

### **Appendix D Additional BAS Review**

Below are additional BAS citations submitted for review to the Planning Commission and Planning Division after the March 2004 Draft BAS Report public release. Staff has reviewed the citations to determine whether they meet the statutory requirements established in WAC 365-195-905, and provided a brief review of the findings. The citations below are listed by the group or individual that submitted them. Some citations were submitted by multiple groups or individuals, but are only reviewed once.

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#### **BAS Submissions provided by the Yakima Association of Realtors**

Alsea Valley vs. Oregon Natural Resources

**Abstract:** a legal opinion in an ongoing case which argues that hatchery raised fish should be counted when determining ESA listing status.

**Staff Review:** This does not meet the statutory requirements for BAS.

Grewell, Bishop J. No Date. Farming for the Future: Agriculture's Next Generation. PERC Policy Series. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an opinion paper that reviews the history of agriculture and the impacts on society and the environment. The new "ecological agrarian", or today's modern farmer has more of an incentive to protect the environment through advanced BMP's. In addition, the authors argue that institutions (laws and regulations) are counter productive toward sustainable agriculture. The two examples used as institutions that hinder sustainable agriculture are the Estate Tax, and the agricultural subsidies. Institutions that foster sustainable agriculture are strong protections of property rights. Policies that encourage voluntary efforts and flexibility are more effective than mandates.

**Staff Review:** This does not meet the statutory requirements for BAS.

Landry, Clay, J. 1998. Saving our Streams Through Water Markets, A Practical Guide. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an opinion paper that gives some background on western water law and ways to fix the controversy. The proposal is to implement water markets as an economic solution to western water problems.

**Staff Review:** This does not meet the statutory requirements for BAS.

Leal, Donald R., DeAlessi, Micheal., Emerson, Pete. 2003. Overcoming Three Hurdles to IFQ's in the U.S. Fisheries: A Guide for Federal Policy Makers. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an opinion paper of the deficiencies of ocean fishing regulations. The opinion of the authors is that Individual Fishing Quotas (IFQ) can solve the problems with the current system of regulating ocean fishing.

**Staff Review:** This does not meet the statutory requirements for BAS.

Makie, Alexander, W. 2004. Protection of Critical Areas and the Mythology of Buffers. Prepared for Wetlands in Washington. CLE. Presented by Law Seminar International, Seattle, WA, October 25-26.

**Abstract:** This is a legal opinion paper based on Western Washington Critical Areas issues in the urban or built environment, and an argument against "big buffers".

**Staff Review:** This opinion paper quotes numerous scientific findings for the functions of buffers, but lacks any bibliographic references in support. This does not meet the statutory requirements for BAS.

Mackie, Alexander, W. 2002. Critical Area Review 2002 and Best Available Science: Guide to Effective Participation. Prepared by Perkins Coie LLP. Presented by the Washington Association of Realtors.

**Abstract:** This is an opinion paper and guidebook that addresses BAS issues and the affects of increasing buffer widths through CAO updates. It gives guidance to local realtors on how to participate in a CAO update, and issues that should be closely monitored. It gives some background on GMA and Critical Areas, and an analysis of case law.

**Staff Review:** This does not meet the statutory requirements for BAS.

Meiners, Roger E., Kosnik, Lea-Rachel. 2003. Restoring Harmony in the Klamath Basin. Issue Number PS-27. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an opinion paper that reviews western water law, and the history behind the controversy in the Klamath River Basin. The authors suggest how to resolve the issues, which generally address fixing state water laws, getting the federal government to clarify water claims, and establishing water markets.

**Staff Review:** This does not meet the statutory requirements for BAS.

Morse, Chandler, C., Parson, Marrolyn PhD., Dilks, David PhD. 2004. The TMDL Tool Kit. National Association of Builders. 1201 15<sup>th</sup>. St. Washington, D.C., 20005

**Abstract:** This is a general overview of the TMDL process and its relation to the Clean Water Act, and stormwater standards. This is a guide for the home building industry to participate in the public process of developing TMDL plans to ensure they do not unnecessarily impinge on development.

**Staff Review:** This does not meet the statutory requirements for BAS.

Norton, Seth, W. 2002 Population Growth, Economic Freedom and the Rule of Law. Issue Number PS-24. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an essay and economic analysis that supports a position where economic freedom, which includes protection of property rights and the rule of law, are more important in determining the quality of human life and the environment than is population growth. The author then suggests that global institutional reform will improve the quality of life and the environment better than population control.

**Staff Review:** This meets the statutory requirements for BAS, but has no applicability to the CAO update.

Pizzimenti, John, J. PhD. 2002. Efficacy and Economics of Riparian Buffers on Agricultural Lands. GEI Consultants, Inc. 6950 S. Potomac St. Suite 200, Englewood, CO, 80112. In association with Pacific Northwest Project and Mason Bruce & Girard, Inc. Submitted to the Washington Hop Growers Association, Ag Caucus, and Multi Agricultural Caucus.

**Abstract:** This is a science synthesis report developed for the agricultural industry to counter proposed state and federal mandated, fixed width 300 foot buffers on existing agricultural land to protect ESA listed anadromous fish. State and federal resource agencies supplied 15 scientific documents as the basis for their recommendation; this report analyzes those documents and conducts an additional scientific synthesis for riparian buffer on agricultural lands. This report has two main objectives: to review the science on buffers associated with agriculture and to evaluate the economic effects of potential state and federal mandated buffers on agricultural land. The report initially introduces six primary functions and values associated with riparian areas, but focuses its analysis on functions they determined are associated with agriculture; sediment retention, pollutant filtering, streambank stabilization, and stormwater treatment. Agricultural impacts are broadly identified as; soil erosion and sedimentation, pesticides and fertilizers, animal wastes, irrigation/water withdrawal, and grazing. The analysis purposely under analyzes large woody debris contribution, organic inputs, wildlife habitat, and floodplain processes, with the justification that these functions are not applicable to agricultural lands, and that they are not necessary to recover ESA listed fish. The report neglects to analyze riparian areas functional contributions to microclimate, hyporheic zone interactions, and aquifer recharge/discharge. The report indicates that it is not intended to be exhaustive, but focused on the minimum buffer width that could reduce known impacts to water quality and salmon on existing agricultural lands. The report also indicates that it is a work in progress, and that other literature will be assessed if identified. The report found the following general conclusions associated with buffers on agricultural land:

- Buffer widths developed for forestry are not applicable to agriculture;
- Buffers between **5 to 30 meters (16-98 feet)** function adequately for water filtration, sediment reduction, animal exclusion, shade, nutrient removal, and streambank stabilization on agricultural lands;
- Buffers wider than **100 feet** are consistent with accommodation for large woody debris recruitment and for terrestrial wildlife;
- Agricultural impacts can be effectively managed with Best Management Practices (BMPs);
- Performance and effectiveness of buffers on agricultural land is highly variable and both site specific and function specific;
- A quantitative approach to buffer width is inadvisable without site-specific data;

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**Staff Review:** This meets the statutory requirements for BAS. This report is valuable in justifying the current, and proposed stream buffer widths. The current range of buffer widths in the CAO is 0-100 feet, and the proposed range in the revised CAO is 15-100 feet. This matches almost exactly the range proposed in the Pizzimenti report of 5 to 30 meters (16-98 feet). This report was reviewed in the first draft of the BAS Report, and can be reviewed in Chapter 2, section 7.4.3, page 73 and listed in the bibliography on page 93. Yakima County believes that the economic analysis is not applicable to the CAO/SMP update project, since it is based on mandatory, statewide, fixed-width, 300 foot buffers on agricultural lands. The report references the economic impacts to agriculture without a concurrent review of the economic impacts of salmon, or tourism for example. The CAO is a development based regulation that does not mandate buffers on existing land uses.

Washington Association of Realtors. 2004. A Citizens Guide to Critical Areas Ordinances, How to Understand and Influence the Adoption of Critical Areas Ordinance under the Washington State Growth Management Act.

**Abstract:** This is a general guide on GMA and critical areas, which contains some case law, some background on the interaction between the SMA and GMA, some suggested ordinance language, and the permitting process.

**Staff Review:** Yakima County will take these concerns into consideration when drafting the updated ordinance. This does not meet the statutory requirements for BAS.

Washington Research Council. 2001. Impact of Government Regulations and Fees on Housing Costs. ePB 01-18

**Abstract:** This is a report on the impacts to housing costs in the Seattle-Bellevue-Everett metropolitan area. The report identifies the following as increasing housing costs:

- Impact fees;
- Park set asides;
- Open space lands and critical areas;
- Federal requirements;
- Local permitting process;
- Multi-jurisdictional authorities and conflicts.

**Staff Review:** This does not meet the statutory requirements for BAS.

Zueger-Nikel, Manuel. 2003. Saving Salmon the American Indian Way. Issue Number PS-29. Political Economy Research Center, 2048 Analysis Dr., Suite A, Bozeman, MT, 59718

**Abstract:** This is an opinion paper that analyzes the anthropologic record of Native American property rights and draws a comparison with current institutions to strengthen property rights that encourage stewardship of ocean fisheries.

**Staff Review:** This does not meet the statutory requirements for BAS.

**BAS Submission provided by Frank Hendrix, WSU Co-Operative Extension.**

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Larsen, Royce., Kruger, William., Barrington, Mack., Buckhouse, John., George, Melvin., Johnson Douglas. 1996. Livestock Influences on Riparian Zones and Fish Habitat; A Bibliography. EM 8660 Oregon State University

**Abstract:** The following review is a synopsis of the authors review, and not staff's review of the literature:

The purpose of this bibliographic review was to determine the state of knowledge base and to evaluate the quality of the literature relating to the influences of livestock on fish habitat, riparian zones, and streams. This report contains a bibliography and assesses the quality of the literature. There were three levels of literature search and acquisition:

- An attempt to find all literature relating to grazing impacts to streams, riparian areas, and fish;
- Sufficient fish habitat literature to define key habitat requirements, and;
- Literature that related to other riparian parameters not exclusive to grazing.

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This bibliography consists of 1,521 citations, with 428 (28%) of them relating directly to grazing impacts on riparian areas and fish habitat. This portion of the bibliography is based largely on documented case histories or observation and comment. Some have data associated, but about 1/3 (~143) are largely observational. **Only 89 citations (21%) of the grazing impact citations, or 6% (~91) of the total, are classified as experimental, or hard science.** Of these 89 citations, most are riparian plant community studies, while only three are studies of stream morphology. The experimentally based (true science) citations usually lack some necessary components of a sound range science experiment, and do not always come to the same conclusion. [Emphasis added]

A review of this literature exposed several inherent problems with studies that relate to livestock influences on riparian zones and fishery habitat. These problems included:

- Inadequate description of grazing management practices;  
-Grazing management descriptions were often so vague, it was impossible to reconstruct the grazing practice prevailing during the study.
- Lack of pretreatment data;  
-Descriptions of historical land use practices are crucial to interpretation of study results, but are almost never explained.
- Non-uniform stream reaches used as experimental units;  
-Use of non-uniform stream reaches results in large experimental errors, and consequently, studies often show different results from similar treatments.
- Differential fisheries management considerations;  
-The complexities of physical and biologic interactions make it difficult to predict effects of grazing practices.

