Independent Multidisciplinary Science Team (IMST)

State of Oregon

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October 20, 2006

Susan Knapp
Chair, Oregon Plan Core Team
Governor's Natural Resource Office
900 Court St. NE
Salem, OR 97301-4047

Dear Sue,

In February 2006, the Independent Multidisciplinary Science Team (IMST) decided to conduct an independent review of the federal document titled "*Sediment removal from active channels in Oregon: Considerations for federal agencies for the evaluation of sediment removal from Oregon streams*" (dated March 1, 2006; Version 1.0). The IMST is addressing this review to the Oregon Plan Core Team with copies going to the agencies that prepared the Federal Guidelines (US Fish and Wildlife Service, National Marine Fisheries Service, US Army Corp of Engineers, and US Environmental Protection Agency). The Core Team is welcome to use this review as it conducts its own review of the federal document.

In general, the IMST found the Federal Guidelines to be clearly written, factual, and in keeping with the documents stated goals. The literature cited is relevant, comprehensive, and useful for understanding the problem assessment and guidelines put forth. Earlier drafts of the document were peer reviewed by a group of well-credentialed and qualified academics and professionals experienced the field of geomorphology both within and outside of Oregon.

The effects of sediment removal from streams, as stated in the Federal Guidelines, conform to our understanding of the processes and physics involved. The recommendations made in the Federal Guidelines on where and when to site gravel removal operations and for mitigating the effects are based on empirical experience and have scientific validity. We found the evaluations by the federal agencies to be fair and balanced with no bias for or against instream gravel mining.

The IMST did find two main shortcomings with the Federal Guidelines. First, the authors use data or examples from sources that are not fully documented in several places. We identify relevant examples in a section of this review called "Specific Comments". Second, while the background information, monitoring, and recommendations for physical aspects of gravel mining are well detailed, the effects on biological components of instream and riparian

areas are lacking. Additionally, the species, habitat information, and discussions within the Federal Guidelines tend to be salmonid-centric. While salmonids are a major concern in Oregon, other important aquatic and riparian dependent species may be affected by sediment removal operations but are not addressed in the document. These are areas where Core Team agencies could provide further guidance to the authors of the federal document.

If the Core Team would like to discuss this review with the IMST, we would be happy to arrange for members to do so at a future Core Team meeting.

Sincerely,

Nancy Molina
IMST Co-Chair

Carl Schreck
IMST Co-Chair

enclosures

cc with enclosures
Michael Carrier, GNRO
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Tom Byler, OWEB
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Patti Smith, House Interim Ag. and Nat. Res. Committee
IMST

IMST Review of:
Sediment Removal from Active Stream Channels in Oregon: Considerations for Federal Agencies for the Evaluation of Sediment Removal Actions from Oregon Streams
(March 1, 2006; Version 1.0)

Released on October 20, 2006

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Oregon Plan for Salmon and Watersheds
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Review Preparation

This review was prepared by the IMST based on an initial draft by an IMST subcommittee (Carl Yee, Michael Harte, and Kathy Maas-Hebner (Oregon State University and Lead IMST Technical Support)). Janine Castro (US Fish and Wildlife Service) and Michael Tehan (National Marine Fisheries) discussed the preparation, goals, and intended use of the federal guidance document at the IMST's August 22, 2006 public meeting. The draft review was discussed at the August 22 and October 16, 2006 IMST public meetings and unanimously adopted (R. Hughes was absent from the final vote) at the October 16, 2006 IMST public meeting.

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Introduction

This document constitutes the Independent Multidisciplinary Science Team's (IMST) scientific review of the federal document titled *Sediment Removal from Active Stream Channels in Oregon: Considerations for Federal Agencies for the Evaluation of Sediment Removal Actions from Oregon Streams* (March 1, 2006; Version 1.0) written by the US Fish and Wildlife Service, National Marine Fisheries Service, US Army Corps of Engineers, and the US Environmental Protection Agency (USEPA). This review was conducted by the IMST because of discussions at IMST public meetings and was not requested by a state or federal agency.

