

Appendix 1-A

Team Guiding Production of Volume 1

An interagency team (the Core Team) guided all aspects of and participated in the search and reading of the scientific literature, wrote the synthesis, and produced Volume 1. Additional members were added during the production of Volume 2 (see Volume 2).

For Volume 1, the team consisted of staff from the Washington State Department of Ecology, the Washington State Department of Fish and Wildlife, the U.S. Environmental Protection Agency, and Sheldon and Associates, the consulting firm hired to assist with production. Additional Ecology staff served as authors (see the list of authors on the title page of this document). The editor was included on the Core Team in the later stages of production of draft of Volume 1 and was involved through the development of the review draft of Volume 2.

The Core Team included the following individuals (alphabetical by last name):

Teri Granger	Washington State Department of Ecology (coordinator)
Kim Harper	Sheldon and Associates ¹
Tom Hruby	Washington State Department of Ecology
Katherine March	Washington State Department of Fish and Wildlife
Andy McMillan	Washington State Department of Ecology
Sara Noland	2N Publications (editor of the draft)
Ralph Rogers	U.S. Environmental Protection Agency
Dyanne Sheldon	Sheldon and Associates
Erik Stockdale	Washington State Department of Ecology

¹ Currently with the Washington State Department of Ecology.

Appendix 1-B

Characteristics of a Valid Scientific Process

The characteristics of a valid scientific process in the context of “best available science” are defined below, as quoted directly from WAC 365-195-905:

1. **Peer review.** *The information has been critically reviewed by other persons who are qualified scientific experts in that scientific discipline. The criticism of the peer reviewers has been addressed by the proponents of the information. Publication in a refereed scientific journal usually indicates that the information has been appropriately peer-reviewed.*
2. **Methods.** *The methods that were used to obtain the information are clearly stated and able to be replicated. The methods are standardized in the pertinent scientific discipline or, if not, the methods have been appropriately peer-reviewed to assure their reliability and validity.*
3. **Logical conclusions and reasonable inferences.** *The conclusions presented are based on reasonable assumptions supported by other studies and consistent with the general theory underlying the assumptions. The conclusions are logically and reasonably derived from the assumptions and supported by the data presented. Any gaps in information and inconsistencies with other pertinent scientific information are adequately explained.*
4. **Quantitative analysis.** *The data have been analyzed using appropriate statistical or quantitative methods.*
5. **Context.** *The information is placed in proper context. The assumptions, analytical techniques, data, and conclusions are appropriately framed with respect to the prevailing body of pertinent scientific knowledge.*
6. **References.** *The assumptions, analytical techniques, and conclusions are well referenced with citations to relevant, credible literature and other pertinent existing information.*

Information derived from one of these sources can be considered scientific information if it possesses the required characteristics shown in Table 1B-1.

Table 1B-1. Source and characteristics of scientific information.

Sources of Scientific Information	Characteristics					
	Peer Review	Methods	Logical Conclusions & Reasonable Inferences	Quantitative Analysis	Context	References
A. Research. Research data collected and analyzed as part of a controlled experiment (or other appropriate method) to test a specific hypothesis.	X	X	X	X	X	X
B. Monitoring. Monitoring data collected periodically over time to determine a resource trend or evaluate a management program.	NA	X	X	Y	X	X
C. Inventory. Inventory data collected from an entire population or population segment (e.g., individuals in a plant or animal species) or an entire ecosystem or ecosystem segment (e.g., the species in a particular wetland).	NA	X	X	Y	X	X
D. Survey. Survey data collected from a statistical sample from a population or ecosystem.	NA	X	X	Y	X	X
E. Modeling. Mathematical or symbolic simulation or representation of a natural system. Models generally are used to understand and explain occurrences that cannot be directly observed.	X	X	X	X	X	X
F. Assessment. Inspection and evaluation of site-specific information by a qualified scientific expert. An assessment may or may not involve collection of new data.	NA	X	X	NA	X	X
G. Synthesis. A comprehensive review and explanation of pertinent literature and other relevant existing knowledge by a qualified scientific expert.	X	X	X	NA	X	X
H. Expert Opinion. Statement of a qualified scientific expert based on his or her best professional judgment and experience in the pertinent scientific discipline. The opinion may or may not be based on site-specific information.	NA	NA	X	NA	X	X
<p>X = Characteristic must be present for information derived to be considered scientifically valid and reliable. Y = Presence of characteristic strengthens scientific validity and reliability of information derived, but is not essential to ensure scientific validity and reliability. NA = The characteristic does not apply to the source type. For example, monitoring data are not typically peer reviewed.</p>						

Appendix 1-C

Methods Used for Searching and Reviewing the Literature

Searching the Literature

To begin the literature review for Volume 1, personal bibliographies were solicited from a small number of professionals known to have extensive libraries on wetlands in the Pacific Northwest. Other published reference lists were reviewed for relevant documents. In addition to the specified reference lists, computer searches were conducted of databases that are publicly available using a variety of keywords. Table 1C-1 lists the sources of reference lists and the names of the databases searched, as well as the approximate number of documents contained in each source.