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- Undefined spatiotemporal scale;
- Riparian and stream systems are highly variable both in space and time, which complicate analysis.
- Inadequate Sample size;
  - There is a relationship between sample size, accuracy, and uncertainty.
- Questionable statistical reliability.

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All of the factors listed above yield results that often are not statistically reliable. Data often are reported with no analysis and are assumed to be accurate. Data that have no statistical analysis do not separate effects and cannot be used to make meaningful predictions. A high percentage of the work reviewed did not meet the standards of being statistically reliable by the authors.

**Staff Review:** This meets the statutory requirements for BAS. Most of the individual citations are not directly available, so the synthesis was reviewed on its own in similar fashion to other synthesis documents. Even with the conflicting results associated with the varied literature base, a few broad generalizations can be made:

- Livestock grazing can be compatible with sustainable riparian systems;
- Vegetation response is highly variable, and no single grazing strategy will work everywhere;
- Ecosystems are highly variable and grazing strategies need to consider all of the factors.

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DelCurto, Timothy. No Date. Season of Use and Off-stream Water as Management Strategies to Manipulate Beef Cattle Distribution Patterns and Vegetation Use on Mixed-conifer Rangelands (abstract only). Easter Oregon Agriculture Research Center, 327 S. Tenth St., Union OR, 97883

**Abstract:** A two year study that evaluated grazing distribution with access to off-stream water versus in-stream water. In general, grazing distribution displays strong diurnal patterns.

**Staff Review:** This meets the statutory requirements for BAS. In summary, grazing distribution, on existing grazing land, can be managed with off-stream water and changing the season of use.

Borman, Michael M. 1998. Grazing Management for Riparian Areas. The Grazier, No. 296. Oregon State University Extension Service. Corvallis OR, 97331

**Abstract:** Water quality impacts are closely related to soil erosion, which can be associated with inappropriate livestock use. Grazing management must be compatible with achieving or maintaining "proper functioning condition" to be considered sustainable. There may be situations where temporary exclusion of live stock can accelerate initiation of riparian area recovery. Free-standing water is the principal focus around which cattle orient their foraging. Passive, continuous grazing rarely improves a degraded riparian area or maintains a riparian area in good condition. Grazing management must provide an adequate cover and height of

vegetation on the banks and overflow zones to promote natural stream functions. Use of streams as pasture boundaries is not advisable.  
**Staff Review:** This meets the statutory requirements for BAS. This study found that no single grazing management system has resulted in consistent recovery of degraded riparian areas. Grazing management for an area should be tailored to site-specific situations.

Council for Agricultural Science and Technology. 1996. Grazing on Public Lands.

**Staff Review:** This meets the statutory requirements for BAS. Improper livestock grazing can damage riparian areas. Most riparian areas, however, can be grazed safely if stocking rate, season, and length of grazing are proper.

Allen-Diaz, Barbra, Jackson, Randall D., Bartolome, James W., Tate, Kenneth W., Oates, Lawrence G. 2004. Long-term Grazing Study in Spring-fed Wetlands Reveals Management Tradeoffs. California Agriculture, Volume 58, Number 3.

**Abstract:** A 10-year (long term) and 3-year (paired plot) experiments on existing grazing lands in California to better understand grazing management effects. A study of spring ecosystem responses in plant composition, diversity and cover; channel morphology; water quality; aquatic insects; and green house gasses. Lightly and moderately grazed wetlands exhibited lower insect family richness than ungrazed springs. Plant cover was maintained for the first 7 years of grazing, and plant diversity was not significantly affected. At the same time, removal of grazing decreased emissions of methane, and increased nitrate levels in spring waters. The results reveal important tradeoffs relative to key response variables. In general, light grazing at springs appears to be desirable from an ecosystem function perspective. Spring systems are highly variable, making it difficult to predict responses to management. All sites studied had historically similar fall-winter-spring grazing histories that left approximately 600 to 700 pounds per acre residual dry matter (RDM) or aboveground biomass in the uplands. Implications for management are that species composition can be manipulated by altering the grazing intensity along creeks. In springs however, species composition is controlled by the vagaries of climate, not by grazing. No significant differences in the total number of species were observed at any of the wetland sites. Lightly grazed wetlands maintained greater species evenness and diversity relative to 1992 pretreatment values than either ungrazed or moderately grazed plots. At creek wetlands, moderately grazed plots maintained greater total species, evenness, and diversity than ungrazed or lightly grazed plots. Their results indicate that light grazing on spring-fed wetlands and moderate grazing on down slope creeks maintained current diversity. After 7 years, there were no significant differences in herbaceous cover among grazing intensities, however, by 2002, moderate grazing resulted in significant decrease in plant cover. Sustained grazing at moderate or higher intensities is not desirable from an ecosystem conservation perspective. After five years, no changes in channel morphology due to grazing were observed. After five years, there were no significant differences among grazing intensity toward water quality. The

removal of grazing impaired the ability of the spring to retain nitrate, by allowing dead plant material to accumulate, and inhibiting plant production. Lightly grazed and moderately grazed wetlands exhibited lower family richness for aquatic insects than ungrazed springs. Grazing removal significantly decreased methane emissions.

**Staff Review:** This meets the statutory requirements for BAS. Most riparian areas and spring systems can be grazed safely if stocking rate, season, and length of grazing are closely managed.

Johnson, D.E., Harris, N.R., du Plessis S., Tibbs, T.M. No Date. Mapping and Analysis of Catherine Creek Using Remote Sensing and Geographic Information Systems (GIS). Oregon State University, Department of Rangeland Resources. Corvallis, OR, 97331

**Abstract:** A two year study to quantify the surface hydrology of Catherine Creek in northeastern Oregon as it relates to existing livestock grazing and salmon spawning. Most of the spawning sites for salmon occurred in grazed portions of the stream. Overall, there were an average of 4.68 redds per enclosed plots compared to 7.41 redds per grazed plots.

**Staff Review:** This meets the statutory requirements for BAS. The study found that it was difficult to separate livestock effects on the stream because excluded areas are relatively small and closely associated with grazed parcels. The findings indicate that this is a preliminary study, and that more questions remain unanswered.

#### **BAS submissions provided by Marie Zuroske, South Yakima Conservation District**

Fuhrer, G.J., Morace, J.L., Johnson, H.M., Rinella, J.F., Ebbert, J.C., Embrey, S.S., Waite, I.R., Carpenter, K.D., Wise, D.R., and Hughes, C.A. 2004, Water Quality in the Yakima River Basin, Washington, 1999-2000: U.S. Geological Survey Circular 1237, 34p.

**Abstract:** A review of the surface water quality in the Yakima River Basin for the National Water Quality Assessment Program (NAWQA). Nitrate and orthophosphate were dominant forms of nitrogen and phosphorous found in the Yakima River. Concentrations of total phosphorous have begun to decrease, but still frequently exceed EPA goals. The combination of BMPs and TMDL assessments have reduced concentrations of sediments and sediment-sorbed contaminants. The majority of the agricultural streams and drains sampled exceeded WDOE fecal-coliform bacteria standards, but none from the Yakima River exceeded. Concentrations of fecal-coliform bacteria in the Yakima River and at the mouths of major tributaries increased with increasing suspended sediment, turbidity, nutrients, and specific conductivity. Arsenic was detected in agricultural drains at elevated concentrations during non-irrigation season when ground water is the primary source of stream flow, which is a cause for concern due to the high use of groundwater for domestic purposes. Historically used oranochloride insecticides were frequently detected, two of which exceeded EPA chronic water quality criteria for the protection of aquatic life. Concentrations of

DDT have decreased since 1991, due to decreases in suspended sediment and sorbed DDT resulted from agricultural erosion control. Concentrations of an orchard insecticide routinely exceeded EPA chronic toxicity criterion for the protection of aquatic life. Shallow ground water underlying agricultural areas contributes soluble pesticides to streams all year. The types of pesticides in streams reflect the types of crops grown in the areas they drain. Transport of a pesticide to a stream depends on its tendency to dissolve in water or adhere to soil. Pesticides that strongly adhere to soil were detected at lower frequency, and the opposite for pesticides that weakly adhere to soil. As overall stream conditions decline, benthic macroinvertebrate assemblages are less diverse. Algal assemblages are increasingly dominated by species indicative of high concentrations of nutrients. Algal biomass was limited by light from high turbidity, or by herbicides.

**Staff Review:** This meets the statutory requirements for BAS. This is part of an ongoing study to assess the water quality in the Yakima River Basin. The irrigation system greatly controls water quality and aquatic health. Generally, some parameters of water quality still exceed acceptable levels, some remain unchanged, and some have decreased, but the general trend in water quality is improving due to management of agricultural practices.

Zuroske, Marie. 2004. Conservation Practices and Water Quality Trends in Sulphur Creek Wasteway and Granger Drain Watersheds, 1997-2002. South Yakima Conservation District in collaboration with the Roza-Sunnyside Board of Joint Control.

**Abstract:** This report evaluates changes in water quality and conservation practices from 1997-2002. Factors suggesting that improved conservation practices were responsible for the improvements in water quality include:

- The simultaneous reduction in loads and concentrations, with no know concurrent systematic changes in hydrology, suggest that source reduction effort, and improved on-farm irrigation water management best explain the improvements;
- Yields of all parameters have decreased, indicative of wide-ranging changes;
- Concentrations of suspended sediment, nutrients, and bacteria decreased even in years of abundant water supply.

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Water quality improvements varied between sub-basins and years. This variability did not correspond to the varying implementation rates of government funded BMPs. The lack of correlation is likely due to widespread BMP implementation, confounding the attempts to quantify the relationship between these two factors. Private landowners were largely responsible for the water quality improvements.

**Staff Review:** This meets the statutory requirements for BAS. Overall, water quality has improved in terms of decreasing concentrations, loads, and yields of suspended sediment, nutrients and fecal coliforms due to on-farm conservation BMPs.

