	X	X	X	X	X	Cressey (1972)	Parasites
							Argulus		X	X	X	X	X	X	X	X	X	X	Cressey (1972)	Parasites
		Copepoda							X	X	X	X	X	X	X	X	X	X		

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
	Ostracoda								X	X	X	X	X	X	X	X	X	X		
	Malacostraca								X	X	X	X	X	X	X	X	X	X	Rogers (2005)	
		Eumalacostraca							X	X	X	X	X	X	X	X	X	X	Rogers (2005)	
			Peracarida						X	X	X	X	X	X	X	X	X	X	Rogers (2005)	
				Mysida					X	X	X	X	X	X	X	X			Rogers (2005)	
						Mysidae			X	X	X	X	X	X	X	X			Rogers (2005)	
							Acanthomysis		X	X	X	X	X	X	X				Rogers (2005)	
								Acanthomysis aspera Ii, 1964	X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
								Acanthomysis hwanhaiensis Ii, 1964	X	X	X	X	X						Rogers (2005)	Fresh and brackish water
							Hyperacanthomysis		X	X	X	X	X						Fukoka and Murano (2000)	Fresh and brackish water
								Hyperacanthomysis longirostris (Ii, 1964)	X	X	X	X	X						Fukoka and Murano (2000)	Fresh and brackish water
							Alienacanthomysis		X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
								Alienacanthomysis macropsis (Tattersall, 1932	X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
							Deltamysis		X	X	X	X	X						Bowman and Orsi (1992)	Fresh and brackish water
								Deltamysis homquistae Bowman and Orsi, 1992	X	X	X	X	X						Bowman and Orsi (1992)	Fresh and brackish water
							Mysis		X	X	X		X	X	X	X			Rogers (2005)	
							Neomysis		X	X	X		X	X	X				Rogers (2005)	
								Neomysis kadiakensis Ortmann, 1908	X	X	X		X	X	X				Rogers (2005)	
								Neomysis mercedis Homes, 1896	X	X	X		X	X	X				Rogers (2005)	
				Amphipoda					X	X	X	X	X	X	X	X	X	X	Rogers (2005)	
						Talitridae				X	X		X	X	X	X	X	X	Rogers (2005)	Terrestrial to amphibious
							Arctitalitus			X	X		X	X	X	X	X	X	Rogers (2005)	Terrestrial to amphibious
								Arctitalitus sylvaticus (Haswell, 1879)		X	X		X	X	X	X	X	X	Rogers (2005)	Terrestrial to amphibious
							Talitroides			X	X		X	X	X	X	X	X	Rogers (2005)	Terrestrial to

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				amphibious
								Talitroides alluaudi Chevreux, 1898		X	X		X	X	X	X	X	X	Morino and Ortal (1993)	Terrestrial to amphibious
								Talitroides topitotum Burt, 1934		X	X		X	X	X	X	X	X	Rogers (2005)	Terrestrial to amphibious
						Hyalellidae			X	X	X		X	X	X	X	X	X	Gonzales and Watling (2002)	
							Hyalella		X	X	X		X	X	X	X	X	X	Gonzales and Watling (2002)	
						Haustoridae					X				X				Bousfield (1958)	
							Diporeia				X				X				Bousfield (1958)	
								Diporeia erythrophthalma (Waldron, 1953)			X				X				Bousfield (1958)	
						Crangonyctidae			X	X			X	X	X	X	X	X	Rogers (2005)	
							Crangonyx		X	X			X	X	X	X	X	X	Rogers (2005)	
							Stygobromus		X	X			X	X	X	X	X	X	Rogers (2005)	
							Stygonyx		X	X				X					Bousfield and Holsinger (1989)	
								Stygonyx courtneyi Bousfield and Holsinger, 1989	X	X				X					Bousfield and Holsinger (1989)	
						Gammaridae			X	X	X		X	X	X	X	X	X	Rogers (2005)	
							Gammarus		X	X	X		X	X	X	X	X	X	Rogers (2005)	
						Anisogammaridae			X	X	X		X	X	X				Bousfield & Morino (1992)	
							Ramellogammarus		X	X	X		X	X	X				Bousfield & Morino (1992)	
								Ramellogammarus californicus Bousfield and Morino, 1992	X	X	X		X						Bousfield & Morino (1992)	
								Ramellogammarus campestris Bousfield and Morino, 1992	X	X	X	X		X					Bousfield & Morino (1992)	Fresh and brackish water

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Ramellogammarus columbianus Bousfield and Morino, 1992	X	X	X	X	X	X	X				Bousfield & Morino (1992)	Fresh and brackish water
								Ramellogammarus littoralis Bousfield and Morino, 1992	X	X	X	X		X					Bousfield & Morino (1992)	Fresh and brackish water
								Ramellogammarus oregonensis (Shoemaker, 1944)	X	X	X	X	X	X	X				Bousfield & Morino (1992)	Fresh and brackish water
								Ramellogammarus ramellus (Weckel, 1907)	X	X	X	X	X	X					Bousfield & Morino (1992)	Fresh and brackish water
								Ramellogammarus setosus Bousfield and Morino, 1992	X	X	X				X				Bousfield & Morino (1992)	
								Ramellogammarus similimanus (Bousfield, 1961)	X	X	X			X					Bousfield & Morino (1992)	
								Ramellogammarus vancouverensis Bousfield, 1979	X	X	X	X			X				Bousfield & Morino (1992)	Fresh and brackish water
						Corophiidae			X	X	X	X	X	X	X				Bousfield & Hoover (1997)	Fresh and brackish water
							Americorophium		X	X	X	X	X	X	X				Bousfield & Hoover (1997)	Fresh and brackish water
								Americorophium spinicorne (Stimpson, 1857)	X	X	X	X	X	X	X				Bousfield & Hoover (1997)	Fresh and brackish water
								Americorophium salmonis (Stimpson, 1857)	X	X	X	X		X	X				Bousfield & Hoover (1997)	Fresh and brackish water
								Americorophium stimpsoni (Shoemaker, 1941)	X	X	X	X	X	X					Bousfield & Hoover (1997)	Fresh and brackish water
				Isopoda					X	X	X	X	X	X	X	X	X	X	Rogers (2005)	Fresh and brackish water
					Flabellifera				X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
						Sphaeromatidae			X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
							Gnorimosphaeroma		X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
					Asellota				X	X	X		X	X	X	X			Williams (1970, 1976)	

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Asellidae			X	X	X		X	X	X	X			Williams (1970, 1976); Toft et al. (2002)	
							Asellus		X	X	X		X	X	X				Toft et al. (2002)	
								Asellus hilgendorfi Bouvallius, 1886	X	X	X		X	X	X				Magniez and Toft (2000); Toft et al. (2002)	Non-native invasive species
							Caecidotea		X	X	X		X	X	X	X			Williams (1970, 1972)	
								Caecidotea communis (Say, 1818)	X	X	X				X				Williams (1970, 1972)	
								Caecidotea occidentalis (Williams, 1970)	X	X	X		X	X	X				Williams (1970, 1972); Bowman (1974)	
								Caecidotea racovitzai (Williams)	X	X	X		X		X				Williams (1970, 1972)	Introduced in CA
								Caecidotea sequoiae Bowman, 1975	X	X	X		X						Bowman (1975)	
								Caecidotea tomalensis (Harford, 1877)	X	X	X		X						Bowman (1974)	
							Columbasellus		X	X	X				X				Lewis et al. (2003)	
								Columbasellus acheron Lewis, Martin and Wetzer, 2003	X	X	X				X				Lewis et al. (2003)	
							Calasellus		X	X	X		X						Bowman (1981)	
								Calasellus californicus (Miller, 1933)	X	X	X		X						Miller (1933); Bowman (1981)	
								Calasellus longus (Bowman, 1981)	X	X	X		X						Bowman (1981)	
							Salmasellus		X	X	X			X	X				Lewis (2001)	
								Salmasellus howarthi Lewis, 2001	X	X	X			X	X				Lewis (2001)	
						Munnidae			X	X	X		X						Rogers (2005)	
					Oniscidea				X	X	X		X	X	X	X	X	X	Rogers (2005)	
						Ligiidae			X	X	X		X	X	X				Rogers (2005)	
							Ligium		X	X	X								Rogers (2005)	
					Tanaidacea				X	X	X	X	X	X	X				Rogers (2005)	Fresh and

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				brackish water
						Tanaidae			X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
							Sinelobus		X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
								Sinelobus stanfordi (Richards, 1901)	X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
						Leptochelidae			X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
							Leptochelia		X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
								Leptochelia dubia (Kroyer, 1842)	X	X	X	X	X	X	X				Rogers (2005)	Fresh and brackish water
				Decapoda					X	X	X	X	X	X	X	X	X	X	Rogers (2005)	Fresh and brackish water
						Atyidae			X	X	X		X						Rogers (2005)	
							Syncaris		X	X	X		X						Martin and Wicksten (2004); Rogers (2005)	
								Syncaris pacifica (Holmes, 1895)	X	X	X		X						Martin and Wicksten (2004); Rogers (2005)	Listed under the Federal and California State Endangered Species Acts
								Syncaris pasadenae (Kingsley, 1897)	X	X	X		X						Martin and Wicksten (2004); Rogers (2005)	Possibly extinct
						Palaemonidae			X	X	X	X	X	X	X	X	X	X	Holthuis (1952); Jayachandran (2001); Rogers (2005)	
							Palaemonetes		X	X	X		X	X	X	X	X	X	Holthuis (1952)	

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Palaemonetes kadiakensis Rathbun, 1902	X	X	X		X						Holthuis (1952); Rogers (2005)	
								Palaemonetes paludosus Gibbes, 1850	X	X	X		X	X	X	X	X	X	Holthuis (1952)	
							Palaemon		X	X	X		X	X					Holthuis (1952)	
								Palaemon macrodactylus Rathbun, 1902	X	X	X		X	X					Jayachandran (2001)	
							Exopalaemon		X	X	X	X	X	X	X				Jayachandran (2001); Rogers (2005)	Fresh and brackish water
								Exopalaemon carinicauda (Holthuis, 1950)	X			X	X						Jayachandran (2001)	Fresh and brackish water
								Exopalaemon modestus (Heller, 1862)	X	X	X		X	X	X				Jayachandran (2001)	
						Astacidae			X	X	X		X	X	X	X	X		Rigel (1959); Rogers (2005)	
							Pacifastacus		X	X	X		X	X	X	X	X		Rigel (1959); Rogers (2005)	
								Pacifastacus connectens (Faxon, 1914)	X	X	X			X					Rigel (1959); Rogers (2005)	
								Pacifastacus fortis (Faxon, 1914)	X	X	X		X						Rigel (1959); Rogers (2005)	
								Pacifastacus gambelii (Girard, 1852)	X	X	X		?	X	X	X			Rigel (1959); Rogers (2005)	
								Pacifastacus lenisculus klamathensis (Stimpson, 1859)	X	X	X		X	X	X				Rigel (1959); Rogers (2005)	
								Pacifastacus lenisculus lenisculus (Dana, 1852)	X	X	X		X	X	X	X	X		Rigel (1959); Rogers (2005)	
								Pacifastacus lenisculus trowbridgii (Stimpson, 1857)	X	X	X			X	X				Rigel (1959); Rogers (2005)	
								Pacifastacus nigrescens (Stimpson, 1857)	X	X	X		X						Rigel (1959); Rogers (2005)	May be extinct
						Cambaridae			X	X	X		X	X	X	X	X	X	Rigel (1959); Rogers (2005)	
							Orconectes		X	X	X		X	X	X	X	X	X	Rigel (1959); Rogers (2005)	

Taxonomic Hierarchy									Habitat				Distribution						Literature Cited	Comments
Subphylum	Class	Subclass	Superorder	Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Orconectes neglectus neglectus (Faxon, 1885)	X	X	X			X					Rigel (1959); Rogers (2005)	
								Orconectes virilis (Hagen, 1870)	X	X	X		X				X		Rigel (1959); Rogers (2005)	
							Procambarus		X	X	X		X	X		X	X	X	Rigel (1959); Rogers (2005)	
								Procambarus clarkii (Girard, 1852)	X	X	X		X	X		X	X	X	Rigel (1959); Rogers (2005)	
						Grapsidae			X	X	X	X	X						Rogers (2005)	Fresh and brackish water
							Eriocheir		X	X	X	X	X						Rogers (2005)	Fresh and brackish water
								Eriocheir sinensis Milne-Edwards, 1854	X	X	X	X	X						Rogers (2005)	Fresh and brackish water
						Panopeidae			X			X	X	X					Rogers (2005)	
							Rhithropanopeus		X			X	X	X					Rogers (2005)	
								Rhithropanopeus harrisii (Gould, 1841)	X			X	X	X					Rogers (2005)	
						Geothelphusidae			X	X	X					X			Rogers (2005)	
							Geothelphusa		X	X	X					X			Rogers (2005)	
								Geothelpusa dehaani (White, 1874)	X	X	X					X			Rogers (2005)	
						Ocypodidae			X			X	X						Rogers (2005)	
							Uca		X			X	X						Rogers (2005)	
								Uca crenulata (Lockington, 1877)	X			X	X						Rogers (2005)	

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Additional Sources of Information on Crustacea

Large Branchiopod Bibliography, updated 6 March 2006. Accessed 27 September 2006 at URL: http://www3.uakron.edu/biology/bibintro.html

Collembola: Springtails
Standard Effort Level I: Rejected from benthic datasets
Standard Effort Level II: Rejected from benthic datasets
Standard Taxonomic Reference: Christiansen and Snider (1996)
Reviewed by:

Collembolans can be identified to genus using the key in Merritt and Cummins (Christiansen and Snider, 1996) or Hilsenhoff (2001). Collembola live neustonically or near any aquatic or moist habitat including stream and pond margins, intertidal pools, watersoaked wood and carpet and even in human skin (Altschuler et al., 2004). Collembola are generally rejected from benthic datasets.

Taxonomic Hierarchy	Habitat				Distribution						Literature Cited	Comments
Class	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Collembola		X	X	X	X	X	X	X	X	X	Christiansen and Snider (1996); Hilsenhoff (2001)	rejected from benthic datasets

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Ephemeroptera: Mayflies
Standard Effort Level I: Genus
Standard Effort Level II: Species (where possible)
Standard Taxonomic Reference: Edmunds and Waltz (1996)
Reviewed by: Joseph Slusark

Nymphs can be identified to genus using the key in Merritt and Cummins (Edmunds and Waltz, 1996). Considerable reorganization of the baetid genera has taken place since the key was published (Lugo-Ortiz and McCafferty, 1998). A mayfly workshop was given by the Northwest Biological Assessment Workgroup in 2005. The manual created by Jacobus and Randolph (2005) serves as a very useful supplementary text with numerous provisional keys and unpublished distributional and habitat information for western mayflies. There are two useful websites on Ephemeroptera: Mayfly Central, hosted by Purdue University, maintains the Mayflies of North America checklist and has distributional information, and; Ephemeroptera Galactica, hosted by the Museum Collections of Aquatic Entomology at Florida A&M University, has a bibliography that offers many mayfly paper PDFs.

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Ephemeroptera				X	X	X		X	X	X	X	X	X	Edmunds and Waltz (1996)	for keys to families and genera
	Ameletidae			X	X			X	X	X	?	X			
		Ameletus		X	X			X						Zloty (1996)	Not all species described as nymphs -- best to leave identifications at *Ameletus* sp.
	Ametropodidae			X	X			X	X	X					
		Ametropus		X	X			X	X	X				Allen and Edmunds (1976); McCafferty (2001)	nymphs for both North American species are known and keyed in Allen and Edmunds (1976)
			Ametropus ammophilus Allen and Edmunds, 1976	X	X			X	X	X					

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
	Baetidae			X				X						Edmunds and Waltz (1996); Lugo-Ortiz and McCafferty (1998); Morihara and McCafferty (1979)	The key in Merritt and Cummins works for most of the baetid genera, except for the *Baetis* complex. Lugo-Ortiz and McCafferty (1998) will separate these genera. Morihara and McCafferty (1979) is still useful because it contains good descriptions.
		Acentrella		X				X						Jacobus and McCafferty (2006)	
			Acentrella insignificans (McDunnough, 1926)	X	X			X	X		X	X		Jacobus and McCafferty (2006)	
			Acentrella turbida (McDunnough, 1924)	X	X			?	X			X		Jacobus and McCafferty (2006)	
		Acerpenna		X	X			X							
		Apobaetis		X	X			X						Meyer and McCafferty (2004)	Occurs in warm water streams; Tuolumne River in CA Central Valley
			Apobaetis etowah (Traver, 1935)	X	X			X						Meyer and McCafferty (2004)	Occurs in warm water streams; Tuolumne River in CA Central Valley
		Baetis		X	X			X	X	X	X	X		Wiersema et al. (2004); Morihara and McCafferty (1979)	The nymphs for several species remain undescribed.
			Baetis adonis Traver, 1935	X	X			?							
			Baetis alius Day, 1954	X	X			X				X			
			Baetis bicaudatus Dodds, 1923	X	X			X	X	X					
			Baetis caurinus Edmunds and Allen, 1957	X	X				X						nymph stage unknown
			Baetis diablus Day, 1954	X	X				X						nymph stage unknown
			Baetis flavistriga McDunnough, 1921	X	X			?							
			Baetis magnus McCafferty and Waltz, 1986	X	X			?				X			
			Baetis notos Allen and Murvosh, 1987	X	X							X			
			Baetis palisadi Mayo, 1952	X	X			X							nymph stage unknown

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Baetis parallelus Banks, 1924	X	X						X				nymph stage unknown
			Baetis piscatoris Traver, 1935	X	X			X							nymph stage unknown
			Baetis tricaudatus Dodds, 1923	X	X			X	X	X	X	X	X		
		Baetodes		X	X				X			X		Cohen and Allen (1978); McCafferty and Provonsha (1993)	
			Baetodes alleni McCafferty and Provonsha, 1993	X	X							X		Cohen and Allen (1978); McCafferty and Provonsha (1993)	
			Baetodes arizonensis Koss, 1972	X	X							X		Cohen and Allen (1978); McCafferty and Provonsha (1993); Koss (1972)	
			Baetodes bibranchius McCafferty and Provonsha, 1993	X	X				X					Cohen and Allen (1978); McCafferty and Provonsha (1993)	
			Baetodes edmundsi Koss, 1972	X	X							X		Cohen and Allen (1978); McCafferty and Provonsha (1993); Koss (1972)	
		Callibaetis		X	X	X		X	X	X	X				No published nymph key to species
		Camelobaetidius		X	X			X	X		X			Lugo-Ortiz and McCafferty (1995); McCafferty and Randolph (2000)	
			Camelobaetidius kickapoo McCafferty, 2000	X	X							X		Lugo-Ortiz and McCafferty (1995); McCafferty and	

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
														Randolph (2000)	
			Camelobaetidius mexicanus (Traver and Edmunds, 1968)	X	X				X					Lugo-Ortiz and McCafferty (1995); McCafferty and Randolph (2000)	
			Camelobaetidius musseri (Traver and Edmunds, 1968)	X	X						X			Lugo-Ortiz and McCafferty (1995); McCafferty and Randolph (2000)	
			Camelobaetidius warreni (Traver and Edmunds, 1968)	X	X			X						Lugo-Ortiz and McCafferty (1995); McCafferty and Randolph (2000)	widespread species; *C. similis* is considered to be a synonym
		Centroptilum		X	X			X	X		X				No published nymph key to species
			Centroptilum asperatum Traver, 1935					X							nymph stage unknown
			Centroptilum bifurcatum McDunnough, 1924								X				
			Centroptilum conturbatum McDunnough, 1929					X							
			Centroptilum convexum Ide, 1930					X							nymph undescribed
			Centroptilum elsa Traver, 1935						X			X			
			Centroptilum oreophilum Edmunds, 1954						X						nymph stage unknown
			Centroptilum selanderorum Edmunds, 1954						X						
		Cloeodes		X	X			X				X		Waltz and McCafferty (1987)	This key includes nymphs of all three southwestern species
		Diphetor		X	X			X	X	X				Morihara and McCafferty (1979)	only one North American species
			Diphetor hageni (Eaton, 1885)	X	X			X	X	X				Morihara and McCafferty (1979)	only one North American species
		Fallceon		X	X			X			X	X			
			Fallceon eatoni (Kimmins, 1934)	X	X							X		McCafferty (2006)	

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
			Fallceon quilleri (Dodds, 1923)	X	X			X			X			Morihara and McCafferty (1979)	only known species in CA
		Paracloeodes		X	X			X							only one species known in the west
			Paracloeodes minutus (Daggy, 1945)	X	X			X							only one species known in the west
		Plauditus		X	X			?	X					Lugo-Ortiz and McCafferty (1998)	
			Plauditus punctiventris (McDunnough, 1923)	X	X			?	X					Lugo-Ortiz and McCafferty (1998)	
		Procloeon		X	X			X							No published nymph key to species
			Procloeon venosum (Traver, 1935)	X	X			X	X						nymph stage unknown
		Pseudocloeon		X	X			X				X		McCafferty and Waltz (1995) Lugo-Ortiz et al. (1999)	Species formerly in *Labiobaetis*
			Pseudocloeon apache (McCafferty & Waltz, 1995)	X	X			?				X		McCafferty and Waltz (1995) Lugo-Ortiz et al. (1999)	
			Pseudocloeon propinquum (Walsh, 1863)	X	X					X				McCafferty and Waltz (1995) Lugo-Ortiz et al. (1999)	
	Baetiscidae			X	X									Pescador and Berner (1981)	
		Baetisca		X	X						X			Baumann and Kondratieff (2000)	
			Baetisca columbiana Edmunds, 1960	X	X					X					
	Caenidae			X				X							Other genera are possible in the Southwest; revision of the family underway by Sun and McCafferty
		Caenis		X				X						Provonsha (1990)	Mature nymphs may be identified to species

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Caenis amica Hagen, 1861	X				X	X	X		X		Provonsha (1990)	
			Caenis bajaensis Allen and Murvosh, 1983	X				X				X	X	Provonsha (1990)	
			Caenis latipennis Banks, 1907	X				X	X	X		X		Provonsha (1990)	
			Caenis punctata McDunnough, 1931	X										Provonsha (1990)	
			Caenis tardata McDunnough, 1931	X											
	Ephemerellidae			X				X	X	X					Family undergoing revision; expect changes in the near future
		Attenella		X				X						Allen and Edmunds (1961a)	
			Attenella attenuata (McDunnough, 1925)	X	X			X						Allen and Edmunds (1961a)	
			Attenella delantala (Mayo, 1952)	X	X			X	X	X				Allen and Edmunds (1961a)	
			Attenella margarita (Needham, 1927)	X	X				X	X				Allen and Edmunds (1961a)	
			Attenella soquele (Day, 1954)	X	X			X	X	X				Allen and Edmunds (1961a)	
		Caudatella		X	X			X	X					Allen and Edmunds (1961b)	
			Caudatella edmundsi (Allen, 1959)	X	X				X					Allen and Edmunds (1961b)	
			Caudatella heterocaudata (McDunnough, 1929)	X	X			X	X					Allen and Edmunds (1961b)	
			Caudatella hystrix (Traver, 1934)	X	X			X	X	X				Allen and Edmunds (1961b)	*Caudatella cascadia* (Allen and Edmunds) now a synonym
			Caudatella jacobi (McDunnough, 1939)	X	X				X					Allen and Edmunds (1961b)	
		Drunella		X	X			X	X	X	X	X	X	Allen and Edmunds (1962)	
			Drunella coloradensis (Dodds, 1923)	X	X			X	X	X	X	X	X	Allen and Edmunds (1962)	
			Drunella doddsii (Needham, 1927)	X	X			X	X	X	X			Allen and Edmunds (1962)	
			Drunella flavilinea (McDunnough, 1926)	X	X			X	X	X			X	Allen and Edmunds (1962)	

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Drunella grandis (Eaton, 1884)	X	X			X	X	X	X	X		Allen and Edmunds (1962)	
			Drunella pelosa (Mayo, 1951)	X	X			X	X	X				Allen and Edmunds (1962)	
			Drunella spinifera (Needham, 1927)	X	X			X	X	X				Allen and Edmunds (1962)	
		Ephemerella		X	X									Allen and Edmunds (1965); Jacobus and McCafferty (2003)	*Ephemerella* and *Serratella* are incompletely separable; easier to key directly to species
			Ephemerella aurivillii (Bengtsson, 1908)	X	X			X	X	X				Allen and Edmunds (1965); Jacobus and McCafferty (2003)	
			Ephemerella dorothea Needham, 1908)	X	X			X	X	X	X	X		Allen and Edmunds (1965); Jacobus and McCafferty (2003)	*Ephemerella inermis* Eaton recently synonymized with *E. dorothea*
			Ephemerella excrucians Walsh, 1862	X	X			X	X	X	X	X		Allen and Edmunds (1965); Jacobus and McCafferty (2003)	*Ephemerella infrequens* McDunnough recently synonymized with *E. excrucians*
			Ephemerella maculata Traver, 1934	X	X			X						Allen and Edmunds (1965); Jacobus and McCafferty (2003)	
			Ephemerella verruca Allen and Edmunds, 1965	X	X				X	X				Allen and Edmunds (1965); Jacobus and McCafferty (2003)	
		Eurylophella		X	X	X		X	X	X				Allen and Edmunds (1963a)	
			Eurylophella lodi (Mayo, 1952)	X	X	X		X	X	X				Allen and Edmunds (1963a)	
		Serratella		X				X	X	X	X	X	X	Allen and Edmunds (1963b)	*Ephemerella* and *Serratella* are incompletely separable; easier to key directly to species