Table 1C-2 lists the keywords that were used in the searches of computer databases. This list was developed by the Core Team and expanded based on comments from focus groups (see Chapter 1 for information on focus groups). The searches were done combining the word “wetland” plus one of the keywords. The words in the last column were used to exclude wetland types not covered by this report. Specific wetland types not found in Washington and known to be very dissimilar from Washington wetlands were also excluded, as were estuarine and marine wetlands. Lists resulting from the searches of the computer databases were compiled into a ProCite® database for the project.

Table 1C-1. Summary of reference lists and databases searched for Volume 1.

List Source	Approx. No. of Documents	Notes
Personal Bibliographies		
Dr. Paul Adamus, EPA	1,600	Broad range of documents
Dr. Tom Hrubby, WA Ecology	600	Broad range of documents, many focus on wetland functions
Mary Kentula, EPA	170	Focus on wetland mitigation, management, policy effectiveness
Dr. Klaus Richter, King County	3,500	Focus on amphibians w/Pacific NW emphasis
Published Reference Lists		
Management recommendations for WA priority habitats: freshwater wetlands and fresh deepwater (Morgan 1998)	640	Focus on wildlife and aquatic habitats
Management recommendations for WA priority habitats: riparian (Knutson and Naef 1997)	550	Focus on riparian habitats, not necessarily wetlands
Managing for enhancement of riparian and wetland areas of the Western U.S.: an annotated bibliography (Koehler and Thomas 2000)	1,900	Broad application to western U.S.; many documents not relevant to Pac. NW
Classification and management of aquatic, riparian and wetland sites on the national forests of Eastern Washington (Kovalchik 2004)	400	Focus on eastside and forested areas
Effects of urbanization on pond-breeding amphibians: an annotated literature review (Ostergaard 2000)	100	Focus on amphibians and urban effects
Database Searches		
Keyword searches of various databases	9,800	Databases searched included Ovid, ProQuest, Biosis, Dissertation Abstracts, Agricola, Current Contents, Biological Abstracts
Total	~17,860	Total includes an unknown number of duplicates among the various sources

Table 1C-2. Keywords used in searching computer databases of literature.

Base Word	Keywords		Exclusions
Wetland	Aesthetics Agriculture Alkali Alluvial Amphibians Aquifer Recharge Arid Land Artesian Birds Bog Buffers Compensation Conservation Cumulative Impacts Development Disturbed Dynamic Economics Enhancement Erosion Farmed Fen Fish Floodplain Fluvial Functions Geology Geomorphology Grazing Groundwater Habitat Hydraulic Hydric Hydrology Hyporheic Industrial Inventory Invertebrates Irrigation Isolated	Land Use Landscape Maintenance Mammals Mapping Mining Mitigation Mollusks Monitoring Nutrients Perched Policy Public Access Recreation Regulation Reptiles Residential Restoration River Rural Seasonal Septic Slope Soils Spatial Stewardship Stormwater Transportation Corridors Urban Utility Corridors Values Variation Vegetation Types Vernal Pools (not Calif.) Water Quality Water Regime Wells Wildlife	Bottomland Hardwood California Vernal Pools Estuarine Intertidal Lacustrine Marine Mississippi Floodplain Mudflats Salt Marsh Saltwater

Reviewing, Sorting, and Prioritizing the Reference Lists

All reference lists were reviewed by one or more of the Core Team members. From these lists, the Core Team selected those documents that were determined to be relevant to the project, based solely on the title of the article and its date. Those marked documents were then prioritized using a two-tiered system in which those considered most critical to the project were designated as those to be obtained first. Eventually, attempts were made

to obtain all the documents on the lists that were believed to be relevant based on their titles. In addition, references were found while individual authors searched for subjects for which information was lacking. These references are provided in the list of references cited in the report.

Criteria Used to Identify Articles Relevant to the Project

When screening lists of articles, the Core Team used the following criteria to determine, through reading the title and looking at the date, which were relevant to the project and should be obtained. Those that were deemed a “definite yes” were those that were:

- Related to wetland protection and management
- Applied to Washington or the Pacific Northwest
- Were out of region but dealt with land uses
- The only paper on a subject

Those that were rejected out-right were those that were:

- Very old and superceded by newer information
- Related to estuarine and marine systems, which were not going to be covered in the document
- Primarily scientific minutia that weren’t useful to managing and protecting wetlands
- Not related because of region
- Related to wetlands and waste-water treatment, which was not going to be covered in the document

Obtaining & Reading Documents & Writing the Report

Of the more than 17,000 documents on all lists used, copies of over 1,400 documents were obtained after review of the titles and dates, as prioritized using the screening process described above. References were skimmed and those dealing with Washington or the Pacific Northwest and with practical application to the protection and management of wetlands were prioritized for reading.