**BAS submissions provided by David Taylor, Taylor Consulting Group**

Henri, C.J., Waller, A. 2004. Economics of Riparian Restoration on selected Stillaguamish Farms. Prepared by Resource Consulting. Prepared for the Stillaguamish Implementation Review Committee, WA Department of Agriculture Contract #03-02-01, US Fish and Wildlife Service Contract # 134102J010.;

**Abstract:** The purpose of this project was to develop tools that agricultural landowners could use to evaluate the economic impacts of riparian restoration. This report on the application of the tool to several case studies, and the impacts of installing riparian buffers on farm net income.

**Staff Comment:** On page v of the executive summary and on page 2 of the introduction, the document states that a case study approach was chosen over a statistical analysis of impacts of riparian buffers based on limited availability of financial resources and limited access to data. Because the results reported in this project document do not represent a statistical sample they cannot be applied to the greater farm community at large (page v Executive Summary and pg. 2 Introduction). It should also be noted that this project is not a full scale economic impact analysis for the watershed, which would include a much broader assessment of the direct and secondary impacts on output, employment, and income; not only for the entire agricultural sector, but for related industries and the local economy at large. Nor is it a cost-benefit-analysis of buffers, which would include a much broader discussion of social benefits and costs. (Page 2 Introduction). This does not meet the statutory requirements for BAS.

Washington State University, Co-Operative Extension. No Date. Pesticide Trapping by Buffers/Maintenance of Buffers.

**Abstract:** Typical buffer widths of about 50 feet can be effective in reducing pesticide runoff by 50% or more if sheet flow occurs.

**Staff Comment:** This document is actually part of a nine chapter online document. The two sections provided are very helpful in describing science related to conservation buffers, agricultural impacts and protection of water quality. This document only analyzes agricultural impacts to water quality, and does not address other land uses or other riparian functions. The recommendations found in this document fit within the range of science reviewed in the Draft BAS Report. This meets the statutory requirements for BAS.

Pizzimenti, John, J. PhD. 2002. Efficacy and Economics of Riparian Buffers on Agricultural Lands. GEI Consultants, Inc. 6950 S. Potomac St. Suite 200, Englewood, CO, 80112. In association with Pacific Northwest Project and Mason Bruce & Girard, Inc. Submitted to the Washington Hop Growers Association, Ag Caucus, and Multi Agricultural Caucus.

**Staff Review:** The Report cited above was reviewed in the first draft of the BAS Report, and can be reviewed in Chapter 2, section 7.4.3, page 73 and listed in the bibliography on page 93. See additional review above.

**BAS submissions provided by Steve George, Hop Growers of Washington and the Yakima Valley Dairy Association**

Pizzimenti, John, J. PhD. 2002. Efficacy and Economics of Riparian Buffers on Agricultural Lands. GEI Consultants, Inc. 6950 S. Potomac St. Suite 200, Englewood, CO, 80112. In association with Pacific Northwest Project and Mason Bruce & Girard, Inc. Submitted to the Washington Hop Growers Association, Ag Caucus, and Multi Agricultural Caucus.

***Staff Review:*** The Report cited above was reviewed in the first draft of the BAS Report, and can be reviewed in Chapter 2, section 7.4.3, page 73 and listed in the bibliography on page 93. See additional review above.

#### **BAS submissions provided by Washington Farm Bureau**

Pizzimenti, John, J. PhD. 2002. Efficacy and Economics of Riparian Buffers on Agricultural Lands. GEI Consultants, Inc. 6950 S. Potomac St. Suite 200, Englewood, CO, 80112. In association with Pacific Northwest Project and Mason Bruce & Girard, Inc. Submitted to the Washington Hop Growers Association, Ag Caucus, and Multi Agricultural Caucus.

***Staff Review:*** The Report cited above was reviewed in the first draft of the BAS Report, and can be reviewed in Chapter 2, section 7.4.3, page 73 and listed in the bibliography on page 93. See additional review above.

Henri, C.J., Waller, A. 2004. Economics of Riparian Restoration on selected Stillaguamish Farms. Prepared by Resource Consulting. Prepared for the Stillaguamish Implementation Review Committee, WA Department of Agriculture Contract #03-02-01, US Fish and Wildlife Service Contract # 134102J010.;

***Staff Review:*** See review above

"Wider Buffers Not Necessarily Better" by Wendell Gilliam and Deanna Osmond, North Carolina State University, in Buffer Notes, October 2003

***Staff Review:*** This is an opinion article arguing against the need for "wide" buffer to protect water quality. The authors recommend, based on their experience, that buffers of 50-100 feet are sufficient to protect water quality. This does not meet the statutory requirements for BAS, but does match the buffer width proposed in the CAO revisions.

Monohan, C., 2004. Riparian buffer function along lowland agricultural streams. Watershed Review, Washington State University, Center for Water and Watershed Studies.

***Abstract:*** The majority of buffer science is based on forestry science, and may not be applicable to agricultural areas. In summary, the soil properties of agricultural areas of the Pacific Northwest in the historic floodplains of lowland rivers, differ significantly from the sandy substrates of the Southeast agricultural regions where most existing buffer research has been conducted to date. This has direct implications for the flow of subsurface water and delivery of excess fertilizer nutrients to the stream ecosystem.

***Staff Review:*** A discussion of agricultural best management practices to mitigate for water quality impacts. Buffers are one tool that can be utilized

to address water quality concerns. This meets the statutory requirements for BAS.

### **BAS citations submitted by 1000 Friends of Washington**

The 1000 Friends of Washington submission was on CD, with the citations organized by category.

#### **Biodiversity**

Gorsline, g. 2003. Biodiversity Conservation and Washington's Growth Management Act. Washington Environmental Council.

**Staff Review:** A two page newsletter for regional workshops held in 2003 to train citizens for effective participation in the updates to Critical Areas ordinances required by the Growth Management Act. This does not meet the statutory requirements for BAS.

Ohland, G., Dittmar, H. 2002. Biodiversity and Smart Growth. Translation paper #10, Funders Network for Smart Growth and Livable Communities.

**Staff Review:** An opinion paper that translates the impact of suburban sprawl and disinvestment on issues of importance to America's communities and suggests opportunities for progress that would be created by smarter growth policies and practices. This does not meet the statutory requirements for BAS.

Craig R. Groves, Deborah B. Jensen, Laura L. Valutis, Kent H. Redford, Mark L. Shaffer, J. Michael Scott, Jeffrey V. Baumgartner, Jonathan V. Higgins, Michael W. Beck, And Mark G. Anderson. 2002. Planning for Biodiversity Conservation: Putting Conservation Science into Practice. BioScience, Vol. 52 No. 6.

**Abstract:** An outline of a framework for identifying the most important remaining areas for conservation and restoration. The seven-step framework is based upon scientific principles and theories. The seven-step approach to conservation planning, which has been applied to terrestrial, freshwater, and marine environments, offers numerous benefits. First, it allows conservation planners to set goals that are based on assessments of the biological needs of species, communities, and ecosystems. Second, this framework complements single species conservation approaches by incorporating a broad set of conservation targets at a variety of levels of biological organization and spatial scales. Third, at a median cost of \$234,000 per plan and an average completion time of just less than 2 years, application of the framework strikes a reasonable balance between planning and action. Fourth, the framework provides an explicit means for conservation planners to measure whether the set of conservation areas that they have identified will sufficiently represent the biodiversity of the region and achieve the target-based goals of the plan. Fifth, the proposed framework pays due diligence to a long-overlooked aspect of conserving biodiversity: the underlying ecological processes and functions that support the long-term persistence of biodiversity. Finally, by using an approach that represents biodiversity in a set of conservation areas across environmental

regimes in which targeted features are known to occur, the framework may help conserve biodiversity in the face of global climate change

**Staff Review:** This document is a planning tool based on science, but does not constitute science itself. While this methodology may be a useful tool, it is well above the requirements for updating the CAO. Some of the underpinnings of the seven steps rest on assumptions that remain inadequately tested (e.g., surrogate measures for biodiversity) and methods that are not yet fully developed (e.g., assessing persistence of conservation targets). This does not meet the statutory requirements for BAS.

Cohn, J.P., Lerner, J.A. 2003. Integrating Land Use Planning & Biodiversity. Defenders of Wildlife.

**Abstract:** Defenders of Wildlife brought together land use planners and conservationists at a workshop held in the spring of 2002. The workshop's goal was to begin a national dialogue about the integration of biodiversity and land use planning. This report attempts to summarize that discussion and draw attention to the numerous fledgling efforts at conservation planning currently underway in communities throughout the country.

**Staff Review:** This document is a planning tool, but does not constitute science itself. While the methodologies presented are a useful tool, Yakima County conducted a habitat mapping exercise described in Chapter 4. This does not meet the statutory requirements for BAS.

### **Fish and Wildlife Habitat**

What is a Riparian Zone? Washington State Department of Ecology.

**Staff Review:** An informational brochure that briefly describes the importance of Riparian Areas. This does not meet the statutory requirements for BAS.

State of the Birds. 2004. Audubon Washington

**Staff Review:** A review of threatened and endangered birds in Washington State. This report is an executive summary of a much longer, more detailed article, which was not submitted for review. This does not meet the statutory requirements for BAS.

### **Fish & Aquatic Areas**

Leavitt, J. 1998. The functions of riparian buffers in urban watersheds. Masters of Science thesis, University of Washington, Seattle.

**Staff Review:** the citation above was reviewed in the Draft BAS Report.

Washington State Salmonid Stock Inventory: Bull Trout/Dolly Varden. Washington Department of Fish and Wildlife (Olympia, Washington: July 1998). Downloaded on August 2, 2004 at:

**Abstract:** The objective of this report was to develop a simple and consistent system of collating and reporting statewide salmonid resource

assessment information, recognizing the inventory will change over time. This inventory incorporated information already available in existing documents and information compiled for submission to the USFWS as part of ESA proceedings. Future updates and associated reports will evolve as necessary to accommodate new information and be integrated with developing regional resource information systems. The planned growth and refinement is an important point. This report, and related data collation, was developed in a short time period. Given the large number of stocks in the inventory, the amount of detailed data and depth of analysis has been limited. This report is meant to provide a first glimpse of current stock status and build a foundation for future restoration and inventory efforts.  
**Staff Review:** Yakima County is constantly updating its GIS data, and all relevant data has been reviewed through the CAO revision. This meets the statutory requirements for BAS.

Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP)  
Executive Summary.

**Abstract:** The SSHIAP is an interactive mapping application designed to display and report a wide range of data related to salmon distribution, status, and habitats within Washington State.

**Staff Review:** Yakima County is constantly updating its GIS data, and all relevant data has reviewed through the CAO revision. This meets the statutory requirements for BAS.