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	**Family**	**Genus**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
			Serratella levis (Day, 1954)	X	X			X						Allen and Edmunds (1963b)	
			Serratella micheneri (Traver, 1934)	X	X			X	X	X		X	X	Allen and Edmunds (1963b)	
			Serratella teresa (Traver, 1934)	X	X			X	X	X				Allen and Edmunds (1963b)	
			Serratella tibialis (McDunnough, 1924)	X	X			X	X	X	X	X		Allen and Edmunds (1963b)	
			Serratella velmae (Allen and Edmunds, 1963)	X	X			X	X					Allen and Edmunds (1963b)	
		Timpanoga		X	X			X	X	X	X			Allen and Edmunds (1959)	
			Timpanoga hecuba (Eaton, 1884)	X	X			X	X	X	X			Allen and Edmunds (1959)	Two dubious subspecies recognized
	Ephemeridae			X				X	X	X	X			McCafferty (1975)	
		Ephemera		X							X			McCafferty (1975)	
			Ephemera simulans Walker, 1853	X							X			McCafferty (1975)	
		Hexagenia		X				X	X	X	X			McCafferty (1975)	
			Hexagenia bilineata (Say, 1824)	X						X				McCafferty (1975)	
			Hexagenia limbata (Serville, 1829)	X				X	X	X	X			McCafferty (1975)	
	Heptageniidae			X				X							Family currently undergoing major revision
		Cinygma		X	X			X	X	X					nymphs cannot be identified to species at present
		Cinygmula		X	X			X	X			X			nymphs cannot be identified to species at present
		Ecdyonurus		X	X			X						McCafferty (2004); Bednarik and Edmunds (1980)	mature nymphs may be separated using labral characters
			Ecdyonurus criddlei (McDunnough, 1927)	X	X			?	X	X	X	X		McCafferty (2004); Bednarik and Edmunds (1980)	species formerly in *Heptagenia,* then *Nixe*
			Ecdyonurus simplicoides (McDunnough, 1924)	X	X			?	X			X		McCafferty (2004); Bednarik	species formerly in *Heptagenia,* then *Nixe*

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
														and Edmunds (1980)	
		Epeorus		X	X			X	X	X	X	X	X		The key in Edmunds and Allen (1964) includes only species found in the Rocky Mts. The nymph stage is unknown for several western species.
		Heptagenia		X	X			X							nymphs cannot be reliably separated at present
		Ironodes		X	X			X	X				X		nymphs cannot be reliably separated at present
		Leucrocuta		X	X			?	X						immature *Leucrocuta/Nixe/Ecdyonurus* difficult to separate
			Leucrocuta jewetti (Allen, 1966)	X	X				X						
		Mccaffertium		X	X					X				Wang and McCafferty (2004)	formerly a subgenus of *Stenonema*
			Mccaffertium terminatum (Walsh, 1862)	X	X					X				Bednarik and McCafferty (1979); Wang and McCafferty (2004)	
		Nixe		X	X			X	X						immature *Leucrocuta/Nixe/Ecdyonurus* difficult to separate
			Nixe kennedyi (McDunnough, 1924)	X	X			X	X					McCafferty (2004)	nymph not described for this species
		Rhithrogena		X	X			X	X	X	X	X	X		nymphs cannot be reliably separated at present
	Isonychiidae			X	X			X			X	X			
		Isonychia		X	X			X			X	X			Although distribution is useful for identifying *Isonychia* in the West, reliable species identifications require rearing

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
	Leptohyphidae			X	X			X						Wiersema and McCafferty (2000); Allen (1978)	several new genera were erected in Wiersema and McCafferty (2000) but no species key to nymphs was included
		Asioplax		X	X			?						Wiersema and McCafferty (2000); Allen (1978)	an unassociated species has been taken in CA
		Homoleptohyphes		X	X			X				X		Wiersema and McCafferty (2000); Allen (1978)	
			Homoleptohyphes dimorphus (Allen, 1967)	X	X			X				X		Wiersema and McCafferty (2000); Allen (1978)	
			Homoleptohyphes mirus (Allen, 1967)	X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
			Homoleptohyphes quercus (Kilgore and Allen, 1973)	X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
		Leptohyphes		X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
			Leptohyphes zalope Traver, 1958	X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
		Tricoryhyphes		X	X							X		Wiersema and McCafferty (2000); Allen (1978)	

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Tricoryhyphes condylus (Allen, 1967)	X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
		Tricorythodes		X	X			X				X	X	Wiersema and McCafferty (2000); Allen (1978)	
			Tricorythodes explicatus (Eaton, 1892)	X	X							X	X	Wiersema and McCafferty (2000); Allen (1978)	
			Tricorythodes minutus Traver, 1935	X	X			X	X	X	X	X		Wiersema and McCafferty (2000); Allen (1978)	
		Vaccupernius		X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
			Vaccupernius packeri (Allen, 1967)	X	X							X		Wiersema and McCafferty (2000); Allen (1978)	
	Leptophlebiidae			X				X							
		Choroterpes		X	X			X	X		X	X	X	McCafferty (1992)	
		Leptophlebia		X	X	X		X	X	X				Burian (2000)	
			Leptophlebia cupida (Say, 1823)	X						X				Burian (2000)	
			Leptophlebia pacifica (McDunnough, 1933)	X					X					Burian (2000)	
		Neochoroterpes		X								X		Henry (1993)	
			Neochoroterpes kossi (Allen, 1974)	X								X		Henry (1993)	
		Paraleptophlebia		X				X	X						Most species undescribed as nymphs; best to leave at genus. See Edmunds and McCafferty (1996) for discussion of species with tusks.
		Thraulodes		X	X							X		Traver and	

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
														Edmunds (1967)	
			Thraulodes brunneus Koss, 1966	X	X							X		Traver and Edmunds (1967)	
			Thraulodes gonzalesi Traver and Edmunds, 1967	X	X							X		Traver and Edmunds (1967)	
			Thraulodes tenulineus Lugo-Ortiz and McCafferty, 1996	X	X							X		Traver and Edmunds (1967)	
		Traverella		X	X					X	X	X		Allen (1973)	
			Traverella albertana (McDunnough, 1931)	X	X					X	X	X		Allen (1973)	
	Oligoneuriidae			X								X		Edmunds et al. (1958)	
		Lachlania		X								X		Edmunds et al. (1958)	
			Lachlania saskatchewanensis Ide, 1941	X								X		Edmunds et al. (1958)	
	Polymitarcyidae			X					X	X	X			McCafferty (1975)	
		Ephoron		X					X	X	X			McCafferty (1975)	
			Ephoron album (Say, 1824)	X					X	X	X			McCafferty (1975)	
	Siphlonuridae			X				X							
		Edmundius		X	X			X							
			Edmundius agilis Day 1953	X	X			X							
		Parameletus		X	X					X					
			Parameletus columbiae McDunnough, 1938	X	X					X					
		Siphlonurus		X				X							

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Odonata: Damselflies and Dragonflies
Standard Effort Level I: Genus
Standard Effort Level II: Species (where possible)
Standard Taxonomic Reference(s): Westfall and May (1996), Needham, Westfall and May (2000)
Reviewed by: Rosser W. Garrison, Andrew Rehn

Keys to families and genera are given in the odonate chapter of Merritt and Cummins (Westfall and Tennessen, 1996). Updated keys, species keys to adults and immatures are given for damselflies in Westfall and May (1996) and dragonflies in Needham, Westfall and May (2000). See Rehn (2000) for more detailed ecological and distributional information on Californian odonates. Kennedy (1917) and Paulson and Garrison (1977) provided considerable distributional information for the Pacific Coast region.

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Odonata					X	X	X		X	X	X	X	X	X		
	Zygoptera				X	X	X		X	X	X	X	X	X	Westfall and May (1996)	Has keys for all damselflies found in the region
		Calopterygidae			X	X			X	X	X	X	X	X	Westfall and May (1996)	
			Calopteryx		X	X			X	X	X				Westfall and May (1996)	
				Calopteryx aequabilis Say, 1839	X	X			X	X	X				Westfall and May (1996)	Relatively intolerant of pollution; rare in Northern CA
			Hetaerina		X	X			X			X	X	X	Westfall and May (1996)	
				Hetaerina americana (Fabricius, 1798)	X	X			X			X	X	X	Westfall and May (1996)	Relatively intolerant of pollution
				Hetaerina vulnerata Hagen in Selys, 1853	X	X							X		Westfall and May (1996)	
		Coenagrionidae			X				X						Westfall and May (1996)	
			Amphiagrion		X	X	X		X	X	X	X	X	X	Westfall and May (1996)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Amphiagrion abbreviatum (Selys, 1876)	X	X	X		X	X	X	X	X	X	Westfall and May (1996)	
			Apanisagrion		X								X		Westfall and May (1996)	
				Apanisagrion lais (Brauer, 1876)	X								X		Westfall and May (1996)	
			Argia		X	X			X	X	X	X	X	X	Westfall and May (1996)	
				Argia agrioides Calvert, 1895	X	X			X	X			X	X	Westfall and May (1996)	
				Argia alberta Kennedy, 1918	X	X			X	X		X	X		Westfall and May (1996)	prefers seeps and springs
				Argia emma Kennedy, 1915	X	X			X	X	X	X			Westfall and May (1996)	
				Argia fumipennis (Burmeister, 1839)	X								X		Westfall and May (1996)	
				Argia hinei Kennedy, 1918	X	X			X			X	X	X	Westfall and May (1996)	
				Argia immunda (Hagen, 1861)	X	X			X			X	X		Westfall and May (1996)	
				Argia lacrimans (Hagen, 1861)	X								X		Westfall and May (1996)	
				Argia lugens (Hagen, 1861)	X	X			X	X			X	X	Westfall and May (1996)	
				Argia moesta (Hagen, 1861)	X	X			X			X	X	X	Westfall and May (1996)	
				Argia munda Calvert, 1902	X								X		Westfall and May (1996)	
				Argia nahuana Calvert, 1902	X	X			X	X		X	X	X	Westfall and May (1996)	
				Argia oenea Hagen in Selys, 1865	X								X	X	Westfall and May (1996)	
				Argia pallens Calvert, 1902	X								X		Westfall and May (1996)	
				Argia pima Garrison, 1994	X								X		Westfall and May (1996)	
				Argia plana Calvert, 1902	X								X		Westfall and May	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
															(1996)	
				Argia sabino Garrison, 1994	X								X		Westfall and May (1996)	
				Argia sedula (Hagen, 1861)	X	X	X		X			X	X		Westfall and May (1996)	
				Argia tarascana Calvert, 1902	X								X		Westfall and May (1996)	
				Argia tezpi Calvert, 1902	X								X	X	Westfall and May (1996)	
				Argia tonto Calvert, 1902	X								X		Westfall and May (1996)	
				Argia translata Hagen in Selys, 1865	X							X	X		Westfall and May (1996)	
				Argia vivida Hagen in Selys, 1865	X	X			X	X	X	X	X	X	Westfall and May (1996)	
			Coenagrion		X		X		X	X	X	X	X		Westfall and May (1996)	
				Coenagrion resolutum (Hagen in Selys, 1876)	X		X		X	X	X	X	X		Westfall and May (1996)	Uncommon in northern Sierra lakes and bogs; nymphs hard to distinguish from *Enallagma* sp.
			Coenagrion/Enallagma		X		X								Westfall and May (1996)	some specimens incompletely separable
			Enallagma		X	X	X		X	X	X	X	X	X	Westfall and May (1996)	
				Enallagma anna Williamson, 1900	X	X			X	X		X	X		Westfall and May (1996)	
				Enallagma basidens Calvert, 1902	X	X			X				X		Westfall and May (1996)	
				Enallagma boreale (Selys, 1875)	X		X		X	X	X	X	X		Westfall and May (1996)	
				Enallagma carunculatum Morse, 1895	X	X	X		X	X	X	X	X	X	Westfall and May (1996)	
				Enallagma civile (Hagen, 1861)	X	X	X		X			X	X	X	Westfall and May (1996)	
				Enallagma clausum Morse, 1895	X	X	X		X	X	X	X			Westfall and May	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
															(1996)	
				Enallagma cyathigerum (Charpentier, 1840)	X		X		X	X	X	X	X	X	Westfall and May (1996)	
				Enallagma ebrium (Hagen, 1861)	X						X				Westfall and May (1996)	
				Enallagma eiseni Calvert, 1895	X									X	Westfall and May (1996)	
				Enallagma novaehispaniae Calvert, 1902	X									X	Westfall and May (1996)	
				Enallagma praevarum (Hagen, 1861)	X	X	X		X			X	X	X	Westfall and May (1996)	
				Enallagma semicirculare Selys, 1876	X								X		Westfall and May (1996)	
			Hesperagrion		X								X		Westfall and May (1996)	
				Hesperagrion heterodoxum (Selys, 1868)	X								X		Westfall and May (1996)	
			Ischnura		X	X	X		X	X	X	X	X	X	Westfall and May (1996)	
				Ischnura barberi Currie, 1903	X	X	X		X				X		Westfall and May (1996)	
				Ischnura cervula Selys, 1876	X	X	X		X	X	X	X	X	X	Westfall and May (1996)	
				Ischnura damula Calvert, 1902	X								X		Westfall and May (1996)	
				Ischnura demorsa (Hagen, 1861)	X								X		Westfall and May (1996)	
				Ischnura denticollis (Burmeister, 1839)	X				X	X		X	X	X	Westfall and May (1996)	
				Ischnura erratica Calvert, 1895	X		X		X	X	X				Westfall and May (1996)	
				Ischnura gemina (Kennedy, 1917)	X		X		X						Westfall and May (1996)	CA endemic
				Ischnura hastata (Say, 1839)	X	X	X		X				X		Westfall and May (1996)	
				Ischnura perparva McLachlan in Selys, 1876	X	X	X		X	X	X	X	X		Westfall and May (1996)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Ischnura ramburii (Selys, 1842)	X		X		X				X	X	Westfall and May (1996)	
			Nehalennia		X		X		X		X				Westfall and May (1996)	
				Nehalennia irene (Hagen, 1861)	X		X		X		X				Westfall and May (1996)	
			Telebasis		X	X	X		X				X	X	Westfall and May (1996)	
				Telebasis incolumis Williamson and Williamson, 1930	X									X	Westfall and May (1996)	
				Telebasis salva (Hagen, 1861)	X	X	X		X				X	X	Westfall and May (1996)	Widespread but uncommon at low to middle elevations
			Zoniagrion		X	X			X						Westfall and May (1996)	
				Zoniagrion exclamationis (Selys, 1876)	X	X			X						Westfall and May (1996)	Monotypic; CA endemic
		Lestidae			X	X	X		X	X	X		X	X	Westfall and May (1996)	
			Archilestes		X	X	X		X	X	X		X	X	Westfall and May (1996)	
				Archilestes californica McLachlan, 1895	X	X	X		X	X	X		X	X	Westfall and May (1996)	
				Archilestes grandis (Rambur, 1842)	X	X			X				X	?	Westfall and May (1996)	
			Lestes		X	X	X		X	X	X	X	X		Westfall and May (1996)	
				Lestes alacer Hagen, 1861	X								X		Westfall and May (1996)	
				Lestes congener Hagen, 1861	X	X	X		X	X	X	X	X		Westfall and May (1996)	
				Lestes disjunctus Selys, 1862	X		X		X	X	X	X	X		Westfall and May (1996)	*Lestes disjunctus disjunctus* Selys
				Lestes dryas Kirby, 1890	X		X		X	X	X	X	X		Westfall and May (1996)	
				Lestes stultus Hagen, 1861	X		X		X	X					Westfall and May (1996)	

Odonata

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Lestes unguiculatus Hagen, 1861	X		X		X	X	X	X			Westfall and May (1996)	
		Platystictidae											X		Westfall and May (1996); Hoekstra and Garrison (1999)	very restricted locality
			Palaemnema										X		Westfall and May (1996); Hoekstra and Garrison (1999)	very restricted locality
				Palaemnema domina Calvert, 1905	X								X		Westfall and May (1996); Hoekstra and Garrison (1999)	very restricted locality
	Anisoptera				X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	Has keys for all dragonflies found in the region
		Aeshnidae			X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
			Aeshna		X	X	X		X						Needham, Westfall and May (2000)	Even late instar larvae are difficult to distinguish and should be left at genus
				Aeshna californica Calvert, 1895	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Aeshna canadensis Walker, 1908	X		X			X	X				Needham, Westfall and May (2000)	
				Aeshna constricta Say, 1839	X						X				Needham, Westfall and May (2000)	
				Aeshna dugesi Calvert, 1905	X								X		Needham, Westfall and May (2000)	
				Aeshna eremita Scudder, 1866	X						X				Needham, Westfall and May (2000)	
				Aeshna interrupta Walker, 1908	X				X	X	X	X	X		Needham, Westfall and May (2000)	*A. interrupta interna* Walker, 1912

Odonata

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Aeshna juncea (Linnaeus, 1758)	X					X	X				Needham, Westfall and May (2000)	
				Aeshna multicolor Hagen, 1861	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Aeshna palmata Hagen, 1856	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Aeshna persephone Donnelly, 1961	X								X		Needham, Westfall and May (2000)	
				Aeshna psillus Calvert, 1918	X								X		Needham, Westfall and May (2000)	
				Aeshna subarctica Walker, 1908	X					X	X				Needham, Westfall and May (2000)	
				Aeshna tuberculifera Walker, 1908	X						X				Needham, Westfall and May (2000)	
				Aeshna walkeri Kennedy, 1917	X	X			X	X				X	Needham, Westfall and May (2000)	
			Anax		X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Anax junius (Drury, 1773)	X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Anax walsinghami McLachlan, 1882	X	X			X			X	X	X	Needham, Westfall and May (2000)	
			Oplonaeshna		X				X				X		Needham, Westfall and May (2000)	
				Oplonaeshna armata (Hagen, 1861)	X				X				X		Needham, Westfall and May (2000)	Only one CA record from Water Canyon in Inyo County
			Remartinia		X								X		Needham, Westfall and May (2000)	
				Remartinia luteipennis (Burmeister, 1839)	X								X		Needham, Westfall and May (2000)	
		Cordulegastridae			X	X			X	X	X	X	X		Needham, Westfall and May (2000)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Cordulegaster		X	X			X	X	X	X	X		Needham, Westfall and May (2000)	
				Cordulegaster diadema Selys, 1868	X								X		Needham, Westfall and May (2000)	
				Cordulegaster dorsalis (Hagen in Selys, 1858)	X				X	X	X	X			Needham, Westfall and May (2000)	
		Corduliidae			X	X	X		X	X	X	X			Needham, Westfall and May (2000)	Corduliids unlikely in samples collected by CSBP
			Cordulia		X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Cordulia shurtleffii Scudder, 1861	X		X		X	X	X	X			Needham, Westfall and May (2000)	Northern CA ponds and lakes at higher elevations
			Epitheca		X	X	X		X	X	X				Needham, Westfall and May (2000)	
				Epitheca canis (McLachlan, 1886)	X	X	X		X	X	X				Needham, Westfall and May (2000)	Lakes and slower sections of Northern CA streasm
				Epitheca spinigera (Selys, 1871)	X				X	X	X				Needham, Westfall and May (2000)	as *Tetragoneuria* in some lists
			Somatochlora		X		X		X	X	X	X			Needham, Westfall and May (2000)	boggy marshes and lakes at higher elevation in Northern CA; uncommon
				Somatochlora albicincta (Burmeister, 1839)	X				X	X	X				Needham, Westfall and May (2000)	
				Somatochlora minor Calvert, 1898	X					X	X				Needham, Westfall and May (2000)	
				Somatochlora semicircularis (Selys, 1871)	X				X	X	X	X			Needham, Westfall and May (2000)	
		Gomphidae			X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
			Erpetogomphus		X				X	X	X	X	X	X	Needham, Westfall and May (2000)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Erpetogomphus compositus Hagen in Selys, 1858	X	X			X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Erpetogomphus crotalinus (Hagen in Selys, 1854)	X								X		Needham, Westfall and May (2000)	
				Erpetogomphus designatus Hagen in Selys, 1858	X							X	X		Needham, Westfall and May (2000)	
				Erpetogomphus lampropeltis Kennedy, 1918	X				X				X		Needham, Westfall and May (2000)	
			Gomphus		X	X	X		X	X	X	X			Needham, Westfall and May (2000)	
				Gomphus graslinellus Walsh, 1862	X						X				Needham, Westfall and May (2000)	
				Gomphus kurilis (Hagen in Selys, 1858)	X	X	X		X	X	X	X			Needham, Westfall and May (2000)	Northern CA streams; rarely in lakes
				Gomphus lynnae Paulson, 1983	X					X	X				Needham, Westfall and May (2000)	
			Octogomphus		X				X	X	X	X		X	Needham, Westfall and May (2000)	
				Octogomphus specularis Hagen, 1859	X				X	X	X	X		X	Needham, Westfall and May (2000)	Monotypic
			Ophiogomphus		X	X			X	X	X	X	X		Needham, Westfall and May (2000)	
				Ophiogomphus arizonicus Kennedy, 1917	X								X		Needham, Westfall and May (2000)	
				Ophiogomphus bison Selys, 1873	X	X			X	X		X			Needham, Westfall and May (2000)	
				Ophiogomphus morrisoni Selys, 1879	X	X			X	X		X			Needham, Westfall and May (2000)	
				Ophiogomphus occidentis Hagen, 1883	X	X			X	X	X	X			Needham, Westfall and May (2000)	
				Ophiogomphus severus Hagen, 1874)	X				X	X	X	X			Needham, Westfall and May (2000)	
			Progomphus		X	X			X	X			X		Needham, Westfall and May (2000)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Progomphus borealis McLachlan in Selys, 1873	X	X			X	X			X		Needham, Westfall and May (2000)	
			Stylurus		X	X			X	X	X	X	X		Needham, Westfall and May (2000)	
				Stylurus intricatus (Hagen in Selys, 1858)	X	X			X			X	X		Needham, Westfall and May (2000)	
				Stylurus olivaceus (Selys, 1873)	X	X			X	X	X	X	X		Needham, Westfall and May (2000)	
				Stylurus plagiatus (Selys, 1854)	X	X			X				X		Needham, Westfall and May (2000)	
		Libellulidae			X				X						Needham, Westfall and May (2000)	
			Brachymesia		X		X		X				X		Needham, Westfall and May (2000)	
				Brachymesia furcata (Hagen, 1861)	X		X		X				X		Needham, Westfall and May (2000)	Southern California ponds
				Brachymesia gravida (Calvert, 1890)	X								X		Needham, Westfall and May (2000)	
			Brechmorhoga		X	X			X				X		Needham, Westfall and May (2000)	
				Brechmorhoga mendax (Hagen, 1861)	X	X			X				X		Needham, Westfall and May (2000)	Deep crenulations in labial palps make this key to Cordullidae in Merritt and Cummins
				Brechmorhoga pertinax (Hagen, 1861)	X								X		Needham, Westfall and May (2000)	stray only? Not a breeding population
			Dythemis		X								X	X	Needham, Westfall and May (2000)	
				Dythemis fugax Hagen, 1861	X								X		Needham, Westfall and May (2000)	
				Dythemis nigrescens Calvert, 1899	X								X	X	Needham, Westfall and May (2000)	
				Dythemis velox Hagen, 1861	X								X		Needham, Westfall and May (2000)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Erythemis		X				X	X	X	X	X		Needham, Westfall and May (2000)	
				Erythemis collacata (Hagen, 1861)	X				X	X	X	X	X		Needham, Westfall and May (2000)	
				Erythemis simplicicollis (Say, 1839)	X								X		Needham, Westfall and May (2000)	
				Erythemis vesiculosa (Fabricius, 1775)	X								X		Needham, Westfall and May (2000)	
			Erythrodiplax		X				?				X	X	Needham, Westfall and May (2000)	
				Erythrodiplax basifusca (Calvert, 1895)	X								X	X	Needham, Westfall and May (2000)	
				Erythrodiplax funerea (Hagen, 1861)	X				?				X		Needham, Westfall and May (2000)	
			Ladona		X		X		X	X	X				Needham, Westfall and May (2000)	
				Ladona julia (Uhler, 1857)	X		X		X	X	X				Needham, Westfall and May (2000)	
			Leucorrhinia		X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Leucorrhinia borealis Hagen, 1890	X						X				Needham, Westfall and May (2000)	
				Leucorrhinia glacialis Hagen, 1890	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Leucorrhinia hudsonica (Selys, 1850)	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Leucorrhinia intacta (Hagen, 1861)	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Leucorrhinia proxima Calvert, 1890	X		X		X		X				Needham, Westfall and May (2000)	
			Libellula		X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Libellula comanche Calvert, 1861	X	X			X	X		X	X		Needham, Westfall and May (2000)	restricted to seeps and springs