Each reader summarized the article in the ProCite® database. Searches of the database or the original articles were used by each author to write their portions of the draft document. Additional articles were discovered during the course of writing the draft document. These references were not included in the ProCite® database.

The documents used to write the synthesis included scientific journal articles, government publications, technical books, and other sources, all of which meet the definition and characteristics of BAS in WAC 365-195-905 (see Appendix 1-B and Chapter 1). Conference proceedings and personal communications were occasionally used when no other information was available. In most cases, we were unable to ascertain to what level these additional sources were peer reviewed.

For the most part, available documents from the past ten years were used as the primary sources for this report. It was assumed that this more recent literature would incorporate relevant science from the preceding years. Older documents were used in instances where they had not been superseded by more recent studies.

In a few instances, we used unpublished data collected during the calibration of the Washington State wetland function assessment methods and the Washington State wetland rating systems. These data have not been published in scientific journals. However, these observations reported as “unpublished data” in Volume 1, were collected in the field by interdisciplinary teams of wetland experts and used to support and calibrate the assessment methods and the wetland rating system. The methods and rating system have been extensively reviewed and field tested by peer experts, as well as the public. The data were offered for review upon request during public review and continue to be available on request. See Chapter 1 for discussion of the occasional use of hypotheses and assumptions made by the authors based on the literature or their professional experience.

Obtaining References Suggested by Reviewers

A questionnaire was circulated with the review draft of the document. The draft of Volume 1 was reviewed by peer experts. In addition, we invited anyone who so desired to review it. Reviewers were asked to provide additional references that we may have missed, for topics for which we lacked information, or to support suggested changes to the document. Many references were provided and a screening process was used to prioritize and obtain references. See the document containing our responses to comments for a table listing the references that were suggested, the references which were obtained, and notes of explanation for each reference suggested. (The Comments and Responses for Volume 1 can be found at <http://www.ecy.wa.gov/biblio/0506007.html>.)

Establishing a Repository

The ProCite® database is not available for general use because of technical reasons and the time and money required in making it accessible to a wide variety of users and their varied software programs. However, paper copies of many of the articles reviewed for the synthesis of the science are being held in an archive at the Washington State Department of Ecology. The archive is accessible to the public by appointment.

A number of theses, dissertations, and books are not included in the archive, as well as some articles in private libraries, due to copyright laws and the limited options for purchasing some documents. In these cases, borrowed copies were used and returned, with only the title pages and tables of contents copied for the archive.

Appendix 1-D

Reviewers of Volume 1

Name of Individual or Organization	Affiliation at the Time of Review (if individual)
Paul Adamus, PhD	Private Consultant
Jeff Azerrad, Wildlife Biologist	WA State Department of Fish and Wildlife
Joann Bartlett, PWS	Wiltermood Associates
Doug Beyerlein, PE	Aqua Terra Consultants
Elizabeth Binney, PhD, PWS	ATSI
Catherine Conolly, PWS and Teresa H. Vanderburg, PWS (submitted comments jointly)	Adolfson Associates
Brent Davis, Wetland Biologist	Clark County Community Development Department
Tim Determan, Puget Sound Ambient Monitoring Program Coordinator	WA State Department of Health
Donald F. Flora	Private citizen
Richard R. Horner, PhD	University of Washington
Richard Jack	WA State Department of Ecology
Jim Kelley, PhD	Parametrix, Inc.
Bernard L (Bud) Kovalchik, retired U.S. Forest Service -- Eastern Washington Area Ecologist	Kovalchik Riparian Wetland Consulting
Ivan Lines, Regional Biologist	Ducks Unlimited, Inc.
Scott Luchessa, Certified Ecologist, MS.	Ecological Solutions, Inc.
Chris L. McAuliffe, Ecologist	Private citizen, retired from the Seattle District of the Army Corps of Engineers
Elliot Menashe, Environmental Consultant	Greenbelt Consulting
Jeff Meyer, PWS	Parametrix, Inc.
Jim Mitchell, PE, PWS	Mitchell Consultants L.L.C.
Lyn Morgan-Hill, Natural Resources Specialist	Whatcom County Planning and Development
Francis Naglich	Ecological Land Services, Inc.
Scott Williams, Land Planner	Puget Sound Energy
Klaus Richter, PhD, PWS	King County Department of Natural Resources
Scott J. Rozenbaum, PWS, Certified Professional Soil Scientist	Rozewood Environmental Services, Inc.
Todd Thompson, Fish & Wildlife Program Lead WETNET (Audubon) Science Committee	Spokane District Bureau of Land Mngmt
Megan White	WA State Department of Transportation
Bob Zeigler	WA State Department of Fish and Wildlife
Unidentified Individual	