Dale E. Miller, Peter B. Skidmore, & Dale J. White. 2001. Channel Design. Submitted to Washington Department of Fish and Wildlife, Washington Department of Ecology And Washington Department of Transportation

**Abstract:** This document is one of a series of white papers developed to provide a scientific and technical basis for developing Aquatic Habitat Guidelines. The white papers address the current understanding of impacts of development and land management activities on aquatic habitat, and potential mitigation for these impacts. The report contains a detailed discussion of stream geomorphology, channel classification, processes of channel de-stabilization as a basis for applied stream channel design.

**Staff Review:** This document is a "how to" manual an applicant could use for a project proposal to meet the BAS requirements. This meets the statutory requirements for BAS.

Bolton, S., Monohan, C., 2001. A Review of the Literature and Assessment of Research Needs in Agricultural Streams in the Pacific Northwest as it Pertains to Freshwater Habitat for Salmonids. Center for Streamside Studies, University of Washington

**Staff Review:** Reviewed in Draft BAS Report

Carrasquero, J. 2001. Over-Water Structures: Freshwater Issues. Submitted to Washington Department of Fish and Wildlife, Washington Department of Ecology And Washington Department of Transportation

**Abstract:** This document is one of a series of white papers developed to provide a scientific and technical basis for developing Aquatic Habitat Guidelines. The white papers address the current understanding of impacts of development and land management activities on aquatic habitat, and potential mitigation for these impacts. This white paper evaluates the state of knowledge of the effects of over-water structures on the functioning of freshwater ecosystems and their relation to salmonids. Scientific and technical literature on the subject was compiled and examined, and input from experts on freshwater habitats and organism life histories was solicited and evaluated. Effects on an array of organisms and communities are considered.

**Staff Review:** This document is a "how to" manual an applicant could use for a project proposal to meet the BAS requirements. This meets the statutory requirements for BAS.

Bolton, S. and Shellberg, J. 2001. Ecological issues in floodplains and riparian corridors. University of Washington, Center for Streamside Studies, Seattle, WA.

**Staff Review:** Reviewed in Draft BAS Report

Norman, D.K., Cederholm, J., and Lingley, W.S. Jr. 1998. Flood plains, salmon habitat, and sand and gravel mining. Washington Geology, 26(2, 3).

**Staff Review:** Reviewed in Draft BAS Report

Norman, D.K. 1998. Reclamation of Flood-Plain Sand and Gravel Pits as Off-Channel Salmon Habitat, Washington Geology, vol. 26, no. 2/3, p. 21

**Staff Review:** Reviewed in Draft BAS Report

Kondolf, G.M., Smeltzer, M., Kimball, L. 2001. Freshwater Gravel Mining and Dredging Issues. Submitted to Washington Department of Fish and Wildlife, Washington Department of Ecology and Washington Department of Transportation

**Abstract:** This white paper, reviews the scientific information regarding the mechanical removal of sediment from river channels, which is conducted for a variety of reasons: to improve navigation, agricultural drainage, flood control, channel stability, and production of construction aggregate. As the environmental impacts of aggregate extraction from river channels become increasingly well understood, the practice has received increased scrutiny, especially in salmon-bearing rivers and streams. The purpose of this report is to build upon existing literature for Washington and elsewhere to summarize current scientific information regarding the environmental effects of mining gravel and sand for construction aggregation from rivers and streams, along with the effects of other freshwater dredging. The emphasis is on effects on salmonids in their various freshwater-based life stages, to provide a scientific basis for future development of guidelines that will be protective of the resource.

**Staff Review:** This document is a "how to" manual an applicant could use for a project proposal to meet the BAS requirements. This meets the statutory requirements for BAS.

Poston, T. 2001. Treated Wood Issues Associated with Overwater Structures in Marine and Freshwater Environments. Submitted to Washington Department of Fish and Wildlife, Washington Department of Ecology And Washington Department of Transportation.

**Abstract:** *This white paper is an assessment of chemical contaminants in treated wood and the potential for adverse impact to salmon listed under the Endangered Species Act (ESA) and other aquatic resources when used in "over water" and "in water".*

**Staff Review:** *This document is a "how to" manual an applicant could use for a project proposal to meet the BAS requirements. This meets the statutory requirements for BAS.*

The Cumulative Impacts of Watershed Urbanization on Stream-Riparian Ecosystems. Christopher W. May and Richard R. Horner AWRA Riparian Ecology and Management in Multiland Use Watersheds Conference Portland Or August 28-31, 2000

**Abstract:** *Historically, watersheds of the Puget Sound lowland ecoregion contained an abundance of complex, diverse, and productive salmonid habitat in the form of small stream ecosystems and associated riparian ecotones. However, development of these lowland watersheds has significantly impacted the ecological integrity of their aquatic ecosystems. The cumulative effects of watershed urbanization have resulted in a loss of natural forest and wetland cover, as well as a significant increase in impervious surface area. Riparian forests, floodplains, and off-channel wetlands have also been severely degraded by the incremental encroachment of residential and commercial development. The decline in ecological integrity of the stream-riparian ecosystem begins at very low levels of watershed development and continues with increasing watershed urbanization. A conservation-based strategy for managing stream-riparian ecosystems in our urbanizing watersheds should be adopted if the remaining salmonid resources are to be protected and to facilitate recovery of those already in decline. Initial research indicates that maintaining natural riparian corridors around streams and wetlands can have a positive influence on ecological integrity even at moderate levels of watershed development. These results suggest that resource managers should place a high priority on preservation of remaining high quality stream-riparian ecosystems. In addition, our long-term objective should be to actively manage for natural riparian buffers throughout our watersheds.*

**Staff Review:** *While this document was developed for the Puget Sound region, it is still applicable to Yakima County concerning habitat quality and anadromous fish. Similar documents developed with the Yakima River Basin were utilized in the BAS report. The current and proposed CAO currently utilize the premise behind this document. This meets the statutory requirements for BAS.*

Cederholm, C.J., Johnson, D.H., Bilby, R.E., Dominguez, L.G., Garrett, A.M., Graeber, W.H., Greda, E.L., Kunze, M.D., Marcot, B.G., Palmisano, J.F., Plotnikoff, R.W., Percy, W.G., Simenstad, C.A., and Trotter, P.C. 2000. Pacific salmon and

wildlife: Ecological contexts, relationships, and implications for management. Special edition Technical Report. In Johnson, D.H. and O'Neil, T.A. Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife.

**Staff Review:** Reviewed in Draft BAS Report

1992 Washington State Salmon and Steelhead Stock Inventory (SASSI).1993. Washington Department of Fisheries, Washington Department of Wildlife and Western Washington Treaty Indian Tribes

**Abstract:** This report documents the results of an initial stock status inventory that is the first step in a statewide effort to maintain and restore wild salmon and steelhead stocks and fisheries. The inventory's intent is to help identify currently available information and to guide future restoration planning and implementation. While overall objectives and future steps of the restoration initiative are briefly described, the report primarily focuses on current condition of Washington's naturally reproducing anadromous salmonid populations and not on the adequacy of current resource management objectives. Assessment of management objectives and strategies will be one of many subsequent steps aimed at improving the status of wild salmon and steelhead resources in Washington.

**Staff Review:** Yakima County is constantly updating its GIS data, and all relevant data has reviewed through the CAO revision. This meets the statutory requirements for BAS.

An Ecosystem Approach to Salmonid Conservation [ManTech Report]. Brian C. Spence, Gregg A. Lomnicky, Robert M. Hughes, Richard P. Novitzki. ManTech Environmental Research Services Corporation. 21TR-4501-96-6057 (December 1996

**Staff Review:** Reviewed in Draft BAS Report

Integrated Streambank Protection Guidelines. Washington Department of Fish and Wildlife, Washington Department of Transportation, & Washington Department of Ecology (April 2003). Downloaded on August 4, 2003 at: <http://www.wa.gov/wdfw/hab/ahg/ispqdoc.htm>

**Abstract:** The Aquatic Habitat Guidelines collection was created by a consortium of public agencies to assist property owners, planners, designers and regulators protect and restore marine, freshwater and riparian fish and wildlife habitat.

**Staff Review:** This document is a "how to" manual an applicant could use for a project proposal to meet the BAS requirements. This meets the statutory requirements for BAS.

### **Plants**

List of Plants Tracked by the Washington Natural Heritage Program. Washington Natural Heritage Information System (April 2004). Downloaded on June 24, 2004 at <http://www.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

**Abstract:** This table lists threatened, endangered, and sensitive plants and other plants needing management and protection.

**Staff Review:** *This list does not meet the statutory requirements for BAS. While maintaining and protecting threatened, endangered, and sensitive plants is important, their protection is not required by the GMA.*

### **Impervious Surface & Forest Loss**

Forest Cover, Impervious-Surface Area, and the Mitigation of Urbanization Impacts in King County, Washington. Derek B. Booth, Ph.D., P.E. (September 2004)

Downloaded on June 24, 2004 at:

<http://depts.washington.edu/cuwrm/research/forest.pdf>

**Abstract:** *This paper focuses on changes in hydrology, because hydrologic processes dominate the formation and functioning of aquatic habitat, and because these changes are ubiquitous in urban settings. The purpose here is to remind readers of the scientific framework for evaluating the consequences of urban development on aquatic systems; to review the history of surface-water management in King County as it relates to the analysis and mitigation of those consequences; and to evaluate the basis for a specific proposal, first explored almost a decade ago, to limit effective impervious areas in high-quality watersheds at or below 10 percent and to maintain forest cover above 65 percent.*

**Staff Review:** *While this is an important piece of science, its applicability to Yakima County is questionable due to dramatic climatic differences between eastern and western Washington. Recent Growth Management Hearings Board decisions have found that requiring developments to maintain imperviousness below 10 percent is not required. This meets the statutory requirements for BAS.*

Urban Stream Rehabilitation in the Pacific Northwest: Physical, Biological and Social Considerations. Booth, D. B, J. R. Karr, S. Schauman, C. P. Konrad, S. A. Morley, M. G. Larson, P. C. Henshaw, E. J. Nelson and S. J. Burges. 2001. Final Report, EPA Grant Number R82-5284-010. University of Washington. Seattle, Washington.