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Libellula composita (Hagen, 1873)	X	X			X	X		X	X		Needham, Westfall and May (2000)	restricted to seeps and springs
				Libellula croceipennis Selys, 1868	X	X			X			X			Needham, Westfall and May (2000)	restricted to seeps and springs
				Libellula forensis Hagen, 1861	X	X			X	X	X	X	X		Needham, Westfall and May (2000)	
				Libellula luctuosa Burmeister, 1839	X				X	X	X		X		Needham, Westfall and May (2000)	
				Libellula nodisticta Hagen, 1861	X	X			X	X		X	X		Needham, Westfall and May (2000)	prefers seeps and springs
				Libellula pulchella Drury, 1773	X		X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Libellula quadrimaculata Linnaeus, 1758	X		X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Libellula saturata Uhler, 1857	X	X	X		X	X		X	X	X	Needham, Westfall and May (2000)	
			Macrodiplax		X		X		X				X	X	Needham, Westfall and May (2000)	
				Macrodiplax balteata (Hagen, 1861)	X		X		X				X	X	Needham, Westfall and May (2000)	desert spring-fed marshes
			Macrothemis		X								X		Needham, Westfall and May (2000)	
				Macrothemis inacuta Calvert, 1898	X								X		Needham, Westfall and May (2000)	
			Orthemis		X		X		X			X	X		Needham, Westfall and May (2000)	
				Orthemis discolor (Burmeister, 1839)	X		X						X			
				Orthemis ferruginea (Fabricius, 1775)	X		X		X			X	X		Needham, Westfall and May (2000)	
			Pachydiplax		X		X		X	X	X	X	X		Needham, Westfall and May (2000)	monotypic
				Pachydiplax longipennis (Burmeister, 1839)	X				X	X	X	X	X		Needham, Westfall and May (2000)	monotypic

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Paltothemis		X	X			X				X	X	Needham, Westfall and May (2000)	
				Paltothemis lineatipes Karsch, 1890	X	X			X				X	X	Needham, Westfall and May (2000)	Deep crenulations in labial palps make this key to Cordullidae in Merritt and Cummins
			Pantala		X				X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Pantala flavescens (Fabricius, 1798)	X				X	X	X	X	X		Needham, Westfall and May (2000)	
				Pantala hymenaea (Say, 1839)	X				X	X	X	X	X	X	Needham, Westfall and May (2000)	
			Perithemis		X		X		X				X		Needham, Westfall and May (2000)	
				Perithemis domitia (Drury, 1773)	X								X		Needham, Westfall and May (2000)	
				Perithemis intensa Kirby, 1889	X		X		X				X		Needham, Westfall and May (2000)	
				Perithemis tenera (Say, 1839)	X								X		Needham, Westfall and May (2000)	
			Plathemis		X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Plathemis lydia (Drury, 1773)	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Plathemis subornata Hagen, 1861	X	X	X		X	X		X	X		Needham, Westfall and May (2000)	
			Pseudoloeon		X								X		Needham, Westfall and May (2000)	monotypic
				Pseudoleon superbus (Hagen, 1861)	X								X		Needham, Westfall and May (2000)	monotypic
			Sympetrum		X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Sympetrum corruptum (Hagen, 1861)	X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Sympetrum costiferum (Hagen, 1861)	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum danae (Sulzer, 1776)	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum illotum (Hagen, 1861)	X	X	X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum internum Montgomery, 1911	X	X	X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum madidum (Hagen, 1861)	X	X	X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum obtrusum (Hagen, 1867)	X		X		X	X	X	X			Needham, Westfall and May (2000)	
				Sympetrum occidentale Bartenev, 1911	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	three recognized subspecies
				Sympetrum pallipes (Hagen, 1874)	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Sympetrum signiferum Cannings and Garrison, 1991	X								X		Needham, Westfall and May (2000)	
				Sympetrum vicinum (Hagen, 1861)	X		X		X	X	X				Needham, Westfall and May (2000)	
			Tramea		X	X	X		X	X	X	X	X	X	Needham, Westfall and May (2000)	
				Tramea calverti Muttkowski, 1895	X	X	X		?							unpublished record for CA
				Tramea lacerata Hagen, 1861	X	X	X		X	X	X	X	X		Needham, Westfall and May (2000)	
				Tramea onusta Hagen, 1861	X	X	X		X			X	X	X	Needham, Westfall and May (2000)	
		Macromiidae			X				X						Needham, Westfall and May (2000)	
			Macromia		X				X	X	X	X	X		Needham, Westfall and May (2000)	
				Macromia magnifica McLachlan in Selys, 1874	X				X	X	X	X	X		Needham, Westfall and May (2000)	Northern CA foothills and coast ranges

Taxonomic Hierarchy					Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
		Petaluridae			X				X	X	X	X			Needham, Westfall and May (2000)	
				Tanypteryx hageni (Selys, 1879)	X				X	X	X	X			Needham, Westfall and May (2000)	Rare and localized in seeps and springs

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Plecoptera: Stoneflies
Standard Effort Level I: Genus
Standard Effort Level II: Species (where possible)
Standard Taxonomic Reference: Stewart and Stark (2002)
Reviewed by: John B. Sandberg

Nymphs may be identified to family and genus using Stewart and Stark (2002) or the chapter in Merritt and Cummins (Stewart and Harper, 1996), which also provides keys to adults. Although species keys exist for the adults of many families and genera in the West, many nymphs remain undescribed. Early instar nymphs of Capniidae can be very difficult to identify to genus; it is recommended that only mature nymphs be identified beyond Capniidae. Many genera and species of Capniidae, Leuctridae, Nemouridae and Taeniopterygidae are underrepresented in benthic samples because they emerge during the winter months or they prefer ephemeral habitats. Jewett (1959, 1960) are good sources of information on adult taxonomy. A current species list and distribution for stoneflies, The North American Stonefly List, is maintained by B.P. Stark and R.W. Baumann on the Monte L. Bean Museum website.

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Plecoptera						X	X	X		X	X	X	X	X	X	Stewart and Stark (2002)	has keys to all families and genera of stoneflies in North America
	Euholognatha																
		Capniidae				X	X			X	X	X	X	X	X		Nymphs notoriously difficult to separate even to genus; immature specimens are best left at Capniidae
			Bolshecapnia			X	X			X						Stewart and Stark (2002)	
					Bolshecapnia maculata (Jewett, 1954)	X	X			X							known only from CA
			Capnia			X	X			X	X	X	X	X	X	Nelson and Baumann (1989)	nymphs are not separable to species
			Capnura			X	X			X	X	X	X	X			nymphs not separable to species

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Eucapnosis			X	X			X	X	X	X	X			only one North American species
					Eucapnosis brevicauda Claassen, 1924	X	X			X	X	X	X	X			only one North American species
			Isocapnia			X	X			X	X	X				Zenger and Baumann, 2004	nymphs not separable to species
			Mesocapnia			X	X			X	X	X		X			nymphs not separable to species
			Paracapnia			X	X			X	X	X				Stark and Baumann (2004)	nymphs not separable to species
			Utacapnia			X	X			X	X	X	X				nymphs not separable to species
		Leuctridae															
			Calileuctra			X	X			X						Shepard and Baumann (1995)	found in intermittant streams; nymphs not separable to species
					Calileuctra dobryi Shepard and Baumann, 1995	X	X			X						Shepard and Baumann (1995)	found in intermittant streams
					Calileuctra ephemera Shepard and Baumann, 1995	X	X			X						Shepard and Baumann (1995)	found in intermittant streams
			Despaxia			X	X			X	X	X					monotypic
					Despaxia augusta (Banks, 1907)	X	X			X	X	X					monotypic
			Megaleuctra			X	X			X	X	X					nymphs not separable to species
			Moselia			X	X			X	X	X	X				monotypic
					Moselia infuscata (Claassen, 1923)	X	X			X	X	X	X				monotypic
			Paraleuctra			X	X			X	X	X	X				nymphs not separable to species
			Perlomyia			X	X			X	X	X					nymphs not separable to species
			Pomoleuctra			X	X			X	X					Stark and Kyzar (2001)	formerly in *Paraleuctra;* nymphs not separable to species
		Nemouridae															
			Amphinemura			X	X							X			nymphs not separable to species

Taxonomic Hierarchy						Habitat				Distribution							
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
			Lednia			X	X			X		X				Kondratieff, Lechleitner and Zuellig (2006)	undescribed species in Sierra Nevadas
			Malenka			X	X			X	X	X	X	X	X		nymphs not separable to species
			Nanonemoura			X	X				X						monotypic; known only from type locality
					Nanonemoura wahkeena (Jewett, 1954)	X	X				X						monotypic; known only from type locality
			Nemoura			X	X			X							
					Nemoura spiniloba Jewett, 1954	X	X			X							only one species in western North America
			Ostrocerca			X	X			?	X	X					nymphs not separable to species; unpublished record for CA
			Podmosta			X	X			X	X	X	X				nymphs not separable to species
			Prostoia			X	X			X	X	X	X				only one species in western North America
					Prostoia besametsa (Ricker, 1952)	X	X			X	X	X	X				only one species in western North America
			Soyedina			X	X			X	X	X	X				nymphs not separable to species
			Visoka			X	X			X	X	X					monotypic
					Visoka cataractae (Neave, 1933)	X	X			X	X	X					monotypic
			Zapada			X	X			X	X	X	X			Baumann et al. (1977)	key to nymphs of three species (cinctipes, columbiana and frigida); remaining species key to oregonensis group
					Zapada cinctipes (Banks, 1897)	X	X			X		X	X			Baumann et al. (1977)	
					Zapada columbiana (Claassen, 1923)	X	X			X	X	X				Baumann et al. (1977)	
					Zapada frigida (Claassen, 1923)	X	X			X	X	X	X			Baumann et al. (1977)	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	**Suborder**	**Family**	**Genus**	**Species group**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
				Zapada oregonensis group sensu Baumann et al. (1977)												Baumann et al. (1977)	includes *Z. cordillera* (Baumann and Gaufin, 1971), *Z. haysi* (Ricker, 1952) and *Z. oregonensis* (Claassen, 1923)
		Taeniopterygidae				X	X			X	X	X	X	X			
			Doddsia			X	X			X	X	X	X				monotypic
					Doddsia occidentalis (Banks, 1900)	X	X			X	X	X	X				monotypic
			Oemopteryx			X	X			X							
					Oemopteryx vanduzeea (Claassen, 1937)	X	X			X							only described species in region
			Taenionema			X	X			X	X	X	X	X			nymphs not separable to species
			Taeniopteryx			X	X			X	X	X					
					Taeniopteryx nivalis (Fitch, 1847)	X	X			X	X	X					only species in region
	Systellognatha																
		Chloroperlidae				X	X			X	X	X	X	X	X	Surdick (1985)	
			Alloperla			X	X			X	X	X	X				nymphs not separable to species
			Bisancora			X	X			X	X				X		nymphs not separable to species
			Haploperla			X	X			X	X	X			X		
					Haploperla chilnualna (Ricker, 1952)	X	X			X	X	X			X		only species in western North America
			Kathroperla			X	X			X	X	X	X			Stark and Surdick (1987)	nymphs not separable to species
			Paraperla			X	X			X	X	X					nymphs not separable to species
			Plumiperla			X	X			X	X	X	X				nymphs not separable to species
			Sasquaperla			X	X			X						Stark and Baumann (2001)	monotypic
					Sasquaperla hoopa Stark and Baumann, 2001	X	X			X						Stark and Baumann (2001)	monotypic
			Suwallia			X	X			X	X	X	X	X		Alexander (1999)	nymphs not separable

Taxonomic Hierarchy						Habitat				Distribution							
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
																	to species
			Sweltsa			X	X			X	X	X	X	X		Stark and Stewart (2005)	nymphs not separable to species; 9 of 21 western species nymphs described
			Triznaka			X	X			X	X	X	X				nymphs not separable to species
			Utaperla			X	X						X				
					Utaperla sopladora Ricker, 1952	X	X						X				only species found in western North America
		Peltoperlidae				X	X			X	X	X	X				
			Sierraperla			X	X			X	X		X				monotypic
					Sierraperla cora (Needham and Smith, 1916)	X	X			X	X		X				monotypic
			Soliperla			X	X			X	X	X	X			Stark (1983	nymphal key includes only 4 of the 7 known species
			Yoraperla			X	X			X	X	X	X			Stark and Nelson (1994)	nymphs for all four North American species described and keyed
					Yoraperla brevis (Banks, 1907)	X	X				X					Stark and Nelson (1994)	
					Yoraperla mariana (Ricker, 1943)	X	X			X	X	X				Stark and Nelson (1994)	
					Yoraperla nigrisoma (Banks, 1948)	X	X			X	X	X	X			Stark and Nelson (1994)	
					Yoraperla siletz Stark and Nelson, 1994	X	X			X	X	X				Stark and Nelson (1994)	
		Perlidae				X	X			X	X	X	X	X			
			Anacroneuria			X	X							X			
					Anacroneuria wipukupa Baumann and Olson, 1984	X	X							X			only species found in North America
			Calineuria			X	X			X	X	X					
					Calineuria californica (Banks, 1905)	X	X			X	X	X					only species found in North America
			Claassenia			X	X			X	X	X		X			
					Claassenia sabulosa (Banks, 1900)	X	X			X	X	X		X			only species found in

Taxonomic Hierarchy						Habitat				Distribution							
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
																	North America
			Doroneuria			X	X			X	X	X	X				
					Doroneuria baumanni Stark and Gaufin, 1974	X	X			X	X	X	X				*D. theodora* (Needham and Claassen) is found in BC, ID, MT and WY
			Hesperoperla			X	X			X	X	X	X	X			mature nymphs of the two species easily separable
					Hesperoperla hoguei Baumann and Stark, 1980	X	X			X						Baumann and Stark (1980)	
					Hesperoperla pacifica (Banks, 1900)	X	X			X	X	X	X	X		Stewart and Stark (2002)	
		Perlodidae				X	X			X	X	X	X	X	X		
			Baumannella			X	X			X						Stark and Stewart (1985)	monotypic
					Baumannella alameda (Needham and Claassen, 1925)	X	X			X						Stark and Stewart (1985)	monotypic
			Calliperla			X	X			X	X	X					monotypic
					Calliperla luctuosa (Banks, 1906)	X	X			X	X	X					monotypic
			Cascadoperla			X	X			X	X	X				Szczytko and Stewart (1979)	monotypic
					Cascadoperla trictura (Hoppe, 1938)	X	X			X	X	X				Szczytko and Stewart (1979)	monotypic
			Chernokrilus			X	X			X	X						nymphs are not separable to species
			Cosumnoperla			X	X									Szczytko and Bottorff (1987)	monotypic
					Cosumnoperla hypocrena Szczytko and Bottorff, 1987	X	X			X						Szczytko and Bottorff (1987)	monotypic
			Cultus			X	X			X	X	X		X			
			Diura			X	X			X	X		X				
					Diura knowltoni (Frison, 1937)	X	X			X	X		X				
			Frisonia			X	X			X	X	X	X				
					Frisonia picticeps (Hanson, 1942)	X	X			X	X	X	X				
			Isogenoides			X	X			X		X		X		Sandberg and Stewart (2005)	key given for nymphs to all species of

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	Isogenoides
					Isogenoides colubrinus (Hagen, 1874)	X	X			X				X		Sandberg and Stewart (2005)	
					Isogenoides elongatus (Hagen, 1874)	X	X					X		X		Sandberg and Stewart (2005)	
					Isogenoides zionensis Hanson, 1949	X	X							X		Sandberg and Stewart (2005)	
			Isoperla			X	X			X	X	X	X	X	X	Szczytko and Stewart (1979); Bottorff et al. (1990); Szczytko and Stewart (2002)	not all western *Isoperla* species described as nymphs
			Kogotus			X	X			X	X	X					immature specimens have secondary lacinial tooth which makes ID to genus difficult; immature *Kogotus* and *Rickera* difficult to separate
					Kogotus nonus (Needham and Claassen, 1925)	X	X			X	X	X					only species in the region
			Kogotus/Rickera			X	X			X	X	X					many specimens of these genera, especially early instars inseparable
			Megarcys			X	X			X	X	X	X				nymphs not separable to species
			Oroperla			X	X			X							monotypic
					Oroperla barbara Needham, 1933	X	X			X							monotypic
			Osobenus			X	X			X	X	X					monotypic
					Osobenus yakimae (Hoppe, 1938)	X	X			X	X	X					monotypic
			Perlinodes			X	X			X	X	X					monotypic
					Perlinodes aurea (Smith, 1917)	X	X			X	X	X					monotypic
			Pictetiella			X	X					X					
					Pictetiella lechleitneri Stark and Kondratieff, 2004	X	X					X				Stark and Kondratieff (2004)	found only in Mt. Ranier, WA area

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	**Suborder**	**Family**	**Genus**	**Species group**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
			Rickera			X	X			X	X	X	X				monotypic; immature specimens difficult to separate from *Kogotus*
					Rickera sorpta (Needham and Claassen, 1925)	X	X			X	X	X	X				monotypic
			Salmoperla			X	X			X							monotypic
					Salmoperla sylvanica Baumann and Lauck, 1987	X	X			X							monotypic
			Setvena			X	X				X	X				Stewart and Stanger (1985)	key to nymphs of all three known species
					Setvena tibialis (Banks, 1914)	X	X				X	X					
					Setvena wahkeena Stewart and Stanger, 1985	X	X				X						
			Skwala			X	X			X	X	X	X	X		Zwick (1989)	nymphs of the two species are not separable
			Susulus			X	X			X						Bottorff et al. (1989)	monotypic
					Susulus venustus (Jewett, 1965)	X	X			X						Bottorff et al. (1989)	monotypic
		Pteronarcyidae				X	X			X	X	X	X	X			
			Pteronarcella			X	X			X	X	X	X	X		Baumann et al. (1977)	key to nymphs of both species
					Pteronarcella badia (Hagen, 1874)	X	X				X		X	X			
					Pteronarcella regularis (Hagen, 1874)	X	X			X	X	X	X				
			Pteronarcys			X	X			X	X	X	X	X		Baumann et al. (1977)	key to nymphs of both species
					Pteronarcys californica Newport, 1851	X	X			X	X	X		X			
					Pteronarcys princeps Banks, 1907	X	X			X	X	X	X				

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Hemiptera (Suborder Heteroptera): True Bugs
Standard Effort Level I: Genus
Standard Effort Level II: Species
Standard Taxonomic Reference(s): Polhemus (1996)
Reviewed by: John T. Polhemus

Keys to families and genera are provided in Merritt and Cummins (Polhemus, 1996). The best regional text for all families remains Menke (ed.) (1979), which gives keys to all genera and species then known to occur in California. Stonedahl and Lattin (1986) surveyed the Corixidae for Oregon and Washington. This revision of the STE includes only those families which are truly aquatic (all Nepomorpha, except Gelastocoridae and Ochteridae) and excludes all Gerromorpha and Leptopodomorpha. The Notonectidae and Pleidae, which are included in this list, are generally rejected from benthic datasets.

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Hemiptera																					
	Heteroptera																			Menke et al. (1979)	
		Nepomorpha												X	X	X	X	X			
			Belostomatidae											X				X		Menke (1979)	
							Abedus							X				X		Menke (1979)	
									Abedus breviceps Stal, 1862	X								X		Menke (1979)	
									Abedus herberti Hidalgo, 1935	X								X		Menke (1979)	
									Abedus indentatus (Haldeman, 1854)	X				X						Menke (1979)	
									Abedus ovatus Stal, 1862	X								X		Menke (1979)	
									Abedus parkeri Menke, 1966	X								X		Menke (1979)	
									Abedus vicinus Mayr, 1871	X								X		Menke	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(1979)	
							Belostoma			X				X	X		X	X		Menke (1979)	
									Belostoma bakeri Montandon, 1913	X				X	X		X	X		Menke (1979)	
									Belostoma confusum Lauck, 1959	X								X		Menke (1979)	
									Belostoma flumineum Say, 1832	X				X	X		X	X		Menke (1979)	
									Belostoma saratogae Menke, 1958	X				X						Menke (1979)	known only from Saratoga Spring, Death Valley, CA
									Belostoma subspinosum (Palisot, 1820)	X				X				X		Menke (1979)	
							Lethocerus			X				X	X	X	X	X		Goodwyn (2006)	
									Lethocerus americanus (Leidy, 1847)	X				X	X	X	X			Goodwyn (2006)	
									Lethocerus angustipes (Mayr, 1871)	X				X			X			Goodwyn (2006)	known in the U.S. only from Saratoga Spring, Death Valley, CA; also found in Mexico
									Lethocerus medius (Guerin-Meneville, 1857)	X								X		Goodwyn (2006)	
			Corixidae							X	X	X	X	X	X	X	X	X	X	Polhemus (1996); Hungerford (1948); Lauck (1979); Stonedahl	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				and Lattin (1986)	
				Corixinae						X	X	X	X	X	X	X	X	X	X	Polhemus (1996); Hungerford (1948); Lauck (1979); Stonedahl and Lattin (1986)	
					Corixini					X	X	X	X	X	X	X	X	X	X	Polhemus (1996); Hungerford (1948); Lauck (1979); Stonedahl and Lattin (1986)	
							Arctocorisa			X		X		?						Hungerford (1948)	high elevation ponds
									Arctocorisa sutilis (Uhler, 1876)	X		X		?						Hungerford (1948)	unpublished record for CA
							Callicorixa			X				X	X	X	X			Stonedahl and Lattin (1986)	
									Callicorixa alaskensis Hungerford, 1926	X						X				Stonedahl and Lattin (1986)	
									Callicorixa audeni Hungerford, 1928	X				X	X	X	X			Stonedahl and Lattin (1986)	
									Callicorixa scudderi Jansson, 1979	X					X	X				Stonedahl and Lattin (1986)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Callicorixa vulnerata (Uhler, 1861)	X				X	X	X				Stonedahl and Lattin (1986)	
							Cenocorixa			X				X	X	X				Hungerford (1948)	
									Cenocorixa andersoni Hungerford, 1948	X					X	X				Hungerford (1948)	
									Cenocorixa bifida (Hungerford, 1926)	X						X				Hungerford (1948)	as *C. bifida hungerfordi* Lansbury, 1960
									Cenocorixa blaisdelli (Hungerford, 1930)	X				X		X				Hungerford (1948)	
									Cenocorixa expleta (Uhler, 1895)	X						X				Hungerford (1948)	
									Cenocorixa kuiterti Hungerford, 1948	X				X						Hungerford (1948)	
									Cenocorixa utahensis (Hungerford, 1925)	X					X	X	X	X		Hungerford (1948)	
									Cenocorixa wileyae (Hungerford, 1926)	X				X	X	X	X	X		Hungerford (1948)	
							Corisella			X				X	X	X	X	X		Hungerford (1948)	
									Corisella decolor (Uhler, 1871)	X				X	X		X			Hungerford (1948)	
									Corisella edulis (Champion, 1901)	X					X		X	X		Hungerford (1948)	
									Corisella inscripta (Uhler, 1894)	X				X	X	X	X	X		Hungerford (1948)	
									Corisella tarsalis (Fieber, 1851)	X				X			X			Hungerford (1948)	
							Hesperocorixa			X				X	X	X	X	X		Hungerford (1948)	
									Hesperocorixa atopodonta (Hungerford, 1927)	X					X	X				Hungerford (1948)	
									Hesperocorixa escheri (Heer, 1853)	X						X				Hungerford (1948)	dubious species?