Downloaded on June 24, 2004 at:

<http://depts.washington.edu/cuwrm/research/final%20rehab%20report.pdf>

**Abstract:** *The goal in this project was to develop a robust approach to urban stream rehabilitation, using examples from the Puget Lowland region of western Washington, that blended knowledge from the physical, biological, and social sciences by:*

- documenting the consequences of urban development on urban streams;*
- understanding the causes of the resulting ecological degradation; and*
- using that understanding to evaluate rehabilitation strategies and techniques.*

**Staff Review:** *Stream rehabilitation is a non-regulatory tool utilized by many entities within the Yakima River Basin. While stream rehabilitation may be an important component of a new project, it can only be required as mitigation to compensate for increased impacts from new development. This meets the statutory requirements for BAS.*

The Cumulative Effects of Urbanization on Small Streams in the Puget Sound Lowland. Christopher W. May, Richard R. Horner, James R. Karr, Brian W. Mar,

Eugene B. Welch, University of Washington, Seattle, Washington. Downloaded on January 23, 2003 at: <http://pluto.apl.washington.edu/etg/chrisrdp.html>

**Abstract:** A key objective of the Puget Sound lowland (PSL) stream study was to identify the linkages between landscape-level conditions and instream environmental factors, including defining the functional relationships between watershed modifications and aquatic biota. The goal was to provide a set of stream quality indices for local resource managers to use in managing urban streams and minimizing resource degradation due to development pressures. In this scenario, there would be a reasonable expectation that a goal of maintaining given populations or communities of organisms (native salmonids) at a specified level could be met by sustaining a certain set of habitat characteristics, which in turn depend on an established group of watershed conditions. A part of this overall objective was to identify any thresholds of watershed urbanization as related to instream salmonid habitat and aquatic biota. The study was designed to establish the linkages between landscape-level conditions, instream habitat characteristics, and biotic integrity.

**Staff Review:** Results of the study indicate that physical, chemical, and biological characteristics of streams change with increasing urbanization in a continuous rather than threshold fashion. Although the patterns of change differed among the attributes studied and were more strongly evident for some than for others, physical and biological measures generally changed most rapidly during the initial phase of the urbanization process as %TIA (Total Impervious Area) above the 5-10% range. As urbanization progressed, the rate of degradation of habitat and biologic integrity usually became more constant. There was also direct evidence that altered watershed hydrologic regime was the leading cause for the overall changes observed in instream physical habitat conditions. While this is an important piece of science, its applicability to Yakima County is questionable due to dramatic climatic differences between eastern and western Washington. This meets the statutory requirements for BAS.

## **Mammals**

Management Recommendations for Washington's Priority Species, Volume V: Mammals Appendix A: Contacts Useful When Evaluating Pesticides and Their Alternatives. J. M. Azerrad, editor. [Online]. Downloaded on August 3, 2004 at: <http://wdfw.wa.gov/hab/phs/vol5/appendixa.pdf>

**Abstract:** The Washington State Department of Fish and Wildlife has developed management recommendations for Washington's priority habitats and species to provide planners, elected officials, landowners, and citizens with comprehensive information on important fish, wildlife, and habitat resources. These management recommendations are designed to assist in making land use decisions that incorporate the needs of fish and wildlife. Agency biologists develop management recommendations for Washington's priority habitats and species through a comprehensive review and synthesis of the best scientific information available. Management recommendations for Washington's priority habitats and species are

guidelines based on the best available scientific information and are designed to meet the following goals:

- Maintain or enhance the structural attributes and ecological functions of habitat needed to support healthy populations of fish and wildlife;
- Maintain or enhance populations of priority species within their present and/or historical range in order to prevent future declines;
- Restore species that have experienced significant declines.

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**Staff Review:** Staff has utilized the PHS Management Recommendations and associated data. The PHS data is recommended as a source of information in WAC 365-190-080(5), but is not required to be used in the designation of fish and wildlife habitat. This meets the statutory requirements for BAS.

### **PHS (Priority Habitats and Species) Management Recommendations**

Addendum to the PHS List. Washington State Department of Fish and Wildlife. This list updates the Priority Species and Habitats List for some species. Please use the Addendum in together with the Priority Species and Habitats List. Downloaded on June 24, 2004 at: <http://wdfw.wa.gov/hab/phsinsert.pdf>

**Staff Review:** Staff has utilized the PHS Management Recommendations and associated data. The PHS data is recommended as a source of information in WAC 365-190-080(5), but is not required to be used in the designation of fish and wildlife habitat. This does not meet the statutory requirements for BAS.

Priority Species and Habitats List. Washington State Department of Fish and Wildlife. The Addendum to the PHS List above updates the Priority Species and Habitats List for some species. Please use the Addendum in together with the Priority Species and Habitats List. Downloaded on June 24, 2004 at: <http://wdfw.wa.gov/hab/phslist.pdf>

**Staff Review:** Staff has utilized the PHS Management Recommendations and associated data. The PHS data is recommended as a source of information in WAC 365-190-080(5), but is not required to be used in the designation of fish and wildlife habitat. This does not meet the statutory requirements for BAS.

Species of Concern in Washington State. Washington State Department of Fish and Wildlife. Downloaded on June 24, 2004 at: <http://wdfw.wa.gov/wlm/diversty/soc/soc.htm>

**Staff Review:** Staff has reviewed the Species of Concern list. Species of Concern are not required to be protected under WAC 365-190-080(5), or to be used in the designation of fish and wildlife habitat. This does not meet the statutory requirements for BAS.

Management Recommendations for Washington's Priority Species, Volume I: Invertebrates. Larsen, E.M., E. Roderick, and R. Milner, eds. 1995. Washington Department of Fish and Wildlife, Olympia. Downloaded on August 5, 2004 at: <http://wdfw.wa.gov/hab/vol1.pdf>

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals.

Management Recommendations for Washington's Priority Species, Volume III: Amphibians and Reptiles. Larsen, E. M., editor. 1997. Washington Department of Fish and Wildlife, Olympia. Downloaded on June 24, 2004 at: <http://wdfw.wa.gov/hab/vol3.pdf>

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals.

Management recommendations for Washington's priority species, Volume IV: Birds. E. Larsen, J. M. Azerrad, N. Nordstrom, editors. 2004. Washington Department of Fish and Wildlife, Olympia, Washington, USA. Downloaded on June 24, 2004 from: [http://wdfw.wa.gov/hab/phs/vol4/phs\\_vol4\\_birds.pdf](http://wdfw.wa.gov/hab/phs/vol4/phs_vol4_birds.pdf)

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals.

Management Recommendations for Washington's Priority Habitats: Riparian. Knutson, K. L. and V. L. Naef. 1997. Washington Department of Fish and Wildlife, Olympia. 181 pp. Downloaded on August 5, 2004 at: <http://wdfw.wa.gov/hab/ripfinal.pdf>

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals. The referenced document was utilized in the BAS synthesis.

Management Recommendations for Washington's Priority Habitats: Oregon White Oak Woodlands. Larsen, E. M., and J. T. Morgan. 1998. Washington Department of Fish and Wildlife, Olympia. Downloaded on August 5, 2004 at: <http://wdfw.wa.gov/hab/oakfinal.pdf>

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals.

Management recommendations for Washington's priority habitats and species. Elizabeth Rodrick and Ruth Miller, editors. May 1991. Washington Department of Wildlife, Wildlife Management, Fish Management, and Habitat Management Division. Olympia, Washington, USA. Downloaded on June 24, 2004 at: <http://wdfw.wa.gov/hab/phs/phs1991.pdf>

**Staff Review:** See Abstract and Staff Review above for Volume V: Mammals. Staff has utilized the PHS Management Recommendations and associated data. The PHS data is recommended as a source of information in WAC 365-190-080(5), but is not required to be used in the designation of fish and wildlife habitat.

### **Salmon Limiting Factors Summary Reports**

The limiting factors analysis prepared as part of the state's Watershed Planning can help identify salmon habitats that need to be protected by city and county critical areas ordinances or regulations. The report summaries available in April 2003 are

in this directory. They were downloaded from <http://salmon.scc.wa.gov/reports/index.html>

**Staff Review:** *the Limiting Factors Analysis for the Yakima River Basin was utilized in the BAS report.*

### **Shrub-Steppe**

Teetering on the Edge or Too Late? Conservation and Research Issues for Avifauna of Sagebrush Habitats. Report of the Cooper Ornithological Society Committee for Conservation of Sagebrush Ecosystems. Steven T. Knick, David S. Dobkin, John T. Rotenberry, Michael A. Schroeder, W. Matthew Vander Haegen, & Charles Van Riper III. The Condor 105:611–634 (2003). Downloaded on August 2, 2004 at: [http://wdfw.wa.gov/wlm/research/papers/shrub/conservation\\_avifauna.pdf](http://wdfw.wa.gov/wlm/research/papers/shrub/conservation_avifauna.pdf)

**Abstract:** *Degradation, fragmentation, and loss of native sagebrush (Artemisia spp.) landscapes have imperiled these habitats and their associated avifauna. Historically, this vast piece of the Western landscape has been undervalued: even though more than 70% of all remaining sagebrush habitat in the United States is publicly owned, 3% of it is protected as federal reserves or national parks. We review the threats facing birds in sagebrush habitats to emphasize the urgency for conservation and research actions, and synthesize existing information that forms the foundation for recommended research directions. Management and conservation of birds in sagebrush habitats will require more research into four major topics: (1) identification of primary land-use practices and their influence on sagebrush habitats and birds, (2) better understanding of bird responses to habitat components and disturbance processes of sagebrush ecosystems, (3) improved hierarchical designs for surveying and monitoring programs, and (4) linking bird movements and population changes during migration and wintering periods to dynamics on the sagebrush breeding grounds. This research is essential because we already have seen that sagebrush habitats can be altered by land use, spread of invasive plants, and disrupted disturbance regimes beyond a threshold at which natural recovery is unlikely. Research on these issues should be instituted on lands managed by state or federal agencies because most lands still dominated by sagebrush are owned publicly. In addition to the challenge of understanding shrubsteppe bird habitat dynamics, conservation of sagebrush landscapes depends on our ability to recognize and communicate their intrinsic value and on our resolve to conserve them.*

**Staff Review:** *The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.*

Predation on Real and Artificial Nests in Shrubsteppe Landscapes Fragmented by Agriculture. W. Matthew Vander Haegen, Michael A. Schroeder & Richard M. Degraaf. The Condor 104:496–506. Downloaded on August 2, 2004 at: [http://wdfw.wa.gov/wlm/research/papers/shrub/nest\\_predation.pdf](http://wdfw.wa.gov/wlm/research/papers/shrub/nest_predation.pdf)

**Abstract:** *Clearing of shrubsteppe communities for agriculture has created a highly fragmented landscape in eastern Washington, a condition that has*

*been shown to adversely affect nesting success of birds in some forest and grassland communities. We used artificial nests monitored by cameras to examine relative effects of fragmentation, distance to edge, and vegetation cover on nest predation rates and to identify predators of shrubsteppe nesting passerines and grouse. Predation rate for artificial nests was 26% (n 5 118). Fragmentation had a strong influence on predation rates for artificial nests, with nests in fragmented landscapes about 9 times more likely to be predated as those in continuous landscapes. Daily survival rate for 207 real nests of 4 passerine species also was greater in continuous than in fragmented landscapes, although pattern of predation between real and artificial nests was not consistent among sites.*

**Staff Review:** *The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.*

Status of Washington's Shrub-Steppe Ecosystem: Extent, ownership, and wildlife/vegetation relationships. Frederick C. Dobler, Jim Eby, Chuck Perry, Scott Richardson, and Matthew Vander Haegen. (Washington Department of Fish and Wildlife, Olympia, Washington: August 1996). Downloaded on August 2, 2004 at: <http://wdfw.wa.gov/wlm/research/songbird/shrub.pdf>

**Abstract:** *Changes in land use over the past century have resulted in the loss of over half of Washington's shrub-steppe habitat. The few remaining large areas of shrub-steppe are primarily on federal holdings (Yakima Training Center, Hanford Nuclear Site, and the Yakama Indian Nation) and may represent the only sites suitable for species requiring extensive areas of continuous shrub-steppe. Washington's shrub-steppe communities support a wide diversity of wildlife. The suitability of Washington's shrub-steppe habitat for wildlife differs from that which occurred a century ago. Conversion of sites with deep, loamy soil to agriculture; invasion by non-native grasses and forbs; and fragmentation of the remaining shrub-steppe habitats have likely lowered the suitability of Washington's shrub-steppe habitat for many native species.*

**Staff Review:** *The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.*

Shrubsteppe Bird Response to Habitat and Landscape Variables in Eastern Washington, USA. W. Matthew Vander Haegen, Frederick C. Dobler and D. John Pierce Conservation Biology 14: 1145-1160 (August 2000). Downloaded on August 2, 2004 at: <http://wdfw.wa.gov/wlm/research/papers/shrub/shrubsteppe.pdf>

**Abstract:** *The landscape of the intermountain west has changed dramatically in the last 150 years, particularly in the State of Washington, where over half of the native shrubsteppe ecosystem has been converted to agricultural lands, resulting in a fragmented landscape with few extensive tracts of shrubsteppe. We examined the historical and current distribution of shrubsteppe on different soil types in eastern Washington, and we censused bird communities at 78 sites in shrubsteppe from 1991 to 1993. We compared abundance of species among soil types and range conditions*

and developed models of species occurrence using site-specific vegetation and landscape variables. The pattern of shrubsteppe conversions resulted in a disproportionate loss of deep soil communities. Eight bird species showed strong relationships with soil types and three with range condition. These associations likely resulted from the influence of soil type and range history on the vegetation of these communities. Brewer's Sparrows and Sage Sparrows reached their highest abundances in deep loamy soils, whereas Loggerhead Shrikes were most abundant in deep, sandy soils. Sage Sparrows occurred more frequently in landscapes dominated by shrubsteppe, indicating a negative relationship with fragmentation. Our results suggest that fragmentation of shrubsteppe and the pattern of agricultural conversion among soil types have had a detrimental effect on numerous shrubsteppe species. The landscape for species with an affinity for deep, loamy soil communities has changed considerably more than the overall loss of shrubsteppe would indicate. Conservation practices that emphasize retention of shrubsteppe communities on deep soils and that reduce further fragmentation will be critical to the maintenance of avian biological diversity.

**Staff Review:** The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.

Shrubsteppe Mapping Of Eastern Washington Using Landsat Satellite Thematic Mapper Data. John E. Jacobson & Michelle C. Snyder. (Washington State Department of Fish and Wildlife: August 2000) Downloaded on August 2, 2004 at: [http://wdfw.wa.gov/wlm/research/papers/shrubsteppe\\_map/shrubsteppe\\_map.pdf](http://wdfw.wa.gov/wlm/research/papers/shrubsteppe_map/shrubsteppe_map.pdf)

**Abstract:** Shrubsteppe provides important habitat for many wildlife species in Washington State, such as the sage grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus*), and pygmy rabbit (*Brachylagus idahoensis*) which are currently listed as threatened or endangered with extinction. Shrubsteppe once extended over nearly all of the non-forested land in Washington east of the Cascade Mountain Range, but now only occupies about 50% of its historical range. The continuous loss of this important habitat makes it imperative the spatial distribution and characteristics of shrubsteppe be mapped for the effective conservation and management of obligate wildlife species. The wide distribution of shrubsteppe land cover throughout eastern Washington made the data obtained from the Thematic Mapper (TM) sensor onboard the Landsat 5 satellite platform a logical and cost-effective choice for this mapping project. An exhaustive literature review and research effort was conducted to determine an image processing methodology which would optimally discriminate between numerous shrubsteppe habitat conditions, and other land cover in eastern Washington. CRP areas were mapped for Okanogan, Douglas, Lincoln, Grant, Adams, Franklin, Benton, Klickitat, Walla Walla, and Yakima counties by compiling and digitizing CRP field boundaries from aerial photographs. Shrubsteppe land cover as of 1993 covered only 30% of the eastern Washington landscape compared to approximately 60% historically. The diminishing extent and fragmentation of shrubsteppe

*makes it imperative this habitat and other interspersed land cover be monitored at least every 5-10 years. Such a mapping effort will assist in the effective management of shrubsteppe and the many wildlife species dependant upon this vital habitat.*

**Staff Review:** *The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.*

Wildlife of Eastside Shrubland and Grassland Habitats. W. Matthew Vander Haegen, Scott M. McCorquodale, Charles R. Peterson, Gregory A. Green, & Eric Yensen. (2001). Downloaded on August 2, 2004 at:

[http://wdfw.wa.gov/wlm/research/papers/shrub/wildlife\\_of\\_shrubsteppe.pdf](http://wdfw.wa.gov/wlm/research/papers/shrub/wildlife_of_shrubsteppe.pdf)

**Abstract:** *Much of the historical vegetation in shrubsteppe habitats, particularly in eastern Washington, has been converted to agricultural crops. In some areas, the only remaining native communities are on rocky soils or steep slopes unfit for agriculture. The dominant land use in these shrubland and grassland habitats is livestock grazing, and a few examples of undisturbed stands exist, limited primarily to sites where topography or remoteness from water has made access for livestock grazing impractical. Although pristine communities do exist for eastside grassland and shrub habitats, the majority of sites have been shaped by a legacy of past land uses that includes continuous grazing by livestock forage and that in turn has facilitated invasion by exotic vegetation. This legacy has modified the vegetation community in many areas, with some changes occurring so long ago that they are not apparent today. Changes in the herb community brought about by excessive grazing and exotic invaders are particularly damaging in these arid habitats where the herb layer often contains the most vegetative biomass. Moreover, the successional trajectory of vegetation communities in arid habitats can be modified by influences such as grazing and fire, resulting in present day "zootic" climax communities that differ greatly from those that occurred historically. Sites in south-central Washington that were dominated by exotic annuals in the 1950's still have not been colonized by native plants. The low vertical structural diversity inherent in these habitats provides fewer habitat layers for wildlife, resulting in lower diversity. Habitats with a shrub component tend to have more diverse wildlife communities than grass dominated habitats, a function of increased nesting and foraging strata. Available water is a defining factor in these arid and semi-arid habitats, and this strongly shapes the composition of plant communities and influences the ecology and behavior of associated wildlife.*

**Staff Review:** *The extent and wildlife populations of sagebrush habitats were utilized in the BAS methodology in Chapter 4. This meets the statutory requirements for BAS.*

### **Flooded Areas**

Floodplain Management in the State of Washington: A Status Report as of February 2004. Washington Department of Ecology Northwest Regional Office. (Publication

#04-06-016 March, 2004). Downloaded on July 27, 2004 from:  
<http://www.ecy.wa.gov/pubs/0406016.pdf>

**Abstract:** *A review of existing floodplain management laws applicable in Washington State and the various agencies that have authority. To cope with significant flooding issues, there have been numerous innovations by local governments in the field of floodplain management, efforts that exceed the minimum requirements established by the NFIP regulations, including: freeboard, cumulative substantial improvement rule, channel migration zones, deep and fast flowing waters, prohibition of fill, prohibition of residences in the floodplain, zero-rise criteria in the flood fringe, setbacks, compensatory storage, higher floodway surcharge, septic system prohibition, enclosures below BFE, determining BFEs where they do not exist, subdivisions and floodplains, hazardous materials, critical facilities, water wells, floodway prohibition, FEMA fish-flood ordinance.*

**Staff Review:** *This document does not meet the statutory requirements for BAS, although some new applications have been incorporated where appropriate.*

Floodplain Management: Higher Regulatory Standards. Federal Emergency Management Agency (FEMA).

**Abstract:** *The purpose of this document is to provide local communities with some regulatory land-use ideas that seek to better balance the needs between floodplain development and maintaining the natural and beneficial functions of the floodplain.*

**Staff Review:** *This document does not meet the statutory requirements for BAS, although some new applications have been incorporated where appropriate.*

#### **Geo Hazards**

A Framework for Delineating Channel Migration Zones. Cygnia F. Rapp, R.G. & Timothy B. Abbe, Ph.D., R.G. (Olympia, Washington, Ecology Publication #03-06-027 [Final Draft] November 2003). Downloaded on August 3, 2004 from:  
<http://www.ecy.wa.gov/pubs/0306027.pdf>

**Staff Review:** *reviewed in the BAS Synthesis Report.*

Optional Comprehensive Plan Element for Natural Hazard Reduction. Jane Preuss, Doug Pflugh, Richard Mayo, Lori Emadi (Urban Regional Research), Roger Wagoner & Nancy Eklund (Berryman & Henigar) & Jon Koloski & Mary Ann Reinhart (GeoEngineers). (Olympia, Washington: Department of Community, Trade, and Economic Development June 1999). Downloaded on April 6, 2004 at:  
<http://www.cted.wa.gov/DesktopModules/Documents/ViewDocument.aspx?DocumentID=1254> it is listed under "Natural Hazard Reduction."

**Abstract:** *This Guidebook provides local government planners with tools that can be used to address hazard avoidance and mitigation in their community comprehensive plans. While the Guidebook is primarily intended for use by cities and counties planning under the Growth Management Act (GMA), the principles and methods can generally be applied to jurisdictions not planning under GMA. The preparation of the Guidebook is supported by*

federal and state agencies involved in hazard-reduction planning to provide better communications between these agencies and local planners.  
**Staff Review:** This document does not meet the statutory requirements for BAS, although some new applications have been incorporated where appropriate.

#### Liquefaction Susceptibility and NEHRP Soil-Type Maps

The Washington State Department of Natural Resources, Division of Geology and Earth Resources has received grant funding through the Hazard Mitigation Grant Program (HMGP) following the Nisqually Earthquake of March 2001.