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Hesperocorixa kennicotti (Uhler, 1897)	X						X				Hungerford (1948)	
									Hesperocorixa laevigata (Uhler, 1893)	X				X	X	X	X	X		Hungerford (1948)	
									Hesperocorixa nitida (Fieber, 1851)	X						X				Hungerford (1948)	
									Hesperocorixa vulgaris (Hungerford, 1925)	X				X	X	X				Hungerford (1948)	
							Morphocorixa			X								X		Hungerford (1948)	
									Morphocorixa lundbladi (Jaczewski, 1931)	X								X		Hungerford (1948)	
							Palmacorixa			X				?						Hungerford (1948)	unpublished record for CA
									Palmacorixa buenoi Abbott, 1913	X				?						Hungerford (1948)	unpublished record for CA
							Pseudocorixa			X								X		Hungerford (1948)	
									Pseudocorixa beameri (Hungerford, 1928)	X								X		Hungerford (1948)	
							Ramphocorixa			X								X		Hungerford (1948)	
									Ramphocorixa rotundocephala Hungerford, 1927	X								X		Hungerford (1948)	
							Sigara			X				X	X	X	X	X		Hungerford (1948)	
									Sigara decoratella (Hungerford, 1926)	X						X				Hungerford (1948)	
									Sigara alternata (Say, 1825)	X					X	X	X	X		Hungerford (1948)	
									Sigara grossolineata Hungerford, 1948	X				X	X	X				Hungerford (1948)	
									Sigara krafti Stonedahl, 1984	X					X	X				Stonedahl (1984)	
									Sigara mckinstryi Hungerford, 1948	X				X	X	X				Hungerford (1948)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Sigara nevadensis (Walley, 1936)	X							X			Hungerford (1948)	
									Sigara omani (Hungerford, 1930)	X				X	X	X	X	X		Hungerford (1948)	
									Sigara vallis Lauck, 1966	X				X						Lauck (1979)	
									Sigara vandykei Hungerford, 1948	X				X		X				Hungerford (1948)	
									Sigara washingtonensis Hungerford, 1948	X				X	X	X	X	X		Hungerford (1948)	
							Trichocorixa			X			X	X			X	X		Hungerford (1948)	
									Trichocorixa arizonensis Sailer, 1948	X								X		Hungerford (1948)	
									Trichocorixa calva (Say, 1832)	X				X			X	X		Hungerford (1948)	
									Trichocorixa reticulata (Guerin-Meneville, 1857)	X			X	X			X			Hungerford (1948)	
									Trichocorixa uhleri Sailer, 1948	X							X	X		Hungerford (1948)	
									Trichocorixa verticalis (Fieber, 1851)	X			X	X			X	X		Hungerford (1948)	
					Graptocorixini					X				X	X		X	X	X	Hungerford (1948)	
							Graptocorixa			X				X	X		X	X		Hungerford (1948)	
									Graptocorixa abdominalis (Say, 1832)	X							X	X	X	Hungerford (1948)	
									Graptocorixa californica (Hungerford, 1925)	X				X	X					Hungerford (1948)	
									Graptocorixa gerhardi (Hungerford, 1925)	X								X		Hungerford (1948)	
									Graptocorixa serrulata (Uhler, 1897)	X					X		X	X		Hungerford (1948)	
									Graptocorixa uhleri (Hungerford, 1925)	X				X			X			Hungerford (1948)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Graptocorixa uhleroidea Hungerford, 1938	X				X						Hungerford (1948)	
							Neocorixa			X								X		Hungerford (1948)	only one species found in North America
									Neocorixa snowi Hungerford, 1925	X								X		Hungerford (1948)	only species found in North America
			Naucoridae							X				X	X		X	X			
				Ambrysinae						X				X	X		X	X			
							Ambrysus			X				X	X		X	X		Polhemus (1979); La Rivers (1951)	
									Ambrysus amargosus La Rivers, 1953	X							X			Polhemus (1979); La Rivers (1951)	Ash Meadows, NV; Listed under the Federal Endangered Species Act
									Ambrysus arizonus La Rivers, 1951	X							X			Polhemus (1979); La Rivers (1951)	
									Ambrysus californicus Montandon, 1897	X				X						Polhemus (1979); La Rivers (1951)	
									Ambrysus circumcinctus Montandon, 1910	X								X		Polhemus (1979); La Rivers (1951)	
									Ambrysus funebris La Rivers, 1949	X				X			X			Polhemus (1979); La Rivers	Death Valley, CA

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(1951)	
									Ambrysus melanopterus Stal, 1862	X								X		Polhemus (1979); La Rivers (1951)	
									Ambrysus mormon Montandon, 1909	X				X	X		X	X		Polhemus (1979); La Rivers (1951)	
									Ambrysus occidentalis La Rivers, 1951	X				X				X		Polhemus (1979); La Rivers (1951)	
									Ambrysus pulchellus Montandon, 1897	X								X		Polhemus (1979); La Rivers (1951)	
									Ambrysus puncticollis Stal, 1876	X				X				X		Polhemus (1979); La Rivers (1951)	
									Ambrysus relictus Polhemus and Polhemus, 1994	X							X			Polhemus and Polhemus (1994)	Ash Meadows, NV
									Ambrysus thermarum La Rivers, 1953	X								X			
									Ambrysus woodburyi Usinger, 1946	X							X	X		Polhemus (1979); La Rivers (1951)	
				Limnocorinae						X							X			Polhemus (1979); La Rivers (1951)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Limnocoris			X							X			Polhemus (1979); La Rivers (1951)	
									Limnocoris moapensis (La Rivers, 1950)	X							X			Sites and Willig (1994)	Moapa Warm Springs, NV
				Naucorinae						X				X			X	X		Polhemus (1979); La Rivers (1951)	
							Pelocoris			X				X			X	X		Polhemus (1979); La Rivers (1951)	
									Pelocoris biimpressus Montandon, 1898	X				X			X	X		Polhemus and Sites (1995)	*P. shoshone* La Rivers, 1948 now a synonym
			Nepidae							X				X	X			X		Sites and Polhemus (1994)	
				Nepinae						X								X		Sites and Polhemus (1994)	
					Curictini					X								X		Sites and Polhemus (1994)	
							Curicta			X								X		Sites and Polhemus (1994)	
									Curicta pronotata Kuitert, 1949	X								X		Sites and Polhemus (1994)	
				Ranatrinae						X				X	X		X	X		Sites and Polhemus (1994)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Ranatra			X				X	X		X	X		Sites and Polhemus (1994)	
									Ranatra brevicollis Montandon, 1910	X				X						Sites and Polhemus (1994)	
									Ranatra fusca Palisot, 1820	X				X	X		X			Sites and Polhemus (1994)	
									Ranatra montezuma Polhemus, 1976	X								X		Sites and Polhemus (1994)	known only from Montezuma's Well, AZ
									Ranatra quadridentata Stal, 1862	X				X				X		Sites and Polhemus (1994)	
			Notonectidae											X	X	X	X	X			excluded from benthic datasets
				Anisopinae										X		X		X			
							Buenoa							X		X	X	X		Truxal (1953)	
									Buenoa arida Truxal, 1953									X		Truxal (1953)	
									Buenoa arizonis Bare, 1928									X		Truxal (1953)	
									Buenoa confusa Truxal, 1953							X				Truxal (1953); Zack (1990)	
									Buenoa hungerfordi Truxal, 1953									X		Truxal (1953)	
									Buenoa macrotibialis Hungerford, 1924							X				Truxal (1953); Zack (1990)	
									Buenoa margaritacea Torre-Bueno,					X			X	X		Truxal	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									1908											(1953)	
									Buenoa omani Truxal, 1953					X			X			Truxal (1953)	
									Buenoa scimitra Bare, 1925					X			X	X		Truxal (1953)	
									Buenoa uhleri Truxal, 1953					?						Truxal (1953)	unconfirmed record
				Notonectinae										X	X	X	X	X			
					Nychini													X			
							Martarega											X		Truxal (1949)	
									Martarega mexicana Truxal, 1949									X		Truxal (1949)	
					Notonectini									X	X	X	X	X			
							Notonecta							X	X	X	X	X		Hungerford (1934)	
									Notonecta repanda Hungerford, 1934									X		Hungerford (1934)	
									Notonecta shooteri Uhler, 1894					X	X			X		Hungerford (1934)	
									Notonecta hoffmani Hungerford, 1925					X				X		Hungerford (1934)	
									Notonecta lobata Hungerford, 1925									X		Hungerford (1934)	
									Notonecta irrorata Uhler, 1879									X		Hungerford (1934)	
									Notonecta indica Linnaeus, 1771					X				X		Hungerford (1934)	
									Notonecta kirbyi Hungerford, 1925					X	X	X	X	X		Hungerford (1934)	
									Notonecta spinosa Hungerford, 1930					X	X		X			Hungerford (1934)	
									Notonecta undulata Say, 1832					X	X	X	X	X		Hungerford (1934)	
									Notonecta unifasciata Guerin-Meneville, 1857					X	X		X	X		Hungerford (1934)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Pleidae											X						Polhemus (1996)	
							Neoplea							X							
									Neoplea striola (Fieber, 1844)					X							introduced to the San Joachin Valley for mosquito control

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Megaloptera: Dobsonflies and Alderflies
Standard Effort Level I: Genus
Standard Effort Level II: Genus
Standard Taxonomic Reference: Evans and Neunzig (1996)
Reviewed by: Norman Penny

Larvae may be identified to genus using the key in Merritt and Cummins (Evans and Neunzig, 1996). Early instar corydalids are best left at family since head color patterns generally do not develop until later instars. Evans's (1972) unpublished dissertation provides a species key to western megalopteran larvae, although the key does not include one species of *Sialis* and three species of *Protochauliodes*. Keys to adults as well as distributional and ecological information may found in the sources listed below. The Bibliography of the Neuropterida website is a useful resource and provides many downloadable PDFs of Megaloptera and Neuroptera literature.

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Megaloptera				X	X	X		X	X	X	X	X	X		
	Corydalidae			X	X			X	X	X	X	X	X	Evans and Neunzig (1996)	
		Corydalus		X	X			X			X	X	X	Contreras-Ramos (1998)	*C. cognatus* (Hagen) is a synonym of *C. texanus* Banks
			Corydalus bidenticulatus Contreras-Ramos, 1998	X	X							X		Contreras-Ramos (1998)	single record from Huachuca Mts., Miller Canyon
			Corydalus texanus Banks, 1903	X	X			X			X	X	X	Contreras-Ramos (1998)	
		Dysmicohermes		X	X			X	X	X				Evans (1972)	
		Neohermes		X	X			X	X		X	X		Evans (1972)	
		Orohermes		X	X			X	X					Evans (1972)	monotypic
			Orohermes crepusculus (Chandler, 1954)	X	X			X	X					Evans (1972)	monotypic
		Protochauliodes		X	X			X	X	X				Evans (1972)	mostly found in intermittent streams; larvae not described for all species

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
	Sialidae			X	X	X		X	X	X	X				
		Sialis		X	X	X		X	X	X	X			Evans (1972); Whiting (1991)	key to mature larvae, but lacking *S. bilobata*

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Evans, E. D. and H. H. Neunzig. 1996. Megaloptera and aquatic Neuroptera. In: An introduction to the aquatic insects of North America, 3rd edition, 862 pp. R. W. Merritt and K. W. Cummins. Dubuque, Iowa, Kendall/Hunt Publishing Company**:** 298-308.

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Additional Sources of Information on Megaloptera

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Neuroptera: Spongillaflies
Standard Effort Level I: Genus
Standard Effort Level II: Genus
Standard Taxonomic Reference: Evans and Neunzig (1996)
Reviewed by: Norman Penny

Larvae may be identified to genus using the key in Merritt and Cummins (Evans and Neunzig, 1996). Bowles (2006) provides a species key to larvae, although there is only one species in each genus found in the region. Larvae feed on and live in conjunction with freshwater sponges. Several other Neuroptera families occur in the region and their larvae occasionally show up in benthic samples. Tauber (1991) provides a key to North American Neuroptera larvae. The Bibliography of the Neuropterida website is a useful resource and provides many downloadable PDFs of Megaloptera and Neuroptera literature.

Taxonomic Hierarchy				Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Neuroptera				X	X	X		X	X					Evans and Neunzig (1996); Parfin and Gurney (1956); Brown (1974)	
	Sisyridae			X	X	X		X	X					Evans and Neunzig (1996); Parfin and Gurney (1956); Brown (1974)	
		Climacia		X		X		X	X					Chandler (1953); Whaley et al. (2004)	only one species in the region
			Climacia californica Chandler, 1953	X		X		X	X					Chandler (1953); Whaley et al. (2004)	only species in the region
		Sisyra		X		X			X					Grigarick (1975)	only one species in the region
			Sisyra vicaria Walker, 1853	X		X			X					Grigarick (1975)	only species in the region

Literature Cited

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Parfin, S. I. and A. B. Gurney. 1956. The spongilla-flies, with special reference to those of the Western Hemisphere (Sisyridae, Neuroptera). Proceedings of the United States National Museum **105**(3360): 421-529.

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Whaley, D. K., E. A. Boyd, D. G. Johnson, and R. S. Zack. 2004. A new state record for *Climacia californica* Chandler (Neuroptera: Sisyridae) in Washington. Pan-Pacific Entomologist **79**(3/4): 247-248.

Additional Sources of Information on Neuroptera

Bibliography of the Neuropterida, version 7.05. Maintained by the Department of Entomology at Texas A&M University. Accessed 18 July 2006 at URL: entowww.tamu.edu/research/neuropterida/neur_bibliography/bibhome.html

Trichoptera: Caddisflies
Standard Effort Level I: Genus
Standard Effort Level II: Species (where possible)
Standard Taxonomic Reference: Wiggins (1996a)
Reviewed by: David E. Ruiter, Robert W. Wisseman

Keys to families and genera are given in Wiggins (1996a) as well as the chapters in Merritt and Cummins (Wiggins, 1996b; Morse and Holzenthal, 1996). Wiggins (2004) provides updated family keys for larvae, pupae and adults as well as providing a wealth of behavioral and ecological information. Distributional information comes from original sources. Blinn and Ruiter (2005) gives a preliminary checklist for Arizona. The Trichoptera World Checklist website maintained by John C. Morse at Clemson University is a good source for information.

Larvae for many genera are not identifiable to species because some remain undescribed. Larvae and pupae can sometimes be reared to adults and thus identified to species, but only if living specimens are collected. For preserved specimens, well-developed, pharate pupae can sometimes be identified to species by using the metamorphotype method (Milne, 1938). In this case, the genitalia of a pharate pupa can be observed through the pupal cuticle and the specimen identified using keys and descriptions of the adult.

There are presently 19 recognized species groups of *Rhyacophila* known from the region covered by this list. Of these, 14 species groups have at least one representative species described as larvae in the peer-reviewed literature. These citations can be found in the list under the literature cited column for each species group. Ross (1956) and Schmid (1970) assigned most of the known *Rhyacophila* species to species groups based on adult characteristics. Three as yet unpublished but disseminated works (Wold, 1973; Smith, draft key and Wisseman, draft key) have further dealt with *Rhyacophila*, illustrating or describing larvae for most of the species groups. Associative material now exists for 4 of the remaining 5 species groups, leaving only larvae from the *Rhyacophila viquaea* group as undescribed and unassociated. Since the metamorphotype method may be used to identify pupae to any of these species groups based on the adult morphology and taxonomy, all 19 species groups names have been included in this version of the STE List (see STE Rules, section 3.2.3). However, at this time we recommend not using the following species group names for larval identifications until formal descriptions appear in the peer reviewed literature: *ecosa* group, *rayneri* group, *vemna* group, *viquaea* group and *vofixa* group.

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Trichoptera						X	X	X		X	X	X	X	X	X	Wiggins (1996)	
	Spicipalpia					X	X	X		X	X	X	X	X	X	Wiggins (1996)	
		Glossosomatidae				X	X			X	X	X	X	X		Wiggins (1996)	
			Agapetus			X	X			X	X	X		X		Wiggins (1996)	
			Anagapetus			X	X			X	X	X				Wiggins (1996); Ruiter (2004)	
			Culoptila			X	X							X		Wiggins (1996); Blahnik and Holzenthal (2006)	
			Glossosoma			X	X			X	X	X	X	X		Wiggins (1996)	
			Protoptila			X	X			X	X	X		X		Wiggins (1996)	
		Hydrobiosidae				X	X							X		Wiggins (1996)	
			Atopsyche			X	X						X	X		Wiggins (1996)	
		Hydroptilidae				X	X	X		X	X	X	X	X		Wiggins (1996); Blickle (1979)	except for monotypic forms, larvae not identifiable to species
			Agraylea			X	X	X		X	X	X				Wiggins (1996)	Primarily lotic, will sometimes be found in slow-moving sections of streams
			Alisotrichia			X	X							X		Wiggins (1996)	
					Alisotrichia arizonica (Blickle & Denning, 1977)	X	X							X			
			Dibusa			X	X			?						Wiggins (1996)	Based on an undescribed species collected by D.G. Denning; larvae probably similar to the eastern species *D. angata* Ross
			Hydroptila			X	X	X		X	X	X	X	X		Wiggins (1996)	
			Ithytrichia			X	X			X				X		Wiggins (1996)	
			Leucrotrichia			X	X			X	X		X	X		Wiggins (1996)	
			Mayatrichia			X	X							X		Wiggins (1996)	
			Metrichia			X	X							X		Wiggins (1996)	found in small springs

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	and seeps
			Neotrichia			X	X			X				X		Wiggins (1996)	
			Nothotrichia			X	X			X						Harris and Armitage (1997)	larval association made with a metamorphotype male; the description is in progress
					Nothotrichia shasta Harris and Armitage, 1997	X	X			X						Harris and Armitage (1997)	larval association made with a metamorphotype male; the description is in progress
			Ochrotrichia			X	X			X	X	X	X	X		Wiggins (1996)	many undescribed species in CA alone
			Oxyethira			X	X	X		X	X	X		X		Wiggins (1996)	
			Palaeagapetus			X	X			X	X	X				Wiggins (1996)	occur in cold water seeps in liverworts
			Stactobiella			X	X			X	X	X		X		Wiggins (1996)	occur in small, rapid streams
			Zumatrichia			X	X							X		Wiggins (1996)	occur in fast-flowing, large rivers
					Zumatrichia notosa (Ross, 1944)	X	X							X			
		Rhyacophilidae				X	X			X	X	X				Wiggins (1996)	
			Himalopsyche			X	X			X	X	X				Wiggins (1996)	only one species in Nearctic
					Himalopsyche phryganea (Ross, 1941)	X	X			X	X	X					only one species in Nearctic
			Rhyacophila			X	X			X	X	X	X	X		Wiggins (1996)	
				Rhyacophila alberta group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1968)	
				Rhyacophila angelita group sensu Schmid (1970)		X	X			X	X	X	X	X		Schmid (1970), Flint (1962), Smith (1968)	
				Rhyacophila betteni group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1968)	
				Rhyacophila brunnea group sensu Smith and		X	X			X	X	X	X			Smith and	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Manuel (1984)												Manuel (1984)	
				Rhyacophila coloradensis group sensu Schmid (1970)		X	X			X	X	X		X		Schmid (1970), Smith (1968), Peck and Smith (1977)	
				Rhyacophila ecosa group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970)	
				Rhyacophila grandis group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1984)	
				Rhyacophila hyalinata group sensu Schmid (1970)		X	X			X	X					Schmid (1970), Smith (1968)	
				Rhyacophila lieftincki group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1984)	
					Rhyacophila arnaudi Denning, 1948	X	X			X	X	X					sole representative of *lieftincki* group
				Rhyacophila nevadensis group sensu Schmid (1970)		X	X			X	X	X	X			Schmid (1970), Smith (1985)	
				Rhyacophila oreta group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1968)	
				Rhyacophila rayneri group sensu Ross (1956)		X	X			X					X	Ross (1956)	larvae associated, but unpublished
					Rhyacophila rayneri Ross, 1951	X	X			X					X		only species in this group
				Rhyacophila rotunda group sensu Schmid (1970)		X	X			X			X	X		Schmid (1970), Smith (1968)	
				Rhyacophila sibirica group sensu Ross (1956)		X	X			X	X	X				Schmid (1970), Smith (1968)	
				Rhyacophila vagrita group sensu Schmid (1970)		X	X				X	X				Schmid (1970), Smith (1968)	
					Rhyacophila vagrita Milne, 1936	X	X				X	X					
				Rhyacophila vemna group sensu Schmid (1970)		X	X				X	X				Schmid (1970)	larvae unknown, most likely similar to *brunnea* group but bigger
				Rhyacophila verrula group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970), Smith (1968)	
				Rhyacophila viquaea group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970)	larva unknown

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Rhyacophila vofixa group sensu Schmid (1970)		X	X			X	X	X				Schmid (1970)	larvae associated, but unpublished
	Annulipalpia																
		Hydropsychidae				X	X			X	X	X	X	X		Wiggins (1996)	
			Arctopsyche			X	X			X	X	X	X			Wiggins (1996); Givens and Smith (1980)	Occur in cold, fast streams; key to larvae in Givens and Smith (1980)
					Arctopsyche californica Ling, 1938	X	X			X						Givens and Smith (1980)	
					Arctopsyche grandis (Banks, 1900)	X	X			X	X	X	X			Givens and Smith (1980)	
			Cheumatopsyche			X	X			X	X	X	X	X		Wiggins (1996)	Occur in warmer streams; relatively tolerant of pollution; larvae not presently identifiable to species
			Diplectrona			X	X			X						Wiggins (1996)	CA endemic; known from only a couple sites in Southern CA
					Diplectrona californica Banks, 1914	X	X			X							CA endemic; known from only a couple sites in Southern CA
			Homoplectra			X	X			X	X					Wiggins (1996)	Occur in intermittent spring seeps, headwaters of mountain streams
			Hydropsyche			X	X			X	X	X	X	X		Wiggins (1996); Schefter and Wiggins (1984)	Some authors split this genus into *Hydropsyche* (s. str.) and *Ceratopsyche* (Schefter and Wiggins use the term *Hydropsyche morosa* group)

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Parapsyche			X	X			X	X	X	X			Wiggins (1996); Givens and Smith (1980)	Occur in small, cold streams; only two of the five known western species described as larvae
			Smicridea			X	X			X				X		Wiggins (1996)	Often abundant in southwestern streams
		Philopotamidae				X	X			X	X		X	X		Wiggins (1996)	
			Chimarra			X	X			X	X		X	X		Wiggins (1996)	
			Dolophilodes			X	X			X	X	X	X			Wiggins (1996)	
			Wormaldia			X	X			X	X	X	X	X		Wiggins (1996)	
		Polycentropodidae				X	X	X		X	X	X		X		Wiggins (1996)	
			Nyctiophylax			X	X	X			X					Wiggins (1996)	some authors use genus *Paranyctiophylax* for North American species
					Nyctiophylax moestus Banks, 1911	X	X	X			X						Occur in lakes and slow-moving sections of streams
			Polycentropus			X	X	X		X	X	X		X		Wiggins (1996); Wiggins (1973)	Wiggins (1973) reported *Polycentropus* in temporary pools
			Polyplectropus			X	X							X		Wiggins (1996)	Occur in small, cool streams
					Polyplectropus charlesi (Ross, 1941)	X	X							X			
		Psychomyiidae				X	X			X	X	X		X		Wiggins (1996)	
			Psychomyia			X	X			X	X	X		X		Wiggins (1996)	
			Tinodes			X	X			X	X		X	X		Wiggins (1996)	Larvae probably occur only in lotic waters where they build silken tubes of sand, often near the stream margin
		Xiphocentronidae				X	X							X		Wiggins (1996)	

Taxonomic Hierarchy						Habitat				Distribution							
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
			Cnodocentron			X	X							X		Wiggins (1996); Moulton and Stewart (1997)	
					Cnodocentron yavapai Moulton and Stewart, 1997	X	X							X		Wiggins (1996); Moulton and Stewart (1997)	The type locality is a small, spring-fed stream with a dense canopy; larvae build silken tubes on rocks
	Integrapalpia					X	X	X		X	X	X	X	X	X		
		Apataniidae				X	X	X		X	X	X	X	X		Wiggins (1996)	
			Allomyia			X	X			X	X	X	X			Wiggins (1996)	cold springs, Sierra Nevada Mts.
			Apatania			X	X	X								Wiggins (1996)	larvae in far North or at high elevations may live in lakes; only 1 of the 4 species described as larvae
			Moselyana			X	X				X	X				Wiggins (1996)	monotypic; larvae live in seeps
					Moselyana comosa (Denning, 1949)	X	X				X	X				Wiggins (1996)	monotypic; larvae live in seeps
			Pedomoecus			X	X			X	X	X				Wiggins (1996)	monotypic
					Pedomoecus sierra Ross, 1947	X	X			X	X	X				Wiggins (1996)	monotypic
		Brachycentridae				X	X			X	X	X	X	X			
			Amiocentrus			X	X			X	X		X			Wiggins (1996)	monotypic
					Amiocentrus aspilus (Ross, 1938)	X	X			X	X		X			Wiggins (1996)	monotypic
			Brachycentrus			X	X			X	X	X	X	X		Wiggins (1996); Flint (1984)	larvae are identifiable to species
					Brachycentrus americanus (Banks, 1899)	X	X			X	X	X		X		Flint (1984)	
					Brachycentrus echo (Ross, 1947)	X	X			X						Flint (1984)	
					Brachycentrus occidentalis Banks, 1911	X	X			X	X	X	X	X		Flint (1984)	
			Eobrachycentrus			X	X				X	X				Wiggins (1996)	monotypic
					Eobrachycentrus gelidae Wiggins, 1965	X	X				X	X				Wiggins (1996)	monotypic
			Micrasema			X	X			X	X	X		X		Wiggins (1996); Chapin (1978)	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
		Calamoceratidae				X	X			X	X					Wiggins (1996)	
			Heteroplectron			X	X			X	X					Wiggins (1996)	larvae live in slower moving waters with woody debris
					Heteroplectron californicum MacLachlan, 1871	X	X			X	X					Wiggins (1996)	larvae live in slower moving waters with woody debris
			Phylloicus			X	X							X		Wiggins (1996)	2 species found in AZ; no species key for larvae
		Goeridae				X	X			X	X	X				Wiggins (1996)	
			Goera			X	X			X	X					Wiggins (1996)	one species in Western North America
					Goera archaon Ross, 1947	X	X			X	X						one species in Western North America
			Goeracea			X	X				X	X				Wiggins (1996); Wiggins (1973)	key to larvae and pupae of both species
					Goeracea genota (Ross, 1941)	X	X				X	X				Wiggins (1996)	
					Goeracea oregona Denning, 1968	X	X			X	X					Wiggins (1996)	
			Lepania			X	X				X	X				Wiggins (1996)	monotypic
					Lepania cascada Ross, 1941	X	X				X	X				Wiggins (1996)	monotypic
		Helicopsychidae				X	X	X		X	X	X		X		Wiggins (1996); Johanson (2002)	
			Helicopsyche			X	X	X		X	X	X		X		Wiggins (1996); Johanson (2002)	larvae not adequately separable to species
					Helicopsyche sinuata Denning and Blickle, 1979	X	X			X							Known from CA: San Bernadino Co., Sheep Creek Canyon
		Lepidostomatidae				X	X	X								Wiggins (1996); Weaver (1988)	
			Lepidostoma			X	X	X		X	X	X	X	X		Wiggins (1996); Weaver (1988)	
		Leptoceridae				X	X	X		X	X	X	X			Wiggins (1996)	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Ceraclea			X	X	X		X	X	X	X			Wiggins (1996); Resh (1976); Morse (1975)	some species feed on freshwater sponges
			Mystacides			X	X	X		X	X	X				Wiggins (1996)	
			Nectopsyche			X	X	X		X	X	X	X	X		Wiggins (1996)	larvae of Western species are incompletely separable
			Oecetis			X	X	X		X	X			X		Wiggins (1996); Floyd (1995)	
			Triaenodes			X	X	X			X	X		X		Wiggins (1996); Glover (1996)	Holzenthal and Andersen (2004) consider *Ylodes* as a subgenus of *Triaenodes*
			Ylodes			X	X	X		X	X			X		Wiggins (1996); Glover (1996)	Holzenthal and Andersen (2004) consider *Ylodes* as a subgenus of *Triaenodes*
		Limnephilidae				X	X			X	X	X	X	X		Wiggins (1996)	monotypic
			Allocosmoecus			X	X			X	X	X				Wiggins (1996)	monotypic
					Allocosmoecus partitus Banks, 1943	X	X			X	X	X				Wiggins (1996)	monotypic
			Amphicosmoecus			X	X			X	X					Wiggins (1996)	monotypic
					Amphicosmoecus canax (Ross, 1947)	X	X			X	X			X			monotypic
			Anabolia			X	X							X			
					Anabolia bimaculata (Walker, 1852)	X	X							X			
			Asynarchus			X	X	X		X	X	X				Wiggins (1996)	
			Chyranda			X	X			X	X	X				Wiggins (1996)	monotypic
					Chyranda centralis (Banks, 1900)	X	X			X	X	X					monotypic
			Clistoronia			X		X		X	X	X		X		Wiggins (1996)	Larvae live in ponds and lakes at higher elevations
			Clostoeca			X		X		X	X	X				Wiggins (1996)	monotypic; larvae live in small seepage areas

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Clostoeca disjuncta (Banks, 1914)	X		X		X	X	X				Wiggins (1996)	monotypic; larvae live in small seepage areas
			Cryptochia			X	X			X						Wiggins (1996); Wisseman and Anderson (1987)	Larvae live in small, cold spring streams at or above water's edge
			Desmona			X	X	X		X	X	X				Wiggins (1996); Wiggins and Wisseman (1990)	Larvae live in small streams and seepage areas
			Dicosmoecus			X	X	X		X	X	X	X			Wiggins (1996); Wiggins and Richardson (1982)	Larvae may be identified to species using Wiggins and Richardson (1982)
			Ecclisocosmoecus			X	X				X	X				Wiggins (1996); Ross (1950)	Only one North American species
					Ecclisocosmoecus scylla (Milne, 1935)	X	X				X	X				Wiggins (1996); Ross (1950)	Only one North American species
			Ecclisomyia			X	X			X	X	X	X			Wiggins (1996)	
			Eocosmoecus			X	X				X	X				Wiggins (1996); Wiggins and Richardson (1989)	Two species occur in Western North America, both described as larvae
					Eocosmoecus frontalis (Banks, 1943)	X	X				X	X				Wiggins (1996)	
					Eocosmoecus schmidi (Wiggins, 1975)	X	X					X				Wiggins (1996)	
			Glyphopsyche			X	X	X		X	X					Wiggins (1996)	Two species occur in North America; *G. missouri* Ross is only found in Missouri
					Glyphopsyche irrorata (Fabricius, 1781)	X	X	X		X	X					Wiggins (1996)	Two species occur in North America; *G. missouri* Ross is only found in Missouri
			Grammotaulius			X	X	X			X					Wiggins (1996)	Found in ponds and small streams
					Grammotaulius betteni Hill-Griffin, 1912	X	X	X			X					Wiggins (1996)	Found in ponds and small streams

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	**Suborder**	**Family**	**Genus**	**Species group**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
			Halesochila			X		X			X	X				Wiggins (1996)	monotypic
					Halesochila taylori (Banks, 1904)	X		X			X	X				Wiggins (1996)	monotypic
			Hesperophylax			X	X	X		X	X	X	X	X		Wiggins (1996); Parker and Wiggins (1985)	larvae described for all but one Western species (*H. minutus*)
			Homophylax			X	X			X	X	X	X			Wiggins (1996)	Larvae easily confused with *Psychoglypha*
			Hydatophylax			X	X			X	X	X				Wiggins (1996); Schmid (1950)	
					Hydatophylax hesperus (Banks, 1914)	X	X			X	X	X				Wiggins (1996); Schmid (1950)	
			Lenarchus			X		X		X	X	X	X			Wiggins (1996)	
			Limnephilus			X	X	X		X	X	X		X		Wiggins (1996)	
			Nemotaulius			X		X			X					Wiggins (1996)	only one Nearctic species
					Nemotaulius hostilis (Hagen, 1873)	X		X			X						only one Nearctic species
			Onocosmoecus			X	X	X		X	X	X	X			Wiggins (1996)	
			Philarctus			X	X	X			X					Wiggins (1996)	only one North American species
					Philarctus quaeris (Milne, 1935)	X	X	X			X						only one North American species
			Philocasca			X	X					X				Wiggins (1996)	
			Pseudostenophylax			X	X			X	X					Wiggins (1996)	only one species in western North America
					Pseudostenophylax edwardsi (Banks, 1920)	X	X			X	X						only one species in western North America
			Psychoglypha			X	X			X	X	X				Wiggins (1996)	larvae may be confused with *Homophylax*
			Pycnopsyche			X	X					X				Wiggins (1996)	
					Pycnopsyche guttifer (Walker, 1852)	X	X					X					only one species in western North America
		Odontoceridae				X	X			X				X		Wiggins (1996)	
			Marilia			X	X			X				X		Wiggins (1996)	

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Namamyia			X	X			X	X					Wiggins (1996)	monotypic
					Namamyia plutonis Banks, 1905	X	X			X	X						monotypic
			Nerophilus			X	X			X	X					Wiggins (1996)	monotypic
					Nerophilus californicus (Hagen, 1861)	X	X			X	X						monotypic
			Parthina			X	X			X	X			X		Wiggins (1996)	
		Phryganeidae				X	X	X		X	X	X				Wiggins (1996); Wiggins (1998)	Wiggins (1998) reviews larvae and adults for the family
			Agrypnia			X	X	X		X	X	X				Wiggins (1996)	
			Banksiola			X	X	X		X	X					Wiggins (1996)	transcontinental; but only species known in western North America
					Banksiola crotchi Banks, 1943	X	X	X		X	X						
			Phryganea			X		X		X	X					Wiggins (1996)	
					Phryganea cinerea Walker, 1852	X		X		X	X						
			Ptilostomis			X	X	X				X				Wiggins (1996)	
					Ptilostomis ocellifera (Walker, 1852)	X	X	X				X					
			Yphria			X	X			X	X					Wiggins (1996)	monotypic
					Yphria californica (Banks, 1907)	X	X			X	X						monotypic
		Rossianidae				X	X					X				Wiggins (1996)	small, cold mountain streams
			Rossiana			X	X					X				Wiggins (1996)	small, cold mountain streams
					Rossiana montana Denning, 1953	X	X					X				Wiggins (1996)	small, cold mountain streams
		Sericostomatidae				X	X			X	X			X		Wiggins (1996)	
			Gumaga			X	X			X	X			X		Wiggins (1996)	
		Uenoidae				X	X			X	X	X	X	X		Wiggins (2005)	
			Farula			X	X			X	X					Wiggins (2005)	small, cold mountain streams
			Neophylax			X	X			X	X	X	X			Vineyard et al. (2005); Wiggins (2004)	larvae may be identified to species
					Neophylax occidentis Banks, 1924	X	X			X	X		X				
					Neophylax rickeri Milne, 1935	X	X			X	X	X					

Taxonomic Hierarchy						Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Neophylax smithi Vineyard and Wiggins, 1987	X	X					X					
					Neophylax splendens Denning, 1948	X	X			X	X	X					
			Neothremma			X	X			X	X	X				Wiggins (2004)	small to medium turbulent mountain streams
			Oligophlebodes			X	X			X	X	X		X		Wiggins (2004)	small, turbulent mountain streams

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Lepidoptera: Moths and Butterflies
Standard Effort Level I: Genus for *Parapoynx* and *Petrophila*, otherwise Order
Standard Effort Level II: Genus for *Parapoynx* and *Petrophila*, otherwise Order
Standard Taxonomic Reference: Lange (1996)
Reviewed by: Allison R. Brigham

Larvae of *Parapoynx* and *Petrophila* may be identified to genus using the key in Merritt and Cummins (Lange, 1996). This key and others for aquatic Lepidoptera should be used with caution for specimens collected in bioassessment samples. Careful collecting of Lepidoptera larvae to preserve case integrity and to record host-plant association is required to eliminate accidentals (e.g., terrestrial or riparian taxa). The key presented in Stehr and Martinat (1987) is a more complete guide to the families of North American Lepidoptera.

Taxonomic Hierarchy			Habitat				Distribution						Literature Cited	Comments
Order	Family	Genus	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Lepidoptera			X	X	X		X	X	X	X	X	X	Lange (1996); Stehr and Martinat (1987)	
	Pyralidae		X	X	X		X	X	X	X	X	X		
		Parapoynx	X	X			X							
		Petrophila	X	X	X		X	X	X	X	X	X		

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Coleoptera: Beetles
Standard Effort Level I: Genus
Standard Effort Level II: Species (where possible)
Standard Taxonomic Reference: White and Brigham (1996), Larson et al. (2000) (Dytiscidae), Shepard (2002) (Elmidae)
Reviewed by: Cheryl B. Barr (Byrrhoidea), Eric G. Chapman (Haliplidae), Doug Post (Dytiscidae), William D. Shepard (Byrrhoidea)

Aquatic beetles (larvae and adults) can generally be identified to genus using the keys in Merritt and Cummins (White and Brigham, 1996). Adults can be identified to genus using the keys in Arnett and Thomas (2001) and Arnett et al. (2002). Although designed for the Florida beetle fauna, Epler (1999) is a useful resource. Larson et al. (2000) should be used for all generic dytiscid identifications. For specimens from the Southwest, other supplementary references may be required for species identifications. Post (2005) put together an excellent guide to California dytiscids. Challet and Brett (1998) is very useful for dytiscid distributions within California. An undescribed elmid genus, which is being described by Cheryl Barr, is known to occur throughout the Pacific Northwest. Shepard (1993) gives some habitat and ecological information for this genus. Brown (1972a) is still the best source for elmid species keys. The keys in White and Brigham (1996) for the Chrysomelidae, Staphylinidae and Curculionidae should be used with caution since each of these families have very few truly aquatic representatives – none benthic – but many terrestrial genera. The inclusion of these genera in White and Brigham (1996) for these families makes the assumption that the specimens being keyed are definitely aquatic, thus excluding the possibility of accidental terrestrials. This caveat also applies to a number of other families that have riparian or strictly terrestrial adults.

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
Coleoptera							X	X	X		X	X	X	X	X	X	White and Brigham (1996)	Keys for families and genera
	Myxophaga																	
		Hydroscaphidae					X				X			X	X			found in thin films of water
					Hydroscapha		X				X			X	X			found in thin films of water

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						Hydroscapha natans LeConte, 1874	X				X			X	X			found in thin films of water
		Microsporidae									X				X		Shepard (2003)	shoredwellers
					Sphaerius						X				X		Shepard (2003)	shoredwellers
	Adephaga																	
		Amphizoidae					X	X			X	X	X				Kavanaugh (1986)	
					Amphizoa		X	X			X	X	X				Kavanaugh (1986)	
						Amphizoa insolens LeConte, 1853	X	X			X	X	X				Kavanaugh (1986)	
		Carabidae									X	X	X	X	X	X		Many species are riparian; only two listed as "semi-aquatic"
				Omophronini														
					Omophron						X							shoredwellers
					Thalassotrechus						X							
						Thalassotrechus barbarae (Horn, 1892)					X							intertidal dweller
						Thalassotrechus nigripennis van Dyke, 1918					X							intertidal dweller
		Dytiscidae					X	X	X		X	X	X	X	X	X	Larson et al. (2000); Post (2005); Challet and Brett (1998)	The keys in Merritt and Cummins are outdated and contain numerous errors; Larson et al. (2000) should be considered as the standard text for this family.
			Copelatinae				X		X		X	X			X		Larson et al. (2000)	
					Copelatus		X		X		X	X			X		Larson et al. (2000)	

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						Copelatus chevrolati renovatus Guignot, 1952	X		X		X				X		Larson et al. (2000)	
						Copelatus glyphicus (Say, 1823)	X		X		X	X					Larson et al. (2000)	
			Hydrotrupinae				X	X			X	X					Larson et al. (2000)	monotypic; Pacific Coast of CA and OR; also Sierra Nevada Mts.
					Hydrotrupes		X	X			X	X					Larson et al. (2000)	monotypic; Pacific Coast of CA and OR; also Sierra Nevada Mts.
						Hydrotrupes palpalis Sharp, 1882	X	X			X	X					Larson et al. (2000)	monotypic; Pacific Coast of CA and OR; also Sierra Nevada Mts.
			Laccophilinae				X		X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1970)	
					Laccophilus		X		X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1970)	
						Laccophilus biguttatus Kirby, 1837	X		X		X						Larson et al. (2000); Zimmerman (1970)	
						Laccophilus fasciatus terminalis Sharp, 1882	X		X		X						Larson et al. (2000); Zimmerman (1970)	
						Laccophilus maculosus decipiens LeConte, 1852	X		X		X	X	X	X			Larson et al. (2000); Zimmerman	

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																	(1970)	
						Laccophilus maculosus shermani Leech, 1944	X								X		Larson et al. (2000); Zimmerman (1970)	
						Laccophilus mexicanus atristernalis Crotch, 1873	X				X						Larson et al. (2000); Zimmerman (1970)	
						Laccophilus mexicanus mexicanus Aube, 1838	X				X						Larson et al. (2000); Zimmerman (1970)	
						Laccophilus quadrilineatus quadrilineatus Horn, 1871	X				X						Larson et al. (2000); Zimmerman (1970)	
						Laccophilus sonorensis Zimmerman, 1970	X				X						Larson et al. (2000); Zimmerman (1970)	
			Hydroporinae				X				X	X	X	X	X	X	Larson et al. (2000)	
				Laccornini			X	X				X	X				Larson et al. (2000)	
					Laccornis		X	X				X	X				Larson et al. (2000)	
						Laccornis pacificus Leech, 1940	X	X				X	X				Larson et al. (2000)	
				Methlini			X				X						Larson et al. (2000)	
					Celina		X				X						Larson et al. (2000)	
						Celina occidentalis Young, 1979	X				X						Larson et al. (2000)	
				Hydrovatini			X				X						Larson et al.	

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																	(2000)	
					Hydrovatus		X				X						Larson et al. (2000)	
						Hydrovatus brevipes Sharp, 1882	X				X						Larson et al. (2000)	
						Hydrovatus davidis Young, 1956	X				X						Larson et al. (2000)	
				Hyphydrini			X				X		X		X		Larson et al. (2000)	
					Desmopachria		X										Larson et al. (2000)	
						Desmopachria convexa (Aube, 1838)	X		X				X				Larson et al. (2000)	
						Desmopachria dispersa (Crotch, 1873)	X				X						Larson et al. (2000)	
						Desmopachria latissima (LeConte, 1851)	X				X						Larson et al. (2000)	
						Desmopachria mexicana Sharp, 1882	X				X				X		Larson et al. (2000)	
						Desmopachria portmanni (Clark, 1862)	X								X		Larson et al. (2000)	
				Bidessini			X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
					Liodessus		X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
						Liodessus obscurellus (LeConte, 1852)	X	X	X		X	X	X	X	X	X	Larson et al. (2000)	widespread in the West
						Liodessus saratogae Miller, 1998	X				X						Larson et al. (2000)	Death Valley, CA
					Neoclypeodytes		X				X			X	X	X	Miller (2001); Larson et al. (2000)	
						Neoclypeodytes cinctellus (LeConte, 1852)	X	X			X			X	X	X	Miller (2001); Larson et al. (2000)	
						Neoclypeodytes leachi (Leech, 1948)	X				X	X					Miller (2001); Larson et al.	

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																	(2000)	
						Neoclypeodytes ornatellus (Fall, 1917)	X		X		X	X					Miller (2001); Larson et al. (2000)	
						Neoclypeodytes pictodes (Sharp, 1882)	X				X						Miller (2001); Larson et al. (2000)	
						Neoclypeodytes plicipennis (Crotch, 1873)	X				X				X		Miller (2001); Larson et al. (2000)	
						Neoclypeodytes quadripustulatus (Fall, 1917)	X				X						Miller (2001); Larson et al. (2000)	
						Neoclypeodytes roughleyi Miller, 2001	X				X						Miller (2001); Larson et al. (2000)	
					Uvarus		X	X			X	X			X	X	Larson et al. (2000)	
						Uvarus subtilis (LeConte, 1852)	X	X			X	X			X	X	Larson et al. (2000)	
				Hydroporini			X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
					Hydroporus		X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
						Hydroporus axillaris LeConte, 1851	X	X			X	X	X				Larson et al. (2000)	
						Hydroporus carri Larson, 1975	X	X				X					Larson et al. (2000)	
						Hydroporus despectus Sharp, 1882	X		X		X		X				Larson et al. (2000)	
						Hydroporus fortis LeConte, 1851	X		X		X	X	X	X			Larson et al. (2000)	
						Hydroporus fuscipennis Schaum, 1868	X		X				X				Larson et al. (2000)	
						Hydroporus hirsutus Gordon, 1981	X				X						Larson et al. (2000)	Mt. Goethe, Fresno Co.

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Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Hydroporus hirtellus LeConte, 1852	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hydroporus leechi Gordon, 1981	X		X		X						Larson et al. (2000)	
						Hydroporus klamathensis Larson and Roughley, 2000	X				X	X					Larson et al. (2000)	
						Hydroporus longiusculus Gemminger & Harold, 1868	X				X	X	X				Larson et al. (2000)	
						Hydroporus mannerheimi Balfour-Browne, 1944	X		X		X	X	X				Larson et al. (2000)	
						Hydroporus notabilis LeConte, 1850	X					X					Larson et al. (2000)	
						Hydroporus occidentalis Sharp, 1882	X		X		X		X				Larson et al. (2000)	
						Hydroporus pervicinus Fall, 1923	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hydroporus signatus Mannerheim, 1853	X						X				Larson et al. (2000)	
						Hydroporus similaris Fall, 1923	X				X	X	X				Larson et al. (2000)	
						Hydroporus simplex Gordon, 1981	X		X		X						Larson et al. (2000)	
						Hydroporus sinuatipes Fall, 1923	X		X		X	X	X				Larson et al. (2000)	
						Hydroporus striola (Gyllenhal, 1827)	X						X				Larson et al. (2000)	
						Hydroporus subpubescens LeConte, 1852	X		X		X	X	X				Larson et al. (2000)	
						Hydroporus tademus Leech, 1949	X		X		X	X	X				Larson et al. (2000)	
						Hydroporus tenebrosus LeConte, 1850	X		X				X	X			Larson et al. (2000)	
						Hydroporus transpunctatus Chandler, 1941	X		X		X		X		X		Larson et al. (2000)	
						Hydroporus tristis (Paykull, 1798)	X		X			X	X				Larson et al. (2000)	
						Hydroporus utahensis Gordon, 1981	X				X						Larson et al.	3300-3700 ft

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Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2000)	Inyo Co.
						Hydroporus zackii Larson and Roughley, 2000	X		X					X			Larson et al. (2000)	springs in Ash Meadows, Nye Co.
					Hygrotus		X		X		X	X	X	X	X		Larson et al. (2000)	
						Hygrotus artus Fall, 1919	X				X						Larson et al. (2000)	
						Hygrotus bruesi (Fall, 1928)	X					X		X			Larson et al. (2000)	
						Hygrotus collatus (Fall, 1919)	X				X						Larson et al. (2000)	
						Hygrotus curvipes (Leech, 1938)	X				X						Larson et al. (2000)	
						Hygrotus dissimilis Gemminger and Harold, 1868	X		X			X					Larson et al. (2000)	
						Hygrotus fontinalis Leech, 1966	X				X						Larson et al. (2000)	
						Hygrotus fraternus (LeConte, 1852)	X				X						Larson et al. (2000)	
						Hygrotus hydropicus (LeConte, 1852)	X				X						Larson et al. (2000)	
						Hygrotus impressopunctatus (Schaller, 1783)	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hygrotus infuscatus (Sharp, 1882)	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hygrotus intermedius (Fall, 1919)	X		X		X	X	X				Larson et al. (2000)	
						Hygrotus lutescens (LeConte, 1852)	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hygrotus marklini (Gyllenhal, 1813)	X		X						X		Larson et al. (2000)	
						Hygrotus masculinus (Crotch, 1874)	X		X		X	X	X	X			Larson et al. (2000)	
						Hygrotus nigrescens (Fall, 1919)	X		X		X	X	X	X			Larson et al. (2000)	
						Hygrotus nubilis (LeConte, 1855)	X		X						X		Larson et al.	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2000)	
						Hygrotus obscureplagiatus (Fall, 1919)	X		X		X	X	X				Larson et al. (2000)	
						Hygrotus patruelis (LeConte, 1855)	X		X		X			X			Larson et al. (2000)	
						Hygrotus pedalis (Fall, 1901)	X				X						Larson et al. (2000)	
						Hygrotus picatus (Kirby, 1837)	X		X				X				Larson et al. (2000)	
						Hygrotus sayi Balfour-Browne, 1944	X		X		X	X	X	X			Larson et al. (2000)	
						Hygrotus semivittatus (Fall, 1919)	X		X		X	X	X	X			Larson et al. (2000)	
						Hygrotus sharpi (van den Branden, 1885)	X				X						Larson et al. (2000)	
						Hygrotus thermarum (Darlington, 1928)	X				X						Larson et al. (2000)	
						Hygrotus tumidiventris (Fall, 1919)	X		X		X	X	X	X	X		Larson et al. (2000)	
						Hygrotus turbidus (LeConte, 1855)	X		X		X	X	X				Larson et al. (2000)	
						Hygrotus unguicularis (Crotch, 1874)	X		X		X	X	X				Larson et al. (2000)	
					Nebrioporus		X		X				X				Larson et al. (2000)	
						Nebrioporus macronychus (Shirt and Angus, 1992)	X		X				X				Larson et al. (2000)	
					Neoporus		X	X	X			X	X		X		Larson et al. (2000)	
						Neoporus dimidiatus (Gemminger and Harold, 1868)	X		X						X		Larson et al. (2000)	
						Neoporus undulatus (Say, 1823)	X		X			X	X				Larson et al. (2000)	
					Oreodytes		X	X	X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1985)	

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Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Oreodytes abbreviatus (Fall, 1923)	X				X						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes alaskanus (Fall, 1926)	X		X				X				Larson et al. (2000); Zimmerman (1985)	
						Oreodytes angustior (Hatch, 1928)	X	X				X	X				Larson et al. (2000); Zimmerman (1985)	
						Oreodytes congruus (LeConte, 1878)	X	X			X	X	X	X			Larson et al. (2000); Zimmerman (1985)	
						Oreodytes crassulus (Fall, 1923)	X	X			X	X	X				Larson et al. (2000); Zimmerman (1985)	
						Oreodytes humboltensis Zimmerman, 1985	X				X						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes laevis (Kirby, 1837)	X		X				X				Larson et al. (2000); Zimmerman (1985)	
						Oreodytes obesus cordillerensis Larson, 1990	X	X			?		X				Larson et al. (2000); Zimmerman (1985)	formerly *O. rivalis* (Gyllenhal)
						Oreodytes obesus obesus (LeConte, 1866)	X	X			X	X					Larson et al. (2000); Zimmerman (1985)	formerly *O. rivalis* (Gyllenhal)
						Oreodytes picturatus (Horn, 1883)	X	X			X	X	X	X			Larson et al. (2000);	

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																	Zimmerman (1985)	
						Oreodytes quadrimaculatus (Horn, 1883)	X	X			X	X	X	X			Larson et al. (2000); Zimmerman (1985)	
						Oreodytes rhyacophilus Zimmerman, 1985	X				X						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes scitulus bisulcatus (Fall, 1923)	X	X			X						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes scitulus scitulus (LeConte, 1855)	X	X			?						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes sierrae Zimmerman, 1985	X				X						Larson et al. (2000); Zimmerman (1985)	
						Oreodytes snoqualmie (Hatch, 1933)	X		X				X				Larson et al. (2000); Zimmerman (1985)	
						Oreodytes subrotundus (Fall, 1923)	X				X						Larson et al. (2000); Zimmerman (1985)	
					Sanfilippodytes		X	X	X		X	X			X		Larson et al. (2000)	*Sanfilippodytes* currently undergoing revision; best to leave specimens at genus
						Sanfilippodytes adelardi (Rochette,	X				X						Larson et al.	