**Abstract:** A statewide liquefaction susceptibility and National Earthquake Hazards Reduction Program (NEHRP) soil-type maps. Regional earthquake hazard maps such as these support hazard mitigation, critical areas regulations updates, emergency planning and response, planning of local zoning ordinances, and building code enforcement. The primary reason for producing this preliminary series of earthquake hazard maps is to support revisions to the State Hazard Mitigation Plan required to implement 44CFR201.4 and 44CFR201.6, which include the requirement that revised mitigation plans describe the location and extent of the earthquake hazards within the jurisdictional boundary. Additionally, these maps will serve a great variety of other partners involved in earthquake hazard mitigation planning and implementation.

**Staff Review:** This meets the statutory requirements for BAS.

The reconnaissance level inventory conducted for Yakima County is too general, and does not adequately address the actual liquefaction hazard present. Staff has concluded that the current IBC standards adequately address liquefaction hazards in Yakima County. Yakima County is currently utilizing a geologically hazardous areas inventory that was developed for Yakima County.

#### **Landslide Hazards**

Digital Compilation of "Landslide Overview Map Of The Conterminous United States" by Dorothy H. Radbruch-Hall, Roger B. Colton, William E. Davies, Ivo Lucchitta, Betty A. Skipp, and David J. Varnes, 1982. Jonathan W. Godt. U.S. Department of the Interior, U.S. Geological Survey Open-File Report 97-289.

**Staff Review:** This meets the statutory requirements for BAS.

The reconnaissance level inventory conducted for Yakima County is too general, and does not adequately address the actual landslide hazard present. Yakima County is currently utilizing a geologically hazardous areas inventory that was developed for Yakima County.

#### **BAS Synthesis Reports**

Stream-Riparian Ecosystems In the Puget Sound Lowland Eco-Region: A Review of Best Available Science Christopher W. May (Watershed Ecology LLC: 2003) prepared for Kitsap County.

**Abstract:** The purpose of this report is to present a summary of the current level of scientific knowledge on the management of riparian ecosystems and the use of riparian buffers to protect aquatic resources in

the Puget Sound Lowland Eco-region, including sensitive biota and critical instream habitat. This report will also make recommendations as to how riparian zone management guidelines should be modified to make them more ecologically sound and scientifically defensible. The objective of this report is to provide sufficient information, such that natural resource managers can properly identify the boundaries of the stream-riparian ecosystem and make sound decisions on the appropriate configuration of the riparian management zone and associated buffers. Buffer criteria, sensitive area ordinances, and land-use regulations designed to protect aquatic resources should be based on best-available science. The underlying goal of this report is the conservation of our valuable aquatic resources, including native biota (e.g.salmonids). In addition, the information presented here should provide a foundation for enhancement, rehabilitation, and restoration efforts within the stream-riparian ecosystem.  
**Staff Review:** Yakima County performed an independent review of the BAS with more science relevant to local conditions. This meets the statutory requirements for BAS.

Best Available Science: Volume I: A Review of Science Literature, Stephanie Brown, Terry Butler, Robert Fuerstenberg, Ph.D, Priscilla Kaufmann, Gino Lucchetti, Klaus Richter, Ph.D., Jeanne Stypula, P.E. Jennifer Vanderhoof, & James Hatch (Seattle, Washington: King County Executive Report, February 2004).

**Abstract:** The purpose of this report is to provide a compilation and review of the best available scientific information that is applicable to King County. This scientific information was selected to meet the Washington Administrative Code requirements given in WAC 365-195-900 to 925. The companion report, Assessment of Proposed Ordinances, discusses the State requirements to include best available science in the development of policies and regulations to protect critical areas. This report describes the overarching scientific framework and organizing principles for King County's approach to environmental management. Discussion covers principles of conservation, context, complexity, and connectivity. The effects of development and landscape change are also illustrated in a brief discussion. A review of BAS for each critical area contains the following sections: (1) introduction (2) a review of the scientific literature, which includes a discussion of functions and values of the critical areas, (3) conclusions, and (4) literature references. The literature Review summarizes a considerable amount of the most applicable scientific and technical literature.

**Staff Review:** Yakima County performed an independent review of the BAS with more science relevant to local conditions. Staff did utilize the BAS bibliography of this report to acquire relevant science. This meets the statutory requirements for BAS.

### **Wetlands**

Washington State Wetland Mitigation Evaluation Study, Phase I: Compliance. 0206009.pdf is a companion study. Downloaded on January 22, 2003 at: <http://www.ecy.wa.gov/biblio/0006016.html>

**Staff Review:** reviewed in the BAS Synthesis Report.

Washington State Wetland Mitigation Evaluation Study - Phase 2, Evaluating Success. 0006016.pdf is a companion study. Downloaded on January 22, 2003 at: <http://www.ecy.wa.gov/biblio/0206009.html>

***Staff Review:*** *reviewed in the BAS Synthesis Report.*

Draft Freshwater Wetlands in Washington State - Vol. 1: A Synthesis of the Science. Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, S. Stanley, E. Stockdale. (Washington State Department of Ecology Publication # 03-06-016 August 2003). The following are companion documents: draft\_appendix8-c-westernwa guidance.pdf, draft\_appendix8-d-easternwa guidance.pdf, draft\_appendix8-e-bufferrationale.pdf, & draft\_appendix8-f-ratiosrationale.pdf. Downloaded on September 11, 2003 at:

<http://www.ecy.wa.gov/biblio/0306016.html>

***Staff Review:*** *reviewed in the BAS Synthesis Report.*

Washington State Wetland Rating System for Eastern Washington Revised. Hruby, T. (2004) Ecology Publication # 04-06-015. Downloaded on July 27, 2004 at: <http://www.ecy.wa.gov/pubs/0406015.pdf>

***Staff Review:*** *reviewed in the BAS Synthesis Report.*

Wetland Buffers: Use and Effectiveness. Downloaded on January 22, 2003 at: <http://www.ecy.wa.gov/biblio/92010.html>

***Abstract:*** *This report was developed to assist efforts by Washington State agencies and local governments developing policies and standards for wetlands protection. The report summarizes and evaluates scientific literature, an agency survey, and a recent field study on wetland buffer use and effectiveness. Published literature was obtained from several sources and contains information from throughout the country on the concept of wetland buffers, their important functions, effective buffer widths, and buffer determination models. The agency survey reviewed buffer requirements of several states throughout the U.S. and for counties and cities in Washington. The field study reviewed the current state of buffers at several sites in King and Snohomish counties.*

***Staff Review:*** *the science in this document has been supplanted by the WDOE science synthesis distributed in 2003. This meets the statutory requirements for BAS.*

Washington State Wetlands Delineation Manual. Downloaded on January 22, 2003 at: <http://www.ecy.wa.gov/biblio/9694.html>

***Staff Comment:***

***Abstract:*** *This document is the wetland delineation manual that is to be used in determining wetland areas when applying state and local government regulations under the Shoreline Management Act and the Growth Management Act in Washington State. This delineation manual is a revised version of the Corps of Engineers 1987 manual (see Preface for a description of the revisions). The relevant mandatory elements of this manual have been adopted into state regulations (WAC 173-22-080). In addition to the mandatory elements, this manual contains additional*

background material, recommended data gathering methods, illustrations and appendices.

**Staff Review:** This document is required for all wetland delineations by the revised CAO. This meets the statutory requirements for BAS.

Wetlands and Urbanization: Implications for the Future. Azous, Amanda L. and Richard R. Horner, 1997. Final Report of the Puget Sound Wetlands and Stormwater Management Research Program. Downloaded on June 2, 2003 at: <http://splash.metrokc.gov/wlr/basins/weturban.htm>

**Abstract:** The wetlands chosen for the study were representative of those found in the Puget Sound lowlands and most likely to be impacted by urban development. The program's goal was to employ the research results to improve the management of both urban wetland resources and stormwater. This overview paper begins by defining the issues facing the program at its inception. It then summarizes the state of knowledge on these issues existing at the beginning and in the early stages of the program. The paper concludes by outlining the general experimental design of the study. Subsequent papers present the specific methods used in the various monitoring activities.

**Staff Review:** the science in this document has been supplanted by the WDOE science synthesis distributed in 2003. This meets the statutory requirements for BAS.

#### **Yakima County Public Services – Environmental Division – Surface Water Management Section**

Leopold, Wolman, Miller 1964. Fluvial Processes in Geomorphology. General Publishing Company, Ltd. 30 Lesmull Road, Don Mills, Toronto, Canada. ISBN 0-486-68588-8

**Staff Review:** This citation was utilized to edit standard 16A.04.14 (5) to add the 1/3 bankfull depth requirement. This meets the statutory requirements for BAS.

#### **Washington Department of Fish and Wildlife**

The WDFW submitted five documents at the Planning Commission Hearing on 01/20/05 to counter a statement made at the 01/19/05 Planning Commission Study Session that Cottonwood trees were not native to Yakima County. Copies of the submittals are available at the Planning Division. All submittals substantiated that the Cottonwood is native to Yakima County. All of the documents meet the statutory requirements for BAS.

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Pacific Northwest Forest and Range Experiment Station. 1973. Vascular Plants of the Pacific Northwest. US Department of Agriculture, Forest Service. General Technical Report PNW-8. Portland, OR.

Natural Vegetation of Oregon and Washington

Natural Resource Conservation Service. Online Plants database.  
<http://plants.usda.gov/checklist.html>

Hitchcock, L. C. Cronquist, A. Ownbey, M. Thompson, J.W. No Date. Vascular Plants of the Pacific Northwest. University of Washington Press, Seattle, WA.

NatureServe Explorer. Online database.  
<http://www.natureserve.org/explorer/servlet/NatureServe?init=Species>

Unknown web printout.  
[http://www.na.fs.fed.us/spfo/pubs/silvics\\_manual/volume\\_2/populus/tricocarpa](http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/populus/tricocarpa)

### **Yakima Valley Audubon Society**

Stepniwski, Andy. 1999. Birds of Yakima County, Washington. Yakima Valley Audubon Society. ISBN 0-9674378-0-6.