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						1983)											(2000)	
						Sanfilippodytes barbarae (Fall, 1932)	X				X						Larson et al. (2000)	
						Sanfilippodytes barbarensis (Wallis, 1933)	X				X						Larson et al. (2000)	
						Sanfilippodytes belfragei (Sharp, 1882)	X				X						Larson et al. (2000)	
						Sanfilippodytes bidessoides (Leech, 1941)	X				X						Larson et al. (2000)	
						Sanfilippodytes corvallis (Fall, 1923)	X					X					Larson et al. (2000)	
						Sanfilippodytes hardyi (Sharp, 1882)	X				X						Larson et al. (2000)	
						Sanfilippodytes kingi (Clark, 1862)	X								X		Larson et al. (2000)	
						Sanfilippodytes latebrosus (LeConte, 1852)	X				X						Larson et al. (2000)	
						Sanfilippodytes malkini (Hatch, 1951)	X				X	X					Larson et al. (2000)	
						Sanfilippodytes pacificus (Fall, 1923)	X										Larson et al. (2000)	
						Sanfilippodytes palliatus (Horn, 1883)	X				X						Larson et al. (2000)	
						Sanfilippodytes rossi (Leech, 1941)	X				X						Larson et al. (2000)	
						Sanfilippodytes setifer Roughley & Larson, 2000	X		X		X						Larson et al. (2000)	
						Sanfilippodytes terminalis (Sharp, 1882)	X	X			X						Larson et al. (2000)	
						Sanfilippodytes veronicae (Rochette, 1983)	X				X						Larson et al. (2000)	
						Sanfilippodytes vilis (LeConte, 1852)	X				X						Larson et al. (2000)	
						Sanfilippodytes williami (Rochette, 1986)	X				X				X		Larson et al. (2000)	
					Stictotarsus		X	X	X		X				X	X	Larson et al. (2000);	

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																	Zimmerman (1975, 1982)	
						Stictotarsus aequinoctialis (Clark, 1862)	X		X						X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus coelamboides (Fall, 1923)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus corvinus (Sharp, 1887)	X								X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus decemsignatus (Clark, 1862)	X								X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus deceptus (Fall, 1932)	X	X			X					X	Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus dolerosus (Leech, 1945)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus eximius (Motschulsky, 1859)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus expositus (Fall, 1923)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus funereus (Crotch, 1873)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	

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						Stictotarsus griseostriatus (DeGeer, 1774)	X		X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus panaminti (Fall, 1923)	X				X						Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus roffi (Clark, 1862)	X								X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus spectabilis (Zimmerman, 1982)	X								X		Larson et al. (2000); Zimmerman (1975, 1982)	
						Stictotarsus striatellus (LeConte, 1852)	X		X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1975, 1982)	
					Stygoporus							X					Larson et al. (2000)	monotypic; stygobiontic
						Stygoporus oregonensis Larson and Labonte, 1994						X					Larson et al. (2000)	monotypic; stygobiontic
			Colymbetinae				X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
				Agabini			X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
					Agabinus		X	X			X	X	X				Larson et al. (2000)	
						Agabinus glabrellus (Motschulsky, 1859)	X	X			X	X	X				Larson et al. (2000)	
						Agabinus sculpturellus Zimermann, 1919	X	X			X	X					Larson et al. (2000)	
					Agabus		X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
						Agabus ambiguus (Say, 1823)	X	X					X				Larson et al. (2000)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Agabus ancillus Fall, 1922	X		X			X	X				Larson et al. (2000)	
						Agabus anthracinus Mannerheim, 1852	X		X		X		X				Larson et al. (2000)	
						Agabus apache Young, 1981	X		X						X		Larson et al. (2000)	
						Agabus approximatus Fall, 1922	X	X			X	X		X	X		Larson et al. (2000)	
						Agabus austinii Sharp, 1882	X	X			X	X	X	X			Larson et al. (2000)	
						Agabus austrodiscors Larson, 1996	X	X			X						Larson et al. (2000)	
						Agabus bifarius (Kirby, 1837)	X		X				X				Larson et al. (2000)	
						Agabus bjorkmanae Hatch, 1939	X	X			X	X	X	X			Larson et al. (2000)	
						Agabus brevicollis LeConte, 1857	X	X			X						Larson et al. (2000)	
						Agabus canadensis Fall, 1922	X		X				X				Larson et al. (2000)	
						Agabus confertus LeConte, LeConte, 1861	X	X			X	X	X				Larson et al. (2000)	
						Agabus cordatus (LeConte, 1853)	X	X							X		Larson et al. (2000)	
						Agabus discors LeConte, 1861	X		X		X	X	X				Larson et al. (2000)	
						Agabus disintegratus (Crotch, 1873)	X		X		X	X		X	X		Larson et al. (2000)	
						Agabus erichsoni Gemminger and Harold, 1868	X		X		X						Larson et al. (2000)	
						Agabus euryomus Larson, 1996	X		X		X	X					Larson et al. (2000)	
						Agabus griseipennis LeConte, 1859	X		X		X	X	X	X	X		Larson et al. (2000)	
						Agabus hoppingi Leech, 1942	X	X			X						Larson et al. (2000)	
						Agabus hypomelas Mannerheim, 1843	X		X		X	X	X				Larson et al.	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2000)	
						Agabus ilybiiformis (Zimmermann, 1928)	X	X			X	X					Larson et al. (2000)	
						Agabus jimzim Larson, 1996	X								X		Larson et al. (2000)	
						Agabus klamathensis Larson & Leech, 1989	X	X			X	X					Larson et al. (2000)	
						Agabus kootenai Larson, 1991	X		X		X	X	X				Larson et al. (2000)	
						Agabus lineelus LeConte, 1861	X		X		X						Larson et al. (2000)	
						Agabus lugens LeConte, 1852	X	X			X	X					Larson et al. (2000)	
						Agabus lutosus LeConte, 1853	X		X		X	X	X			X	Larson et al. (2000)	
						Agabus minnesotensis Wallis, 1933	X	X						X			Larson et al. (2000)	
						Agabus morosus LeConte, 1852	X	X			X	X					Larson et al. (2000)	
						Agabus obliteratus nectris Leech, 1942	X	X				X	X				Larson et al. (2000)	
						Agabus obliteratus obliteratus LeConte, 1859	X	X			X			X	X		Larson et al. (2000)	
						Agabus oblongulus Fall, 1922	X		X			X	X				Larson et al. (2000)	
						Agabus obsoletus LeConte, 1858	X	X			X			X			Larson et al. (2000)	
						Agabus pandurus Leech, 1942	X	X			X						Larson et al. (2000)	
						Agabus perplexus Sharp, 1882	X	X			X	X	X				Larson et al. (2000)	
						Agabus pisobius Leech, 1949	X		X				X				Larson et al. (2000)	
						Agabus punctulatus Aube, 1838	X		X		X	X	X		X		Larson et al. (2000)	
						Agabus regularis (LeConte, 1852)	X				X					X	Larson et al. (2000)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Agabus roguus Larson, 1997	X	X				X					Larson et al. (2000)	Curry Co., OR
						Agabus rumppi Leech, 1964	X	X			X			X			Larson et al. (2000)	
						Agabus sasquatch Larson, 1991	X		X		X			X			Larson et al. (2000)	
						Agabus semipunctatus (Kirby, 1837)	X		X				X				Larson et al. (2000)	
						Agabus semivittatus LeConte, 1852	X	X			X			X	X		Larson et al. (2000)	
						Agabus seriatus (Say, 1823)	X	X			X	X	X	X	X		Larson et al. (2000)	
						Agabus smithi Brown, 1930	X					X	X				Larson et al. (2000)	
						Agabus strigulosus (Crotch, 1873)	X		X		X	X	X	X			Larson et al. (2000)	
						Agabus tristis Aube, 1838	X		X		X	X	X		X		Larson et al. (2000)	
						Agabus vandykei Leech, 1942	X		X		X	X					Larson et al. (2000)	
						Agabus vancouverensis Leech, 1937	X		X				X				Larson et al. (2000)	
						Agabus versimilis Brown, 1932	X		X			X	X				Larson et al. (2000)	
						Agabus walsinghami (Crotch, 1873)	X	X			X	X	X				Larson et al. (2000)	
					Ilybius		X		X		X	X	X	X	X		Larson et al. (2000); Larson (1987)	
						Ilybius angustior (Gyllenhal, 1808)	X		X						X		Larson et al. (2000); Larson (1987)	
						Ilybius fraterculus LeConte, 1862	X		X		X	X	X	X	X		Larson et al. (2000); Larson (1987)	
						Ilybius picipes (Kirby, 1837)	X		X				X				Larson et al. (2000); Larson	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(1987)	
						Ilybius quadrimaculatus Aube, 1838	X		X		X	X	X				Larson et al. (2000); Larson (1987)	
				Colymbetini			X	X	X		X	X	X	X	X		Larson et al. (2000)	
					Colymbetes		X		X		X	X	X	X	X		Larson et al. (2000)	
						Colymbetes crotchi Sharp, 1882	X		X		X						Larson et al. (2000)	
						Colymbetes densus LeConte, 1859	X		X		X	X					Larson et al. (2000)	two recognized subspecies with possible intergrades
						Colymbetes incognitus Zimmerman, 1981	X		X		X	X	X	X	X		Larson et al. (2000)	
						Colymbetes strigatus LeConte, 1851	X		X		X						Larson et al. (2000)	
					Rhantus		X	X	X		X	X	X	X	X		Larson et al. (2000); Zimmerman (1975)	
						Rhantus anisonychus Crotch, 1873	X				X						Larson et al. (2000); Zimmerman (1975)	
						Rhantus atricolor (Aube, 1838)	X								X		Larson et al. (2000); Zimmerman (1975)	
						Rhantus binotatus (Harris, 1828)	X				X	X	X	X	X		Larson et al. (2000); Zimmerman (1975)	
						Rhantus consimilis Motschulsky, 1859	X		X		X	X	X	X			Larson et al. (2000); Zimmerman	

Taxonomic Hierarchy							Habitat				Distribution							
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
																	(1975)	
						Rhantus gutticollis (Say, 1834)	X	X			X	X	X	X	X		Larson et al. (2000); Zimmerman (1975)	
						Rhantus sericans Sharp, 1882	X		X		X	X	X				Larson et al. (2000); Zimmerman (1975)	
						Rhantus sinuatus (LeConte, 1862)	X		X				X				Larson et al. (2000); Zimmerman (1975)	
						Rhantus suturellus (Harris, 1828)	X		X				X				Larson et al. (2000); Zimmerman (1975)	
						Rhantus wallisi Hatch, 1953	X		X		X	X	X				Larson et al. (2000); Zimmerman (1975)	
				Coptotomini			X				X	X	X	X			Larson et al. (2000)	
					Coptotomus		X		X		X	X	X	X			Larson et al. (2000)	
						Coptotomus longulus longulus LeConte, 1852	X		X		X	X	X	X			Larson et al. (2000)	
			Dytiscinae				X	X	X		X	X	X	X	X	X	Larson et al. (2000)	
				Dytiscini			X				X	X	X	X	X		Larson et al. (2000)	
					Dytiscus		X		X		X	X	X	X	X		Larson et al. (2000)	
						Dytiscus alaskanus Balfour-Browne, 1944	X		X				X				Larson et al. (2000)	
						Dytiscus circumcinctus Ahrens, 1811	X		X				X				Larson et al.	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	(2000)	
						Dytiscus cordieri Aube, 1838	X		X		X	X	X				Larson et al. (2000)	
						Dytiscus dauricus Gebler, 1832	X		X		X	X	X	X	X		Larson et al. (2000)	
						Dytiscus habilis Say, 1834	X		X						X		Larson et al. (2000)	
						Dytiscus hatchi Wallis, 1950	X		X		X	X	X				Larson et al. (2000)	
						Dytiscus hybridus Aube, 1838	X		X			X					Larson et al. (2000)	
						Dytiscus marginicollis LeConte, 1845	X		X		X	X	X	X	X		Larson et al. (2000)	
				Hydaticini			X		X		X	X	X				Larson et al. (2000)	
					Hydaticus		X		X		X	X	X				Larson et al. (2000)	
						Hydaticus aruspex Clark, 1864	X		X		X	X	X				Larson et al. (2000)	
				Acilini			X		X		X	X	X	X			Bergsten&Miller (2006)	
					Acilius		X		X		X	X	X	X			Bergsten&Miller (2006)	
						Acilius abbreviatus Mannerheim, 1843	X		X		X	X	X	X			Larson et al. (2000)	
					Graphoderus		X		X		X		X				Larson et al. (2000)	
						Graphoderus liberus (Say, 1825)	X		X		?		X				Larson et al. (2000)	CA record unpublished
						Graphoderus occidentalis Horn, 1883	X		X		X	X	X				Larson et al. (2000)	
						Graphoderus perplexus Sharp, 1882	X		X		X		X				Larson et al. (2000)	
					Thermonectus		X		X		X	X			X		Larson et al. (2000)	
						Thermonectus intermedius Crotch, 1873	X		X		X	X					Larson et al. (2000)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Thermonectus marmoratus Hope, 1832	X	X			X						Larson et al. (2000)	
						Thermonectus nigrofasciatus nigrofasciatus Aube, 1838	X		X						X		Larson et al. (2000)	
						Thermonectus sibleyi Goodhue-McWilliams, 1981	X		X						X		Larson et al. (2000)	
				Eretini			X				X				X		Larson et al. (2000)	
					Eretes		X				X				X		Larson et al. (2000)	
						Eretes sticticus (Linnaeus, 1767)	X				X				X		Miller (2002)	
				Cybistrini			X		X		X			X			Larson et al. (2000)	
					Cybister		X		X		X			X			Larson et al. (2000)	
						Cybister ellipticus LeConte, 1851	X		X		X						Larson et al. (2000)	
						Cybister explanatus LeConte, 1851	X		X		X			X			Larson et al. (2000)	
		Gyrinidae					X	X	X		X	X	X	X	X	X		adults not benthic; generally discarded from benthic sets
			Gyrininae				X	X	X		X	X	X	X	X	X		
				Enhydrini			X	X	X		X				X	X		
					Dineutus		X	X	X		X				X	X	Leech and Chandler (1956); Wood (1962)	no recent published key for North American species
				Orectochilini			X	X			X				X			
					Gyretes		X	X			X				X		Babin (2004)	
				Gyrinini			X	X	X		X	X	X	X	X		Oygur and Wolfe (1992)	
					Gyrinus		X	X	X		X	X	X	X	X		Oygur and Wolfe (1992)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
		Haliplidae					X		X		X		X			X	Leech and Chandler (1956)	the species keys in Usinger are the still the most recent
					Apteraliplus		X		X		X	X	X					vernal pools only; this genus may be sunk under *Haliplus* at some point
						Apteraliplus parvulus (Roberts, 1913)	X		X		X	X	X					vernal pools only; this genus may be sunk under *Haliplus* at some point
					Brychius		X				X							
						Brychius hornii Crotch, 1873	X				X							
						Brychius pacificus Carr, 1928	X				X							
					Haliplus		X				X					X		
						Haliplus concolor LeConte, 1852	X				X					X		
						Haliplus cylindricus Roberts, 1913	X				X							
						Haliplus distinctus Wallis, 1933	X				X						Kenner (2005)	
						Haliplus dorsomaculatus Zimmermann, 1924	X				X							
						Haliplus gracilis Roberts, 1913	X				X							
						Haliplus leechi Wallis, 1933	X				X							
						Haliplus longulus LeConte, 1859	X				X						Kenner (2005)	
						Haliplus mimeticus Matheson, 1912	X				X						Leech (1957)	
						Haliplus robertsi Zimmermann, 1924	X				X							
						Haliplus rugosus Roberts, 1913	X				?					X		records probably only for Baja and not CA
						Haliplus subguttatus Roberts, 1913	X				X	X	X				Leech (1964)	
					Peltodytes		X				X					X	Leech and Chandler (1956)	
						Peltodytes callosus (LeConte, 1852)	X	X	X		X					X	Leech and	

Taxonomic Hierarchy							Habitat				Distribution							
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
																	Chandler (1956)	
						Peltodytes dispersus Roberts, 1913	X	X	X		?				X			unconfirmed record for CA
						Peltodytes simplex (LeConte, 1852)	X	X	X		X					X	Leech and Chandler (1956)	
		Noteridae					X		X		X						Leech (1970)	
					Suphisellus		X		X		X						Leech (1970)	
						Suphisellus bicolor (Say, 1831)	X		X		X						Leech (1970)	
	Polyphaga																	
		Chrysomelidae									X							excluded from benthic datasets
		Curculionidae									X							excluded from benthic datasets
		Dryopidae					X				X	X	X	X	X		Brown (1972a)	larvae are primarily terrestrial; occasionally in headwater seeps
					Dryops		X	X			X				X		Brown (1972a)	riparian; seldomly taken in benthic samples
						Dryops arizonensis Schaeffer, 1905	X	X			X				X		Brown (1972a)	
					Helichus		X	X			X	X	X	X	X	X	Brown (1972a); Nelson (1989)	
						Helichus columbianus Brown, 1931	X	X			X	X	X	X	X	X	Brown (1972a); Nelson (1989); Nelson (1981)	
						Helichus striatus LeConte, 1852	X	X			X	X	X	X	X		Brown (1972a); Nelson (1989)	
						Helichus suturalis LeConte, 1852	X	X			X				X	X	Brown (1972a); Nelson (1989)	

Taxonomic Hierarchy							Habitat				Distribution							
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja	Literature Cited	Comments
						Helichus triangularis Musgrave, 1935	X	X							X		Brown (1972a); Nelson (1989)	
					Postelichus		X	X			X				X	X	Brown (1972a); Nelson (1989)	
							X	X							X		Brown (1972a); Nelson (1989)	
						Postelichus immsi (Hinton, 1937)	X	X			X				X		Brown (1972a); Nelson (1989)	
						Postelichus productus (LeConte, 1852)	X	X			X					X	Brown (1972a); Nelson (1989)	
		Elmidae					X	X	X		X	X	X	X	X	X	Shepard (2002); White and Brigham (1996); Brown (1972a)	Shepard's updated generic key to elmid adults includes *Xenelmis* but not the undescribed genus known to occur in the Pacific Northwest.
			Larainae				X	X	X		X	X	X					
				Larini			X	X	X		X	X	X					
					Lara		X	X	X		X	X	X					adults usually terrestrial, may be taken in benthic samples
						Lara avara LeConte, 1852	X	X	X		X						Brown (1972a)	
						Lara gehringi Darlington, 1929	X	X	X		X	X	X				Brown (1972a)	may be a synonym of *Lara avara*
			Elminae				X	X	X		X	X	X	X	X	X		
				Elmini			X	X	X		X	X	X	X	X	X		
					Ampumixis		X	X			X	X						monotypic

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Ampumixis dispar (Fall, 1925)	X	X			X	X						monotypic
					Atractelmis		X	X			X	X						monotypic
						Atractelmis wawona Chandler, 1954	X	X			X	X						monotypic
					Cleptelmis		X	X			X	X					Shepard (1998)	monotypic
						Cleptelmis addenda (Fall, 1907)	X	X			X	X	X				Shepard (1998)	monotypic
					Cylloepus		X	X							X			
						Cylloepus abnormis (Horn, 1870)	X	X							X		Brown (1972a)	
						Cylloepus parkeri Sanderson, 1953	X	X							X		Brown (1972a)	
					Dubiraphia		X	X	X		X				X			
						Dubiraphia brunnescens (Fall, 1925)	X	X	X		X						Brown (1972a)	Lake Co., Clear Lake
						Dubiraphia giulianii (van Dyke, 1949)	X	X	?		X						Brown (1972a); Shepard (1993)	may be a synonym of *Dubiraphia brunnescens*
					Heterelmis		X	X			X				X	X		
						Heterelmis glabra (Horn, 1870)	X	X							X		Brown (1972b)	
						Heterelmis obesa Sharp, 1882	X	X			X				X		Brown (1972b)	
						Heterelmis stephani Brown, 1972	X	X							X		Brown (1972b)	
					Heterlimnius		X	X			X	X	X					
						Heterlimnius corpulentus (LeConte, 1874)	X	X			X		X				Brown (1972a)	
						Heterlimnius koebelei (Martin, 1927)	X	X			X	X	X				Brown (1972a)	
					Hexacylloepus		X	X							X			unpublished records for AZ
					Huleechius		X	X							X	X	Brown (1981)	
						Huleechius marroni Brown, 1981	X	X								X	Brown (1981)	
						Huleechius marroni carolus Brown, 1981	X	X							X		Brown (1981)	
					Macrelmis		X	X							X		Brown (1972a)	
						Macrelmis moestus (Horn, 1870)	X	X							X		Brown (1972a)	may be a synonom of *Macrelmis texanus* Schaeffer, 1911

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Microcylloepus		X	X			X				X			there are unpublished records of additional species in the SW
						Microcylloepus formicoideus Shepard, 1990	X	X			X						Shepard (1990)	occurs in Death Valley only
						Microcylloepus moapus fraxinus La Rivers, 1949	X	X						X			Brown (1972a)	warm springs in SE Nevada
						Microcylloepus moapus moapus La Rivers, 1949	X	X						X			Brown (1972a)	warm springs in SE Nevada
						Microcylloepus similis (Horn, 1870)	X	X			X				X		Shepard (1993)	widespread in the West
						Microcylloepus thermarum (Darlington, 1928)	X	X						X			Brown (1972a)	warm springs in NW Nevada
					Narpus		X	X			X	X	X		X		Brown (1972a)	
						Narpus angustus Casey, 1893)	X	X			X	X	X				Brown (1972a)	
						Narpus arizonicus (Brown, 1930)	X	X							X		Brown (1972a)	
						Narpus concolor (LeConte, 1881)	X	X			X	X	X				Brown (1972a)	
					Neocylloepus		X	X							X		Shepard (2002); White and Brigham (1996)	undetermined species
					Neoelmis		X	X							X		Shepard (2002); White and Brigham (1996)	undetermined species
					Optioservus		X	X			X	X	X	X	X		Shepard (2002); White (1978); Shepard (1993)	several Western species may not be valid
						Optioservus canus Chandler, 1954	X	X			X						Shepard (2002); White (1978); Shepard (1993)	several Western species may not be valid
						Optioservus divergens (LeConte, 1874)	X	X			X			X	X		Shepard (2002); White (1978); Shepard (1993)	several Western species may

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																		not be valid
						Optioservus heteroclitus White, 1978	X	X			X						Shepard (2002); White (1978); Shepard (1993)	several Western species may not be valid
						Optioservus quadrimaculatus (Horn, 1870)	X	X			X	X	X	X			Shepard (2002); White (1978); Shepard (1993)	several Western species may not be valid
						Optioservus seriatus (LeConte, 1874)	X	X			X	X					Shepard (2002); White (1978); Shepard (1993)	several Western species may not be valid
					Ordobrevia		X	X			X	X					Shepard (2002); White and Brigham (1996)	only one species in North America
						Ordobrevia nubifera (Fall, 1901)	X	X			X	X					Shepard (2002); White and Brigham (1996)	only one species in North America
					Rhizelmis		X	X			X	X					Shepard (2002); White and Brigham (1996)	monotypic
						Rhizelmis nigra Chandler, 1954	X	X			X	X					Shepard (2002); White and Brigham (1996)	monotypic
					Stenelmis		X	X			X	X	X	X	?		Shepard (2002); White and Brigham (1996)	*S. occidentalis* is the only species occurring outside of Nevada springs
						Stenelmis calida Chandler, 1949	X	X						X			Schmude (1999)	Key designed for *Stenelmis* of the Nevada springs, but will serve for the West in general

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Stenelmis lariversi Schmude, 1999	X	X						X			Schmude (1999)	Key designed for *Stenelmis* of the Nevada springs, but will serve for the West in general
						Stenelmis moapa LaRivers, 1949	X	X						X			Schmude (1999)	Key designed for *Stenelmis* of the Nevada springs, but will serve for the West in general
						Stenelmis occidentalis Schmude and Brown, 1991	X	X				X		X	?		Schmude (1999)	Key designed for *Stenelmis* of the Nevada springs, but will serve for the West in general
					Xenelmis		X	X							X		Shepard (2002); Brown (1985); Brown (1981)	
						Xenelmis sandersoni Brown, 1985	X	X							X		Shepard (2002); Brown (1985); Brown (1981)	only species from the USA; larvae still not included in generic keys, but easily identifiable
				Macronychini			X	X			X	X	X	X	X	X		
					Zaitzevia		X	X			X	X	X	X	X	X	Brown (1972a); Brown (2001)	
						Zaitzevia parvula (Horn, 1870)	X	X			X	X	X	X	X	X	Brown (2001)	
						Zaitzevia posthonia Brown, 2001	X	X			X	X	X					
		Eulichadidae					X				X						Brown (1972a)	formerly placed in the Ptilodactylidae; adults terrestrial

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Stenocolus		X				X						Brown (1972a)	adults terrestrial
						Stenocolus scutellaris LeConte, 1853	X				X						Brown (1972a)	adults terrestrial
		Georissidae									X						Shepard (2003)	some authors consider this a subfamily of Hydrophilidae
					Georissus						X		X				Shepard (2003)	shoredwellers
						Georissus californicus LeConte, 1874					X		X				Shepard (2003)	shoredwellers
		Heteroceridae									X	X	X	X	X		Pacheco (1978)	larvae and adults shoredwellers
		Hydraenidae					X	X	X		X	X	X	X	X	X		
			Hydraeninae				X	X	X		X	X	X	X	X	X		
				Hydraenini			X	X	X		X	X	X	X	X	X		
					Hydraena		X	X	X		X	X	X	X	X	X	Perkins (1980); Perkins (2001)	Found along stream margins, also some lentic situations
					Limnebius						X	X	X			X	Perkins (1980); Perkins (2001)	
			Ochthebiinae				X	X	X	X	X	X	X	X	X	X		
					Gymnocthebius						X	X			X	X	Perkins (1980); Perkins (2001)	
					Neochthebius						X	?	?				Perkins (1980); Perkins (2001)	intertidal, found in rock crevises from CA to BC
						Neochthebius vandykei (Knisch, 1924)					X	?	?				Perkins (1980); Perkins (2001)	intertidal, found in rock crevises from CA to BC
					Ochthebius		X	X	X		X	X	X	X	X	X	Perkins (1980); Perkins (2001)	dwellers of stream and pond margins

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
		Hydrophilidae					X	X	X		X	X	X	X	X	X	Smetana (1988); Leech and Chandler (1956)	Smetana's keys are more recent, but do not cover the SW USA
					Ametor		X	X			X	X	X				Smetana (1988); Leech and Chandler (1956)	
						Ametor latus (Horn, 1873)	X	X			X	X	X				Smetana (1988); Leech and Chandler (1956)	
						Ametor scabrosus (Horn, 1873)	X	X			X	X	X				Smetana (1988); Leech and Chandler (1956)	
					Anacaena		X	X	X		X						Leech and Chandler (1956)	
						Anacaena limbata (Fabricius, 1792)	X	X	X		X						Smetana (1988); Leech and Chandler (1956)	This name probably represents a species complex
						Anacaena signaticollis (Fall, 1924)	X				X						Leech and Chandler (1956)	
					Berosus		X				X						Miller (1965); van Tassel (1963); Leech and Chandler (1956)	van Tassel's (1966) revision of *Berosus* remains unpublished; species keys should be used with caution
						Berosus fraternus LeConte, 1855	X				X				X		Leech and Chandler (1956)	*B. californicus* now a synonym
						Berosus infuscatus LeConte, 1855	X				X				X		Leech and Chandler (1956)	
						Berosus ingeminatus d'Orchymont, 1946	X				X						Leech and Chandler (1956)	
						Berosus maculosus Mannerheim, 1853	X				X						Leech and	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																	Chandler (1956)	
						Berosus metalliceps Sharp, 1882	X				X						Leech and Chandler (1956)	
						Berosus notapeltatus van Tassell, 1963	X								X		van Tassell (1963)	
						Berosus punctatissimus LeConte. 1852	X				X				X		Leech and Chandler (1956)	
						Berosus striatus (Say, 1823)	X				X						Leech and Chandler (1956)	
						Berosus stylifera Horn 1873	X				X				X		Leech and Chandler (1956)	
					Chaetarthria		X				X						Miller (1974)	
						Chaetarthria bicolor Sharp,	X				X						Miller (1974)	
						Chaetarthria hespera Miller, 1974	X				X						Miller (1974)	
						Chaetarthria leechi Miller, 1974	X				X						Miller (1974)	
						Chaetarthria magna Miller, 1974	X				X						Miller (1974)	
						Chaetarthria nigrella (LeConte, 1861)	X				X						Miller (1974)	
						Chaetarthria ochra Miller, 1974	X				X						Miller (1974)	
						Chaetarthria pallida (LeConte, 1861)	X				X						Miller (1974)	
						Chaetarthria punctulata Sharp,	X				X						Miller (1974)	
						Chaetarthria pusilla Sharp,	X				X						Miller (1974)	
						Chaetarthria spinata Miller, 1974	X				X						Miller (1974)	
						Chaetarthria truncata Miller, 1974	X				X						Miller (1974)	
					Crenitis		X	X	X		X	X	X	X	X		Miller (1965); Smetana (1988)	
						Crenitis alticola (Fall, 1924)	X	?	?		X	X	X		X		Miller (1965)	
						Crenitis dissimilis (Horn, 1873)	X				X						Miller (1965); Smetana (1988)	
						Crenitis malkini Miller, 1965	X	X				X					Miller (1965); Smetana (1988)	
						Crenitis morata (Horn, 1890)	X		X		X						Smetana (1988)	
						Crenitis palpalis Miller, 1965	X				X	X					Miller (1965)	
						Crenitis paradigma (d'Orchymont, 1942)	X		X			X	X				Smetana (1988)	
						Crenitis rufiventris (Horn, 1873)	X		X		X				X		Smetana (1988)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Crenitis seriellus (Fall, 1924)	X				X							
						Crenitis snoqualmie Miller, 1965	X	?				X	X				Miller (1965)	
					Cymbiodyta		X	X	X		X	X	X	X	X	X	Smetana (1974)	
						Cymbiodyta acuminata Fall, 1924	X						X				Smetana (1974)	
						Cymbiodyta arizonica Smetana, 1974	X								X		Smetana (1974)	
						Cymbiodyta columbiana Leech, 1948	X	X	X		X	X	X				Smetana (1974)	
						Cymbiodyta dorsalis (Motschulsky, 1859)	X	X	X		X	X	X	X	X	X	Smetana (1974)	
						Cymbiodyta fraterculus (Sharp, 1882)	X								X		Smetana (1974)	
						Cymbiodyta howdeni Smetana, 1974	X								X		Smetana (1974)	
						Cymbiodyta imbellis (LeConte, 1861)	X	X	X		X	X					Smetana (1974)	
						Cymbiodyta leechi Miller, 1964	X				X	X	X				Smetana (1974)	
						Cymbiodyta occidentalis Smetana, 1974	X	?	X		X						Smetana (1974)	
						Cymbiodyta pacifica Leech, 1948	X	X	X		X	X	X				Smetana (1974)	
						Cymbiodyta pseudopacifica Smetana, 1974	X				X						Smetana (1974)	
						Cymbiodyta puella Smetana, 1974	X	X	X		X						Smetana (1974)	
						Cymbiodyta punctatostriata (Horn, 1873)	X	X	?		X						Smetana (1974)	
						Cymbiodyta seriata Smetana, 1974	X	X							X		Smetana (1974)	
						Cymbiodyta vindicata Fall, 1924	X						X				Smetana (1974)	
					Enochrus		X	X	X		X	X	X	X	X	X	Gundersen (1978); Gundersen (1977)	
						Enochrus aridus Gundersen, 1977	X				X				X		Gundersen (1978); Gundersen (1977)	
						Enochrus californicus (Horn, 1890)	X		X		X	X	X			X	Gundersen (1978); Gundersen (1977)	
						Enochrus carinatus carinatus (LeConte, 1855)	X				X						Gundersen (1978); Gundersen (1977)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Enochrus carinatus fucatus (Horn, 1873)	X								X		Gundersen (1978); Gundersen (1977)	
						Enochrus cristatus (LeConte, 1855)	X				X	X	X	X	X	X	Gundersen (1978); Gundersen (1977)	
						Enochrus cuspidatus (LeConte, 1878)	X				X	X		X			Gundersen (1978); Gundersen (1977)	
						Enochrus diffusus (LeConte, 1855)	X				X	X	X	X			Gundersen (1978); Gundersen (1977)	
						Enochrus hamiltoni Leech, 1950	X	X	X		X	X	X	X			Gundersen (1978); Gundersen (1977)	Several different color morphs exist
						Enochrus ochraceus (Melsheimer, 1844)	X		X		X						Gundersen (1978); Gundersen (1977)	
						Enochrus perplexus (LeConte, 1855)	X				X			X			Gundersen (1978); Gundersen (1977)	
						Enochrus piceus piceus Miller, 1964	X				X	X	X	X	X		Gundersen (1978); Gundersen (1977)	
						Enochrus piceus glabrus Gundersen, 1977	X								X		Gundersen (1978); Gundersen (1977)	
						Enochrus pygmaeus pectoralis (LeConte, 1855)	X				X			X	X	X	Gundersen (1978); Gundersen (1977)	
						Enochrus pygmaeus pygmaeus (Fabricius, 1792)	X				X				X	X	Gundersen (1978); Gundersen (1977)	
					Helochares		X				X							
						Helochares normatus (LeConte, 1861)	X				X							as *H. maculicollis* Mulsant, 1844

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
					Hydrochara		X				X						Smetana (1980); Leech and Chandler (1956)	
						Hydrochara lineata LeConte, 1855	X				X			X	X	X	Smetana (1980); Leech and Chandler (1956)	
						*Hydrochara ricksecker*i Horn, 1895	X				X						Smetana (1980); Leech and Chandler (1956)	Listed as a species of concern; may become federally listed
					Hydrobius		X				X							
						Hydrobius fuscipes (Linnaeus, 1758)	X				X							
					Hydrophilus		X				X						Leech and Chandler (1956)	
						Hydrophilus insularis Laporte, 1840	X				X						Leech and Chandler (1956)	
						Hydrophilus triangularis Say, 1823	X		X		X						Leech and Chandler (1956)	
					Laccobius		X				X							
						Laccobius agilis Randall, 1838	X				X							
						Laccobius californicus d'Orchymont,1942	X				X							
						Laccobius carri d'Orchymont, 1942	X				X							
						Laccobius ellipticus LeConte,1855	X				X							
						Laccobius insolitus d'Orchymont, 1942	X				X							
					Paracymus		X				X						Wooldridge (1966)	*P. securus* not in this key, but all US species are
						Paracymus communis Wooldridge, 1966	X				X				X		Wooldridge (1966)	
						Paracymus confusus Wooldridge, 1966	X								X		Wooldridge (1966)	
						Paracymus elegans (Fall, 1901)	X				X						Wooldridge (1966)	
						Paracymus ellipsis (Fall, 1910)	X				X				X		Wooldridge (1966)	
						Paracymus restrictus Wooldridge, 1966	X				X						Wooldridge (1966)	

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
						Paracymus securus Wooldridge, 1975	X									X	Wooldridge (1975)	
						Paracymus subcupreus (Say, 1825)	X				X						Wooldridge (1966)	
						Paracymus tarsalis Miller, 1963	X				X						Wooldridge (1966)	
					Tropisternus		X				X						Leech and Chandler (1956)	
						Tropisternus californicus (LeConte, 1855)	X				X	X				X	Leech and Chandler (1956)	
						Tropisternus columbianus Brown, 1931	X	X	X		X	X	X				Leech and Chandler (1956)	
						Tropisternus ellipticus (LeConte, 1855)	X		X		X	X	X	X	X	X	Leech and Chandler (1956)	
						Tropisternus lateralis (Fabricius, 1775)	X	X	X		X	X	X	X	X	X	Leech and Chandler (1956)	
						Tropisternus obscurus Sharp, 1882	X									X	Leech and Chandler (1956)	
						Tropisternus orvus Leech, 1945	X				X	X		X			Leech and Chandler (1956)	
						Tropisternus salsamentus Fall, 1901	X				X	X					Leech and Chandler (1956)	
						Tropisternus sublaevis (LeConte, 1855)	X				X			X	X	X	Leech and Chandler (1956)	
		Helophoridae					X											some authors consider this as a subfamily of Hydrophilidae
					Helophorus		X											
		Hydrochidae					X											some authors consider this as a subfamily of Hydrophilidae
					Hydrochus		X											
		Lampyridae							X									larvae are shoredwellers, not truly aquatic
					Pyractomena				X									emergent vegetation of ponds and

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																		marshes
		Limnichidae									X	X	X		X		Wooldridge (1975, 1986)	larvae and adults shoredwellers
		Lutrochidae					X	X							X		Brown (1972a); Brown and Murvosh (1970)	adults terrestrial
					Lutrochus		X	X							X		Brown (1972a); Brown and Murvosh (1970)	adults terrestrial
						Lutrochus arizonensis Brown and Murvosh, 1970	X	X							X		Brown (1972a); Brown and Murvosh (1970)	adults terrestrial
		Psephenidae					X	X			X	X	X	X	X	X	Brown (1972a); Shepard (1993)	
			Eubriinae				X	X			X	X					Brown (1972a); Shepard (1993)	
					Acneus		X	X			X	X					Brown (1972a); Shepard (1993)	larvae not separable to species
			Eubrianacinae				X	X			X	X		X			Brown (1972a); Shepard (1993)	
					Eubrianax		X	X			X	X		X			Brown (1972a); Shepard (1993)	
						Eubrianax edwardsii (LeConte, 1874)	X	X			X	X		X			Brown (1972a); Shepard (1993)	only one species in Nearctic Region
			Psepheninae				X	X			X	X	X	X	X		Brown (1972a); Brown and Murvosh (1974)	
					Psephenus		X	X			X	X	X	X	X		Brown (1972a); Brown and Murvosh (1974)	larvae to genus, except *P. falli* Casey which is widespread

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																		outside of AZ
		Ptilodactylidae					X				X						Brown (1972a)	adults terrestrial; larvae found mainly in seeps and headwater streams
					Anchycteis		X				X						Brown (1972a)	adults terrestrial; larvae found mainly in seeps and headwater streams
						Anchycteis velutina Horn, 1880	X				X						Brown (1972a)	adults terrestrial; larvae found mainly in seeps and headwater streams
					Araeopidius		X				X						Lawrence (1991)	adults terrestrial; larvae found mainly in seeps and headwater streams
						Araeopidius monochus LeConte, 1874	X				X						Lawrence (1991)	adults terrestrial; larvae found mainly in seeps and headwater streams
		Scirtidae					X		X		X				X		Tetrault (1967)	adults terrestrial; larvae to genus only; all lentic, some lotic in slower

Taxonomic Hierarchy							Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Family	Subfamily	Tribe	Genus	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																		microhabitats
					Cyphon		X		X		X							
					Elodes		X		X		X							
					Prionocyphon		X		X						X			
					Scirtes		X		X		X							
		Scarabaeidae							X		X						Rogers (1997)	
			Aphodiinae						X		X						Rogers (1997)	
					Aphodius				X		X						Rogers (1997)	
						Aphodius alternatus Horn, 1887			X		X						Rogers (1997)	surface dweller in some vernal pools
		Staphylinidae									X							excluded from benthic datasets

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Diptera: True Flies
Standard Effort Level I: Genus (where possible) -- Chironomidae to family
Standard Effort Level II: Genus (where possible) -- Chironomidae to genus
Standard Taxonomic Reference: Merritt and Cummins (1996)
Reviewed by:

Keys to families and genera are given in Merritt and Cummins (Courtney et al., 1996 – larvae; Merritt et al., 1996 – pupae and adults; Byers, 1996 – Tipulidae; Peterson, 1996 – Simuliidae; Walker and Newson, 1996 – Culicidae; Coffman and Ferrington, 1996 – Chironomidae). Stone et al. (1983) is a good source for distributional information. See also McAlpine et al. (1981, 1987, 1989) for additional keys, illustrations, biological and phylogenetic information and bibliographic references for all Diptera families. The Simuliidae have recently been revised for North America (Adler et al., 2004) When identifying chironomids, it may be helpful to have a number of additional texts at hand including Wiederholm (1983), Wiederholm (1986), and Epler (2001). The latter text, although designed for use in North and South Carolina, is well illustrated and has up-to-date keys for many Nearctic genera. It also contains useful information on the hazards of midge larva identification including ecology, nomenclature, slide-mounting, and quality assurance.

Taxonomic Hierarchy										**Habitat**				**Distribution**						**Literature Cited**	**Comments**
Order	**Suborder**	**Infraorder**	**Family**	**Subfamily**	**Tribe**	**Genus group**	**Genus**	**Species group**	**Species**	**Benthic**	**Lotic**	**Lentic**	**Estuarine**	**CA**	**OR**	**WA**	**NV**	**AZ**	**Baja**		
Diptera																				Courtney et al. (1996); Merritt et al. (1996)	
	Nematocera																				
		Tipulomorpha																			
			Tanyderidae							X	X			X	X					Alexander (1967)	
							Protanyderus			X	X			X	X					Alexander (1967)	only genus in western USA
			Tipulidae							X	X			X	X	X	X	X	X	Byers (1996), Gelhaus (2000)	also a number of terrestrial forms; Gelhaus key identifies many of these

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
				Limoniinae						X	X			X	X	X	X	X		Byers (1996), Gelhaus (2000)	
							Antocha			X	X			X	X	X				Byers (1996), Gelhaus (2000)	
							Cryptolabis			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	larvae are often confused with *Limnophila*
							Dicranota			X	X			X	X	X				Byers (1996), Gelhaus (2000)	
							Erioptera			X	X			X	X	X	X	X		Byers (1996), Gelhaus (2000)	
							Gonomyia			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	
							Hesperoconopa			X	X			X	X	X				Byers (1996), Gelhaus (2000)	
							Hexatoma			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	
							Limnophila			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	
							Limonia			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	
							Molophilus			X	X			X	X	X		X		Byers (1996), Gelhaus	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(2000)	
							Ormosia			X	X			X	X	X				Byers (1996), Gelhaus (2000)	
							Pedicia			X	X			X	X	X				Byers (1996), Gelhaus (2000)	
							Pilaria			X	X				X	X				Byers (1996), Gelhaus (2000)	
							Pseudolimnophila			X	X			X						Byers (1996), Gelhaus (2000)	
							Rhabdomastix			X	X			X	X	X		X		Byers (1996), Gelhaus (2000)	
				Tipulinae						X	X			X	X	X	X	X	X	Byers (1996), Gelhaus (2000)	
							Holorusia			X	X			X	X	X				Byers (1996), Gelhaus (2000)	monotypic
									Holorusia hespera Arnaud and Byers, 1990	X	X			X	X	X				Byers (1996), Gelhaus (2000), Arnaud and Byers (1990)	monotypic
							Prionocera			X	X			X	X					Byers (1996), Gelhaus (2000), Arnaud and Byers	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(1990)	
							Tipula			X	X			X	X	X	X	X	X	Byers (1996), Gelhaus (2000)	
		Blephariceromorpha																			
			Blephariceridae																		
				Blepharicerinae																	
					Blepharicerini																
							Agathon			X	X			X	X	X	X				
							Bibiocephala			X	X			X							
									Bibiocephala nigripes Alexander, 1965	X	X			X							
							Blepharicera			X	X			X							
							Philorus			X	X			X							
			Deuterophlebiidae							X	X									Courtney (1990)	
							Deuterophlebia			X	X			X	X	X				Courtney (1990)	all species keyed
		Psychodomorpha								X	X			X	X	X		X	X		
			Psychodidae							X	X			X	X	X		X	X		
							Maruina			X	X			X	X	X				Hogue (1973)	
									Maruina lanceolata (Kincaid, 1899)	X	X			X	X	X			X	Hogue (1973)	2 other spp. Known from Colorado
							Psychoda			X	X			X	X	X		X			
							Pericoma/Telmatoscopus			X	X			X	X	X		X	X		larvae of these genera incompletely separable
		Ptychopteromorpha																			
			Ptychopteridae																		found in seeps or stream margins
							Bittacomorpha			X	X	X		X	X	X		X			rarely shows up in benthic samples

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Bittacomorphella			X	X			X	X	X	X				rarely shows up in benthic samples
							Ptychoptera			X	X	X		X	X	X	X	X			most commonly encountered of the three genera (in benthic samples)
		Culicomorpha																			
			Ceratopogonidae							X	X									Courtney et al. (1996); Glukova (1979)	A number of additional genera may be encountered in benthic samples; larvae and pupae in need of revision
				Ceratopogoninae						X	X										
							Bezzia/Palpomyia			X	X										
							Ceratopogon			X	X										
							Culicoides			X	X										
							Probezzia			X	X										
							Sphaeromias			X	X										
							Stilobezzia			X	X										
				Dasyheleinae						X	X										
							Dasyhelea			X	X										
				Forcipomyiinae																	
							Atrichopogon			X	X										
							Forcipomyia			X	X										
			Chaoboridae									X		X	X	X					
							Chaoborus					X		X	X	X					
							Eucorethra			X	X			X	?	?					occasionally found in benthic samples; associated with cold springs
									Eucorethra underwoodi Underwood, 1903	X	X			X	?	?					occasionally found in benthic samples; associated with

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					cold springs
							Mochlonyx					X		X	X						
			Chironomidae							X	X										
				Chironominae						X	X										
					Chironomini					X	X										
							Apedilum			X	X			X							
							Chernovskiia			X	X			X							
									Chernovskiia orbicus (Townes, 1945)	X	X			X							
							Chironomus			X	X			X							
							Cladopelma			X	X			X							
							Cryptochironomus			X	X			X							
							Cryptotendipes			X	X			X							
							Demeijerea			X	X				X						
									Demeijerea brachialis (Coquillett, 1901)	X	X				X						
							Demicryptochironomus			X	X			X							
							Dicrotendipes			X	X			X							
							Endochironomus			X	X			X	?	?				Grodhaus (1987)	
							Endotribelos			X	X			X						Grodhaus (1987)	
							Glyptotendipes			X	X			X							
							Goeldichironomus			X	X			X							
							Harnischia			X	X			X						Sublette (1960)	
							Kiefferulus			X	X			X							
							Lauterborniella			X	X			X							monotypic
									Lauterborniella agrayloides (Kieffer, 1911)	X	X			X							monotypic
							Microchironomus			X	X			X							
							Microtendipes			X	X			X						Wiederholm (1983)	two species groups recognized
								Microtendipes pedellus group sensu		X	X			X						Wiederholm	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
								Pinder and Reiss (1983)												(1983)	
								Microtendipes rydalensis group sensu Pinder and Reiss (1983)		X	X			X						Wiederholm (1983)	
							Nilothauma			X	X			X							
							Pagastiella			X	X			X							
							Parachironomus			X	X			X							
							Paracladopelma			X	X			X							
							Paralauterborniella			X	X			X							monotypic
									Paralauterborniella nigrohalteris (Malloch, 1915)	X	X			X							monotypic
							Paratendipes			X	X			X							
							Phaenopsectra			X	X			X							
							Polypedilum			X	X			X							
							Robackia			X	X			X						Wiederholm (1983); Epler (2001)	two species, easily separable
									Robackia claviger (Townes, 1945)	X	X									Wiederholm (1983); Epler (2001)	
									Robackia demeijeri (Kruseman, 1933)	X	X			X						Wiederholm (1983); Epler (2001)	
							Sergentia			X	X			X							
							Stenochironomus			X	X			X							
							Stictochironomus			X	X			X							
							Synendotendipes			X	X			X						Grodhaus (1987)	
							Tribelos			X	X			X						Grodhaus (1987)	
							Xenochironomus			X	X			X							
					Pseudochironomini					X	X			X							
							Pseudochironomus			X	X			X							
					Tanytarsini					X	X			X							

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Caladomyia			X				X						Lothrop and Mulla (1995); Sawedahl (1981)	Sawedahl (1981) has larval figures
									Caladomyia pistra Sublette and Sasa, 1994	X				X						Lothrop and Mulla (1995)	
							Cladotanytarsus			X	X			X							
							Constempellina			X	X			X							
							Micropsectra			X	X			X							
							Paratanytarsus			X	X			X							
							Rheotanytarsus			X	X			X							
							Stempellina			X	X			X							
							Stempellinella			X	X			X							may be synonymous with *Zavrelia*
							Sublettea			X	X			X							
							Tanytarsus			X	X			X							*Nimbocera* now a synonym of *Tanytarsus*
							Zavrelia			X	X			X							
				Diamesinae						X	X										
					Boreoheptagyini					X	X										
							Boreoheptagyia			X	X			?		X					
					Diamesini					X	X										
							Diamesa			X	X			X	X	X	X	X			
							Pagastia			X	X			?							
							Potthastia			X	X			?							
								Potthastia gaedii group		X	X			?							
								Potthastia longimana group		X	X			?							
							Pseudodiamesa			X	X			X	X						
							Sympotthastia			X	X			X	X						
				Orthocladiinae						X											
							Acricotopus			X				?							