#### **Abstract:**

**Staff Review:** *This book is a synthesis of ornithology for Yakima County. The book begins with an introduction and discussion of the methods used, a brief description of the geography and climate, a description of the vegetation zones, a brief history of Yakima County ornithology, birdlife through the seasons, good locations for finding birds, an annotated list of species, a summary of the distribution of birds, and data concerning bird surveys. The report indicates that there are approximately 302 bird species that inhabit Yakima County for at least part of the year. In the authors opinion, Yakima County's "claim to fame" is the diversity of migrant, breeding birds, especially noticeable along the and near the Columbia River at Priest Rapids, and the nearby ridges and riparian areas on the Yakima Traing Center. Riparian areas are noted as being critically important for avian diversity, especially in the shrub-steppe zone. A wide array of species are present in the riparian zone, the most diverse of any zone within the County. Many species in the riparian zone are migratory. The Shrub-steppe zone covers large areas of the County, but most has been extensively modified, more so than any other zone. The shrub-steppe zone is most active for birds from March through June. The Columbia River at Priest Rapids and nearby cliffs and shrub-steppe habitats attract great numbers of birds and a variety of speices, especially water birds. Bird habitat in the Yakima Valley lowlands mainly consists of converted habitats of agriculture. The Ponderosa Pine Zone exhibits a mosaic of habitats between souteren and northern slopes along the ridges. Most of the Ponderosa Pine Zone has been logged, altering the natural mosaic. Resident diversity of the Ponderosa Pine Zone is limited due to climate, but spring brings many migrants to breed. The Mixed-Conifer Zone has been greatly affect by logging, with numerous clear cuts in various stages of regeneration. These clear cut openings offer an array of several habitats, each hostong a bird fauna different from the original, mostly unbroken forest. The Mixed-Conifer Zone harbors a modest list of resident birds due to climate, spring however brings many migrants to breed. The Sub-Alpine*

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*Zone has been less affected by humans than the zones at lower elevations. The Sub-Alpine Zone harbors few resident birds due to climate, seasonally it attracts many migrants to breed with a delayed season due to elevation. Birdlife in the Alpine Zone is extremely limited due to climate, with late summer and fall migrations. This meets the statutory requirements for BAS.*

Cassidy, K.M., Smith, M.R., Grue, C.E., Dvornich, K.M., Cassady, J.E., McAllister, K.R., Johnson, R.E. 1997. Gap Analysis of Washington State: An Evaluation of the Protection of Biodiversity. Volume 5 in Washington Ste Gap Analysis – Final Report. Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, 192 pp.

**Abstract:** *The objectives of the Washington State Gap Analysis Project (WAGAP) were to map land cover; model the distributions of terrestrial vertebrates; identify land cover types, vertebrate species, and areas of high vertebrate species richness inadequately represented on protected areas; and make these data available to users in a readily accessible format. To achieve the latter, data and results are reported in both a hard copy and digital format. The hard copy format is a five volume report. Volume 1 is a description of current land cover and its conservation status. Volumes 2, 3, and 4 are atlases for herptofauna, mammals, and birds, respectively. This volume, Volume 5, is a summary and analysis of the information presented in the first four volumes, with our conclusions concerning conservation priorities.*

**Staff Review:** *Staff utilized a mapping methodology that utilized Gap data as one of the tools, but was not the only consideration in anitically mapping species richness and representation in Yakima County. For more detail on the mapping methodology, see Chapter 4.*

#### ***Roza/Sunnyside Board of Joint Control***

Smith, D. L., Johnson, G., Williams, T. 2006. Natural Streamflow Estimates for Watersheds in the Lower Yakima River. S.P. Cramer and Associates. Unpublished report submitted to the Roza/Sunnyside Board of Joint Control.

**Executive Summary:** *Irrigation in the Yakima Valley has altered the regional hydrology through changes in streamflow and the spatial extent of groundwater. Natural topographic features such as draws, coulees and ravines are used as drains to discharge irrigation water (surface and groundwater) back to the Yakima River. Salmonids are documented in some of the drains raising the question of irrigation impacts on habitat as there is speculation that the drains were historic habitat. We assessed the volume and temporal variability of streamflow that would occur in six drains without the influence of irrigation. We used gage data from other streams that are not influenced by irrigation to estimate streamflow volume and timing, and we compared the results to two reference streams in the Yakima River Valley that have a small amount of perennial streamflow. We estimate that natural streamflow in the six study drains ranged from 33 to 390 acre ft/year depending on the contributing area. Runoff occurred*

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infrequently often spanning years between flow events, and was unpredictable. The geology of the study drains was highly permeable indicating that infiltration of what runoff occurs would be rapid. For fish to use intermittent streams there must be local groundwater to maintain perennial pools and a reliable connection to other perennial water bodies. The study drains did not have a local groundwater, perennial pools or a reliable surface flow connection to the Yakima River prior to irrigation. We therefore conclude that there was no salmonid habitat within the study drains prior to irrigation."

**"Conclusions:**

1) Mean annual runoff for the study drainages was less than 400 acre ft/year (range 33-391 acre ft/year)

2) Natural streamflow contributed approximately 1% of the current streamflow in the study drainages.

3) Watershed area is important in determining mean annual runoff. Precipitation or runoff per unit area was not correlated with mean annual runoff. Larger watersheds have greater natural streamflow.

4) The temporal distribution of natural streamflow was unpredictable and several years can pass between flow events.

5) The role of geology on streamflow was important. Watersheds with greater than 80% low permeability substrates may support perennial surface flow. None of the study drains have a high percentage of low permeability substrates.

6) Study drains would be ephemeral with negligible benefit as fish habitat without the influence of irrigation."

**Staff Review:** This report, while unpublished or peer reviewed, meets the statutory requirements for BAS. This report estimates how the study drains may, or may not have provided fish (i.e. aquatic) habitat before the introduction of irrigation. The assumption that perennial water presence is required for a streams use as fish habitat could be questionable. Fish habitat would generally not exist in ephemeral streams, but some fish biologists may dispute that habitat is limited intermittent streams with perennial pools. Whether that would change the results of the study is unknown.

The problem is that there are a number of drains/streams within the county that currently, and have for quite some time, provided aquatic and riparian habitat; and state laws and administrative rules do not provide any guidance on their application to artificially enhanced/alterd habitat areas. This report concludes that the study drains/streams did not provide aquatic habitat, or habitat for salmonids, but does not assess the potential for other functional properties provided by intermittent and ephemeral streams, which includes upland wildlife habitat/migratory corridors, food web functions, and sediment sources for downstream perennial tributaries. This report oversimplifies the geologic/groundwater relationship. While the permeability of the geologic matrix can cause surface waters to become groundwater, that water does not simply disappear, but often will resurface somewhere downslope as a spring. A review of the General Land Office

(GLO) surveys along the leftbank of the Yakima River parallel to Rattlesnake Ridge indicated numerous intermittent/ephemeral tributaries with a surface connection to the Yakima River. One entry reads as follows: Jesse Richardson, Surveyor

"Field Notes of the \_\_\_\_\_ of the \_\_\_\_\_ boundaries of Township 9 N. of Range 23 E. of the Willamette Meridian, in the Territory of Washington, by Jesse Richardson deputy surveyor, under his contract. No. 88 \_\_\_\_\_ date the 24<sup>th</sup> day of Sept., 1866."  
"Commenced October 30<sup>th</sup> 1866"  
"Completed October 31<sup>st</sup> 1866"

"Between Townships 9 & 10 North, Range 23 E. W.M., General Land Description"

"This Township is well watered and embraces fine farming and grazing lands." "Flowing through this Township have formed and rendered productive a large proportion of its area. Although all of the brooks become dry in the summer. Springs of water North and the Yakama River South of this Township render the lands available at all seasons. Its grassy prairies are choice and superior, and are now grazed upon by large droves of American cattle and horses."

Yakima County and the Joint Board have agreed to work out the issues regarding drains/streams, including mapping, regulatory control, and the use of best management practices, in 2007.

#### **GEI Consultants Inc.**

Pizzimenti, John, J. PhD. 2005. Efficacy and Economics of Riparian Buffers on Agricultural Lands – State of Washington – Phase II. GEI Consultants, Inc. 311 B Avenue, Suite F, Lake Oswego, OR 97034. In association with the Pacific Northwest Project. 3030 West Clearwater #205-A Kennewick, WA 99336. Submitted to the Washington Aq Caucus.

**"Executive Summary.** This Phase II Report is an extension of the work done in Phase I. In Phase I, we examined the scientific literature of riparian buffers on agricultural lands. Best available science validates the importance of riparian habitat for fish and wildlife, but it does not validate the State Caucus proposal that wide fixed-width riparian buffers should be mandatory on all agricultural streams in the State of Washington to protect listed salmon... Since Phase I was complete we received comments on the report and found new scientific literature relevant to protecting Washington's critical areas. Buffers are one means of protecting the states watersheds and fish from agricultural impact. But many other scientifically tested methods recommended by the USDA Natural Resource Conservation Service are also important and may be more effective and cost-effective than mandatory fixed width buffers. These are commonly known as "Best Management Practices" on the farm. Phase II addresses "Best Management Practices" (BMPs) including the use of riparian buffers, which is one BMP. In summary, Phase II has three components: (1) a review of agriculture BMPs (2) a review of additional scientific literature on effectiveness of buffers and

other BMPs and (3) suggested approaches for applying BMPs including riparian buffers in Washington agriculture. Two additional appendices support these as follows: Appendix II includes detailed reviews of additional Scientific Literature supplied by NOAA Fisheries and other scientists and agencies; Appendix III is a suggested model county ordinance that can be adopted for meeting Washington Growth Management Act to protect Critical Areas. That ordinance, based on the Phase I and II reports, suggests a specific range of riparian buffers between 25 and 60- feet contingent upon employment of other BMPs, slope (gradient) and local precipitation. The ordinance is intended to be broadly "protective" of all ecological and water quality functions of buffers. Because significant economic aspects of buffer prescriptions must also be considered as well as special natural resource conditions, the ordinance provides an exemption process for the local county government for exceptional circumstances."

**Staff Review:** Section 4 of the report is a synthesis of BAS, and therefore meets the statutory requirements for BAS, although does not add any additional information on what was addressed in Phase I or this report. Section 3 discusses BMP's and references the NRCS FOTG (Field Office Technical Guide). While the FOTG may be considered science, the general discussion of BMP's in Section 3 is not. The remainder of the document does not meet the statutory requirements for BAS.

Appendix III, which includes the draft model ordinance, describes the purpose of a CAO system that the model ordinance is to fit within. "The Critical Area protection ordinance directs existing and future agricultural operations to review their..." Consequently, the Model ordinance would apply to existing farm operations. The existing and updated CAO/SMP is a development based ordinance that regulates new developments and uses with a number of development standards, including buffers, to mitigate for increased impacts on critical areas. The CAO/SMP does not regulate legally established, on-going operations, including agriculture, so the proposed model ordinance has limited applicability in Yakima County. The development of NRCS BMPs, or other scientifically based BMPs, constitutes the application of BAS, but since the CAO/SMP does not regulate on-going agriculture, their application would have to be on a voluntary basis. If a new agricultural operation were proposed within a critical area, the BMPs could be implemented to mitigate for increased impacts.