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Brillia			X	X										
							Cardiocladius			X	X			X			X	X			
							Chaetocladius			X	X				X						
							Chasmatonotus							X	X	X					
							Clunio							X							inter tidal
									Clunio californiensis Hashimoto, 1974					X							inter tidal
							Corynoneura							?							
							Cricotopus			X	X			X							
								Cricotopus bicinctus group		X	X			X							
								Cricotopus trifascia group		X	X			X							
							Doithrix			X	X			X							
							Epoicocladius														
							Eretmoptera							X							inter tidal; larvae unknown
									Eretmoptera browni Kellogg, 1900					X							inter tidal; larvae unknown
							Eukiefferiella			X	X			X						Bode (1983); (Epler 2001)	*E. similis* group sensu Bode, 1983 is *Cardiocladius*
								Eukiefferiella brehmi group sensu Bode, 1983		X	X			X						Bode (1983); (Epler 2001)	
								Eukiefferiella brevicalcar group sensu Bode, 1983		X	X			X						Bode (1983); (Epler 2001)	
								Eukiefferiella claripennis group sensu Bode, 1983		X	X			X						Bode (1983); (Epler 2001)	
								Eukiefferiella cyanea group sensu Bode, 1983		X	X				?					Bode (1983); (Epler 2001)	
								Eukiefferiella coerulescens group sensu Bode, 1983		X	X			X						Bode (1983);	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(Epler 2001)	
									Eukiefferiella devonica group sensu Bode, 1983	X	X			X						Bode (1983); (Epler 2001)	
									Eukiefferiella gracei group sensu Bode, 1983	X	X			X						Bode (1983); (Epler 2001)	
									Eukiefferiella pseudomontana group sensu Bode, 1983	X	X			X						Bode (1983); (Epler 2001)	
							Euryhapsis			X	X			X							
							Georthocladius			X	X			X							
							Gymnometriocnemus			X	X			?							
							Heleniella			X	X			X							
							Heterotanytarsus			X	X			?							
							Heterotrissocladius			X	X			X							
							Hydrobaenus			X	X			X							
							Krenosmittia			X	X			X							
							Limnophyes			X	X			X							
							Lopescladius			X	X			?							
							Metriocnemus			X	X			X							
							Nanocladius			X	X			X							
							Orthocladius			X	X			X							
									Orthocladius lignicola (Kieffer, 1915)	X	X			X	X						genus except for *O. (Symposiocladius) lignicola* (Kieffer, 1915)
							Parachaetocladius			X	X			X							
							Parakiefferiella			X	X			X							
							Parametriocnemus			X	X			X							
							Paraphaenocladius			X	X			X							
							Paratrichocladius			X	X			X							

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Parorthocladius			X	X				X						unnamed species
							Psectrocladius			X	X			X							
							Pseudorthocladius			X	X			X							
							Pseudosmittia			X	X			X							
							Rheocricotopus			X	X			X							
							Rheosmittia			X	X			X							
							Smittia			X	X			X							
							Symbiocladius				X			X							phoretic on mayflies
									Symbiocladius equitans (Claassen, 1922)		X			X							phoretic on mayflies
							Synorthocladius			X	X			X							
							Tethymyia							X							inter tidal
									Tethymyia aptena Wirth, 1949					X							inter tidal
							Thalassosmittia							?							inter tidal
							Thienemanniella			X	X			X							
							Tvetenia			X	X			X						Bode (1983)	
								Tvetenia bavarica group sensu Bode, 1983		X	X			X						Bode (1983)	
								Tvetenia discoloripes group sensu Bode, 1983		X	X			X						Bode (1983)	
				Podonominae						X	X									Brundin (1983); Brundin (1986)	found in headwater streams
					Boreochlini					X	X									Brundin (1983); Brundin (1986)	
							Boreochlus			X	X			X		X				Brundin (1983); Brundin (1986)	larvae are inseparable to species
					Podonomini					X	X									Brundin (1983); Brundin (1986)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Parochlus			X	X			X	?	?				Brundin (1983); Brundin (1986)	
									Parochlus kiefferi (Garrett, 1925)	X	X			X	?	?				Brundin (1983); Brundin (1986)	only species known from North American
				Prodiamesinae						X	X			?						Saether (1983); Saether (1986)	
							Monodiamesa			X	X			?						Saether (1983); Saether (1986)	
							Odontomesa			X	X			?						Saether (1983); Saether (1986)	
							Prodiamesa			X	X			?						Saether (1983); Saether (1986)	
				Tanypodinae						X	X			X	X	X	X	X	X		
					Coelotanypodini					X	X			?							
							Clinotanypus			X	X			X							
					Macropelopiini					X	X			X	X	X			X		
							Alotanypus			X	X			X		X			X		
							Apsectrotanypus			X	X			X	X	X					
							Brundiniella			X	X			X	X	X					monotypic
									Brundiniella eumorpha (Sublette, 1964)	X	X			X	X	X					monotypic
							Derotanypus			X	X			X	X	X	X				
							Macropelopia			X	X			?							
							Psectrotanypus			X	X			X	X	X					
							Radotanypus			X	X			X	X						
					Natarsiini					X	X			X							

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Natarsia			X	X			X							
					Pentaneuriini					X	X			X	X	X	X	X			
							Ablabesmyia			X	X			X	X	X	X	X			
							Conchapelopia			X	X			X		X		X			
							Hayesomyia			X	X			X							
							Krenopelopia			X	X				X						
							Labrundinia			X	X			X				X			
							Larsia			X	X			X							
							Meropelopia			X	X			X							
							Monopelopia			X	X			X							
							Nilotanypus			X	X			X							
							Paramerina			X	X			?	X	X					
							Pentaneura			X	X			X	X	X		X			
							Reomyia			X	X				X						
						Thienemannimyia group				X	X			X	X	X	X	X			includes *Arctopelopia, Conchapelopia, Hayesomyia, Helopelopia, Meropelopia, Rheopelopia, Thienemannimyia*
							Thienemannimyia			X	X			X	X	X	X	X			
							Xenopelopia			X	X			X							
							Zavrelimyia			X	X			X	X						
					Procladiini					X	X										
							Procladius			X	X										
					Tanypodini					X	X										
							Tanypus			X	X										
				Telmatogetoninae																	intertidal
							Telmatogeton														intertidal
			Culicidae							X	X										
							Aedes													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					beyond genus
									Aedes aegypti (Linneaus, 1762)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Aedes cinereus Meigen, 1918			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Aedes vexans (Meigen, 1830)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Anopheles													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles franciscanus McCracken, 1904		X	X		X	X		X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles freeborni Aitken, 1939		X	X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles hermsi Barr and Guptavanij, 1989		X	X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles judithae Zavortnik, 1969		X	X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles occidentalis Dyar and Knab, 1906		X	X		X	X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Anopheles punctipennis (Say, 1823)		X	X		X	X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Culex													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex anips Dyar, 1916			X		X					X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex apicalis Adams, 1903			X		X	X		X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex arizonensis Bohart, 1948			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex boharti Brookman and Reeves, 1950			X		X	X	X	X		X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex coronator Dyar and Knab, 1906			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex erythrothorax Dyar, 1907			X		X			X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex interrogator Dyar and Knab, 1906			X		X				X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex pipiens pipiens Linneaus, 1758			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex quinquefasciatus Say, 1823			X		X			X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex reevesi Wirth, 1948			X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					beyond genus
									Culex restuans Theobald, 1901			X		X	X		X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex salinarius Coquillett, 1904			X			X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex stigmatosoma Dyar, 1907			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex tarsalis Coquillett, 1896			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex territans Walker, 1856			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culex thriambus Dyar, 1921			X		X			X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Culiseta													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culiseta impatiens (Walker, 1848)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culiseta incidens (Thompson, 1869)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culiseta inornata (Williston, 1893)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Culiseta minnesotae Barr, 1957			X			X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culiseta morsitans (Theobald, 1901)			X			X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Culiseta particeps (Adams, 1903)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Coquillettidia													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Coquillettidia peturbans (Walker, 1856)			X		X	X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Ochlerotatus													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus aboriginis (Dyar, 1917)			X		X	X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus aloponotum (Dyar, 1917)			X			X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus bicristatus (Thurman and Winkler, 1950)			X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus burgeri (Zavortnik)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus campestris (Dyar and Knab, 1907)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					beyond genus
									Ochlerotatus cataphylla (Dyar, 1916)			X		X	X	X	X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus clivis (Lanzaro and Eldridge, 1992)			X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus communis (DeGeer, 1776)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus desrticola (Zavortnik, 1969)			X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus dorsalis (Meigen, 1830)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus epactius (Dyar and Knab, 1908)			X		X			X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus excrucians (Walker, 1856)			X			X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus fitchii (Felt and Young, 1904)			X		X	X	X	X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus flavescens (Müller, 1764)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus hendersoni (Cockerell, 1918)			X					X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Ochlerotatus hexodontus Dyar, 1916			X		X	X	X	X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus impiger (Walker, 1848)			X			X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus implicatus (Vockeroth, 1954)			X		X	X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus increpitus (Dyar, 1916)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus intrudens (Dyar, 1919)			X			X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus japonicus japonicus (Theobald, 1901)			X				X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus melanimon (Dyar, 1924)			X		X	X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus monticola (Belkin and McDonald, 1957)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus muelleri (Dyar, 1920)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus nevadensis Chapman and Barr, 1964			X			X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus nigromaculatus (Ludlow, 1906)			X		X	X	X	X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					beyond genus
									Ochlerotatus niphadopsis (Dyar and Knabb, 1917)			X		X	X		X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus papago (Zavortnik, 1970)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus provocans (Walker, 1848)			X			X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus pullatus (Coquillett, 1904)			X		X	X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus purpureipes (Aitken, 1941)			X		X				X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus schizopinax (Dyar, 1929)			X		X	X		X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus sierrensis (Ludlow, 1905)			X		X	X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus sollicitans sollicitans (Walker, 1856)			X		X				X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus sollicitans idahoensis (Theobald, 1903)			X			X	X	X			Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus squamiger (Coquillett, 1902)			X		X					X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Ochlerotatus sticticus (Meigen, 1838)			X		X	X	X				Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus taeniorhynchus (Wiedemann, 1821)			X		X				X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus tahoensis (Dyar, 1916)			X		X						Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus thelcter (Dyar, 1918)			X		X				X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus trivittatus (Coquillett, 1902)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus varipalpus (Coquillett, 1902)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus ventrovittus (Dyar, 1916)			X		X	X			X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Ochlerotatus washinoi (Lanzaro and Eldridge, 1992)			X		X	X					Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Orthopodomyia													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Orthopodomyia kummi Edwards, 1939			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Orthopodomyia signifera (Coquillett, 1896)			X		X	X			X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					beyond genus
							Psorophora													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Psorophora columbiae (Dyar and Knab, 1906)			X		X			X	X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Psorophora discolor (Coquillett, 1903)			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Psorophora howardii Coquillett, 1901											Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Psorophora signipennis (Coquillett, 1904)			X		X			X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Toxorhynchites													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Toxorhynchites moctezuma Dyar and Knab, 1906			X						X		Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
							Uranotaenia													Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
									Uranotaenia anhydor anhydor Dyar, 1907			X		X			X	X	X	Darsie and Ward (2005)	Only fourth instar larvae can be reliably identified beyond genus
			Dixidae																	Cook (1983)	
							Dixa			X	X			X		X		X		Cook (1983)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
							Dixella			X	X	X		X	X	X				Cook (1983)	
							Meringodixa			X	X									Cook (1983)	
									Meringodixa chalonensis (Nowell, 1951)	X	X									Cook (1983)	
			Simuliidae							X	X			X	X	X	X	X	X	Adler et al. (2004)	
				Parasimuliinae						X	X			X	X	X				Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
							Parasimulium			X	X			X	X	X				Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
									Parasimulium species "A", Adler et al., 2004	X	X				X					Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
									Parasimulium crosskeyi Peterson, 1977	X	X				X	X				Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
									Parasimulium furcatum Malloch, 1914	X	X			X	X	X				Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
									Parasimulium stonei Peterson, 1977	X	X			X	X	X				Adler et al. (2004)	streams in coniferous forests dominated by western hemlock
				Simuliinae						X	X			X	X	X	X	X		Adler et al. (2004)	
					Prosimuliini					X	X			X	X	X	X	X		Adler et al. (2004)	
							Twinnia			X	X			X	X	X				Adler et al. (2004)	headwater streams; impoundment outflows
									Twinnia hirticornis Wood, 1978	X	X			X	X					Adler et al. (2004)	headwater streams;

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																					impoundment outflows
									Twinnia nova (Dyar & Shannon, 1927)	X	X					X				Adler et al. (2004)	headwater streams; impoundment outflows
							Helodon			X	X			X	X	X	X			Adler et al. (2004)	
									Helodon pleuralis (Malloch, 1914)	X	X					X				Adler et al. (2004)	
									Helodon clavatus (Peterson, 1970)	X	X					X				Adler et al. (2004)	
									Helodon beardi Adler et al., 2004	X	X			X	X			X		Adler et al. (2004)	
									Helodon chaos Adler et al., 2004	X	X			X	X	X				Adler et al. (2004)	
									Helodon diadelphus Adler et al., 2004	X	X				X	X				Adler et al. (2004)	
									Helodon mccreadiei Adler et al., 2004	X	X			X	X	X				Adler et al. (2004)	
									Helodon newmani Adler et al., 2004	X	X			X	X					Adler et al. (2004)	
									Helodon onchyodactylus (Dyar & Shannon, 1927)	X	X			X	X	X				Adler et al. (2004)	
									Helodon proteus Adler et al., 2004	X	X				X	X				Adler et al. (2004)	
									Helodon susanae (Peterson, 1970)	X	X			X	X	X				Adler et al. (2004)	
									Helodon trochus Adler et al., 2004	X	X						X			Adler et al. (2004)	
							Prosimulium			X	X			X	X	X	X	X		Adler et al. (2004)	
									Prosimulium caudatum Shewell, 1959	X	X			X	X	X				Adler et al. (2004)	
									Prosimulium constrictistylum Peterson, 1970	X	X						X			Adler et al. (2004)	
									Prosimulium davesi Peterson & Defoliart, 1960	X	X				X	X				Adler et al. (2004)	
									Prosimulium dicentum Dyar & Shannon, 1927	X	X			X	X	X				Adler et al. (2004)	
									Prosimulium dicum Dyar &	X	X			X	X	X		X		Adler et al.	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Shannon, 1927											(2004)	
									Prosimulium doveri Sommerman, 1962 ("1961")	X	X					X				Adler et al. (2004)	
									Prosimulium esselbaughi Sommerman, 1964	X	X			X	X	X	X			Adler et al. (2004)	
									Prosimulium exigens Dyar & Shannon, 1927	X	X			X	X	X	X	X		Adler et al. (2004)	
									Prosimulium flaviantennus (Stains & Knowlton, 1940)	X	X			X				X		Adler et al. (2004)	
									Prosimulium formosum Shewell, 1959	X	X			X	X	X		X		Adler et al. (2004)	
									Prosimulium frohnei Sommerman, 1958	X	X			X						Adler et al. (2004)	
									Prosimulium fulvithorax Shewell, 1959	X	X			X	X	X				Adler et al. (2004)	
									Prosimulium fulvum (Coquillett, 1902)	X	X			X	X	X				Adler et al. (2004)	
									Prosimulium idemai Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Prosimulium imposter Peterson, 1970	X	X			X	X			X		Adler et al. (2004)	
									Prosimulium longirostrum Adler et al., 2004	X	X				X					Adler et al. (2004)	
									Prosimulium minifulvum Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Prosimulium rusticum Adler et al., 2004	X	X							X		Adler et al. (2004)	
									Prosimulium secretum Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Prosimulium shewelli peterson & Defoliart, 1960	X	X			X						Adler et al. (2004)	
									Prosimulium travisi Stone, 1952	X	X			X	X	X	X	X		Adler et al. (2004)	
									Prosimulium uinta Peterson & Defoliart, 1960	X	X							X		Adler et al. (2004)	
									Prosimulium unicum (Twinn, 1938)	X	X							X		Adler et al. (2004)	
					Simuliini					X	X			X	X	X	X	X		Adler et al. (2004)	
							Greniera			X	X			X	X	X				Adler et al. (2004)	rarely encountered

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Greneria "species F", Adler et al., 2004	X	X			X						Adler et al. (2004)	rarely encountered
									Greneria humeralis Currie et al., 2004	X	X			X	X	X				Adler et al. (2004)	rarely encountered
									Greneria denaria (Davies et al., 1962)	X	X					X				Adler et al. (2004)	rarely encountered
							Stegopterna			X	X			X	X	X	X			Adler et al. (2004)	shallow mountain streams
									Stegopterna acra Currie et al., 2004	X	X			X			X	X		Adler et al. (2004)	shallow mountain streams
									Stegopterna permutata (Dyar, & Shannon, 1927)	X	X			X		X				Adler et al. (2004)	shallow mountain streams
									Stegopterna xantha Currie et al., 2004	X	X			X	X	X				Adler et al. (2004)	shallow mountain streams
							Tlalocomyia			X	X			X	X			X		Adler et al. (2004)	shallow mountain streams, seeps
									Tlalocomyia andersoni Currie et al., 2004	X	X			X	X					Adler et al. (2004)	shallow mountain streams, seeps
									Tlalocomyia osbornii (Stains & Knowlton, 1943)	X	X			X	X	X		X		Adler et al. (2004)	shallow mountain streams, seeps
									Tlalocomyia ramifera Currie et al., 2004	X	X				X	X				Adler et al. (2004)	shallow mountain streams, seeps
									Tlalocomyia stewarti (Coleman, 1953)	X	X			X						Adler et al. (2004)	shallow mountain streams, seeps
							Gigantodax			X	X							X		Adler et al. (2004)	small, high-elevation springs
									Gigantodax adleri Moulton, 1996	X	X							X		Adler et al. (2004)	small, high-elevation springs
							Metacnephia			X	X			X						Adler et al. (2004)	high elevation lake outlets and streams
									Metacnephia jeanae (Defoliart & Peterson, 1960)	X	X			X						Adler et al. (2004)	high elevation lake outlets and streams
									Metacnephia villosa (Defoliart & Peterson, 1960)	X	X			X						Adler et al. (2004)	high elevation lake outlets and streams
							Simulium			X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium anduzei Vargas & Diaz Najera, 1948	X	X							X		Adler et al. (2004)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Simulium apricarium Adler et al., 2004	X	X			X				X		Adler et al. (2004)	
									Simulium argus Wiliston, 1893	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium balteatum Adler et al., 2004	X	X			X	X	X				Adler et al. (2004)	
									Simulium bivittatum Malloch, 1914	X	X				X	X		X		Adler et al. (2004)	
									Simulium brevicercum Knowlton & Rowe, 1934	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium bricenoi vargas et al., 1946	X	X							X		Adler et al. (2004)	
									Simulium canadensis Hearle,1932	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium canonicolum (Dyar & Shannon, 1927)	X	X						X	X		Adler et al. (2004)	
									Simulium carbunculum Adler et al., 2004	X	X			X			X	X		Adler et al. (2004)	
									Simulium chromatinum Adler et al., 2004	X	X							X		Adler et al. (2004)	
									Simulium chromocetrum Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Simulium clarum (Dyar & Shannon, 1927)	X	X			X						Adler et al. (2004)	
									Simulium conicum Adler et al., 2004	X	X			X	X	X				Adler et al. (2004)	
									Simulium craigi Stone & Snoddy, 1969	X	X			X				X		Adler et al. (2004)	
									Simulium curiei Adler & Wood, 1991	X	X			X	X	X		X		Adler et al. (2004)	
									Simulium decorum Walker, 1948	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium defoliarti Stone & Peterson, 1958	X	X			X	X	X				Adler et al. (2004)	
									Simulium donovani Vargas, 1943	X	X			X	X		X	X		Adler et al. (2004)	
									Simulium encisoi Vargas & Diaz Najera, 1949	X	X			X			X	X		Adler et al. (2004)	
									Simulium freemani Vargas & Diaz Najera, 1949	X	X							X		Adler et al. (2004)	
									Simulium griseum Coquillett, 1898	X	X			X				X		Adler et al.	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				(2004)	
									Simulium hechti Vargas et al., 1946	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium hippovorum Malloch, 1914	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium hunteri Malloch, 1914	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium infernale Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Simulium iriartei Vargas et al., 1946	X	X							X		Adler et al. (2004)	
									Simulium jacumbae Dyar & Shannon, 1927	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium joculator Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Simulium longithallum Diaz najera & Vulcano, 1962 ("1961")	X	X							X		Adler et al. (2004)	
									Simulium meridionale Riley, 1887	X	X			X			X			Adler et al. (2004)	
									Simulium modicum Adler et al., 2004	X	X			X		X				Adler et al. (2004)	
									Simulium mysterium Adler et al., 2004	X	X			X						Adler et al. (2004)	
									Simulium nebulosum Currie & Adler, 1986	X	X			X	X	X				Adler et al. (2004)	
									Simulium negativum Adler et al., 2004	X	X						X			Adler et al. (2004)	
									Simulium notatum Adams, 1904	X	X							X		Adler et al. (2004)	
									Simulium paynei Vargas, 1942	X	X							X		Adler et al. (2004)	
									Simulium petersoni Stone & Defoliart, 1959	X	X			X	X		X			Adler et al. (2004)	
									Simulium pilosum (Knowlton & Rowe, 1934)	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium piperi Dyar & Shannon, 1927	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium pugetense (Dyar & Shannon, 1927)	X	X			X	X	X				Adler et al. (2004)	
									Simulium quadratum (Stains & Knowlton, 1943)	X	X			X		X				Adler et al. (2004)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Simulium rostratum (Lundstrom, 1911)	X	X				X	X				Adler et al. (2004)	
									Simulium saxosum Adler et al., 2004	X	X			X	X	X				Adler et al. (2004)	
									Simulium silvestre (Rubtsov, 1956)	X	X			X	X	X				Adler et al. (2004)	
									Simulium tescorum Stone & Boreham, 1965	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium twinni Stains & Knowlton, 1940	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium tribulatum Lugger, 1897	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium vandalicum Dyar & Shannon, 1927	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium venator Dyar & Shannon, 1927	X	X			X	X		X			Adler et al. (2004)	
									Simulium venustum Say, 1823	X	X			X				X		Adler et al. (2004)	
									Simulium virgatum Coquillett, 1902	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium vittatum Zetterstadt, 1838	X	X			X	X	X	X	X		Adler et al. (2004)	
									Simulium wyomingense Stone & Defoliart, 1959	X	X			X	X					Adler et al. (2004)	
									Simulium zephyrus Adler et al., 2004	X	X				X	X				Adler et al. (2004)	
			Thaumaleidae							X	X			X						Wirth and Stone (1956)	second genus *Trichothaumalea* is found in British Columbia
							Thaumalea			X	X			X						Wirth and Stone (1956)	
	Brachycera																				
		Tabanomorpha																			
			Athericidae							X	X			X						Webb (1977)	
							Atherix			X	X			X						Webb (1977)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
									Atherix pachypus Bigot, 1887	X	X			X						Webb (1977)	Three species known from the USA. *A. pachypus* is the name used for the western species
			Oreoleptidae							X	X				?					Zloty, Sinclair and Pritchard (2005)	unpublished records for Oregon
								Oreoleptis		X	X				?					Zloty, Sinclair and Pritchard (2005)	unpublished records for Oregon
									Oreoleptis torrenticola Zloty, Sinclair and Pritchard (2005)	X	X				?					Zloty, Sinclair and Pritchard (2005)	unpublished records for Oregon
			Pelecorhynchidae																		
							Bequaertomyia			?	?			X	?	?					unknown biology; possibly not aquatic
							Glutops			X	X			X	X	X					
			Stratiomyidae							X	X			X							
							Caloparyphus			X	X			X	X	X		X		Sinclair (1989)	early instars inseparable from *Euparyphus*
							Caloparyphus/Euparyphus			X	X			X						Sinclair (1989)	use this name for all early instars of *Caloparyphus* and *Euparyphus*
							Euparyphus			X	X			X	X	X		X		Sinclair (1989)	spiracular stalk doesn't develop until final instar
							Hedriodiscus/Odontomyia			X	X			X	X	X		X			
							Myxosargus			X	X			X				X			
							Nemotelus			X	X			X	X	X	X		X		
							Stratiomys			X	X			X	X	X					
			Tabanidae											X						Courtney et al. (1996);	also many terrestrial genera

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
																				Middlekauff and Lane (1980)	
							Apatolestes			X	X			X	X	X		X	X		
							Atylotus/Tabanus			X	X			X	X	X		X			incompletely separable, except by habitat; most specimens from lotic habitats will be Tabanus
							Chrysops			X	X			X	X	X	X	X			
							Haematopota			X	X			X							
							Hybomitra			X	X			X	X	X		X			
							Silvius			X	X			X	X	X	X				
		Asilomorpha								X	X			X							
			Empididae							X	X			X	X	X					only a few genera are aquatic
				Clinocerinae						X	X			X		X					
							Clinocera			X	X			X		X					
							Roderiodes			X	X			X							feed on simuliid pupae
							Trichoclinocera			X	X			?							
							Wiedemannia			X	X			?		X					feed on simuliid pupae
				Empidinae						X	X			X	X	X					
							Oreogeton			X	X			X	X	X					feed on simuliid larvae
				Hemerodromiinae						X	X			X	X	X					
							Chelifera/Metachela			X	X			X	X	X				MacDonald and Harkrider (1999)	larvae are inseparable at this time
							Hemerodromia			X	X			X	X	X					
							Neoplasta			X	X			X	X	X				MacDonald and Harkrider (1999)	

Taxonomic Hierarchy										Habitat				Distribution						Literature Cited	Comments
Order	Suborder	Infraorder	Family	Subfamily	Tribe	Genus group	Genus	Species group	Species	Benthic	Lotic	Lentic	Estuarine	CA	OR	WA	NV	AZ	Baja		
			Dolichopodidae							X	X			X	X	X	X	X			larvae and pupae should be identified to family
		Muscomorpha																			
			Canacidae											X							intertidal dwellers
			Phoridae																		larvae and pupae should be identified to family
			Syrphidae							X	X	X		X	X	X	X	X	X		larvae and pupae should be identified to family
			Sciomyzidae							X	X	X		X	X	X	X	X	X		larvae and pupae should be identified to family
			Ephydridae							X	X	X		X	X	X	X	X	X	Courtney et al. (1996)	The key in Merritt and Cummins is incomplete. Larvae should be left at family unless reared or identified using a more complete key.
			Muscidae							X	X	X		X	X	X	X	X	X		larvae and pupae should be identified to family

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