Our comments are intended to be constructive and to help enhance future versions of the document (hereafter referred to as the Federal Guidelines) and to assist state agencies in their management of instream sediment/aggregate (i.e. sand and gravel) removal in Oregon. In the review below, our comments are not presented in order of importance.

In general, the IMST found the Federal Guidelines to be clearly written, factual, and in keeping with the documents stated goals. The literature cited is relevant, comprehensive, and useful for understanding the problem assessment and guidelines put forth. Earlier drafts of the document were peer reviewed by a group of well-credentialed and qualified academics and professionals experienced the field of geomorphology both within and outside of Oregon.

The effects of sediment removal from streams, as stated in the Federal Guidelines, conform to our understanding of the processes and physics involved. The recommendations made in the Federal Guidelines on where and when to site gravel removal operations and for mitigating the effects are based on empirical experience and have scientific validity. We found the evaluations by the federal agencies to be fair and balanced with no bias for or against instream gravel mining.

The IMST did find two main shortcomings with the Federal Guidelines. First, the authors use data or examples from sources that are not fully documented in several places. We identify relevant examples in a section of this review called "Specific Comments". Second, while the background information, monitoring, and recommendations for physical aspects of gravel mining are well detailed, the effects on biological components of instream and riparian areas are lacking. In general, Chapter 6, *Monitoring and Performance Criteria for Streams*, sufficiently covers the elements needed to conduct a technically sound monitoring program that determines on site and cumulative changes induced by gravel mining, however, the biological monitoring section does not include adequate guidance, methods, or references to the appropriate information (see IMST's discussion under "Biological Monitoring").

Additionally, the species, habitat information, and discussions within the Federal Guidelines tend to be salmonid-centric. While salmonids are a major concern in Oregon, other important aquatic and riparian dependent species may be affected by sediment removal operations and these need to be better accounted for in Section 4.3.2 titled

Identify species, life stages present, and habitat elements needed and 4.3.3 titled *Identify physical processes that create or maintain habitat elements*.

Organization of this review

This review begins with a description of its relationship to an earlier review of instream aggregate mining conducted by the IMST (July 31, 2002 letter to Governor John Kitzhaber, Senate President Gene Derfler, and House Speaker Mark Simmons). It continues with general comments addressing sediment budgets and associated monitoring followed by biological monitoring concerns. General comments are followed by a section with more specific technical comments. Finally, Appendix A includes editorial comments.

Relationship to the previous IMST review of instream aggregate mining

In an earlier review (July 31, 2002 letter to Governor John Kitzhaber, Senate President Gene Derfler, and House Speaker Mark Simmons; http://www.fsl.orst.edu/imst/reports/Gravel2002.pdf), the IMST evaluated the technical basis of the management and removal of instream aggregate resources in Oregon. In this 2002 review, the IMST found that the Division of State Lands (DSL) approached instream mining from an operation (or project) management perspective instead of from a resource management perspective that includes spatial and temporal considerations. The IMST identified several key issues that needed to be addressed by the DSL and its administrative board, the State Land Board, including effects on channel morphology, bedload transport rates and sediment budgets, cumulative effects, and effectiveness monitoring.

These issues are well represented within in the Federal Guidelines. However, one issue that is not addressed by either the state or the Federal Guidelines is the artificial segregation of instream and floodplain aggregates and their management. The IMST pointed out in 2002:

> "Gravel as an extractable resource is regulated by two separate [state] agencies, instream mining is regulated by DSL and floodplain mining is regulated by DOGAMI [Department of Geology and Mineral Industries]. Within stream and river systems, floodplains and channels are connected and do not function independently of one another. This separation in thinking maintains site-specific management approaches. The IMST advocates managing resources from a landscape perspective, which in the case of gravel resources includes the channel, floodplain, and uplands, which supply sediment to the stream/river system."

Managing aggregates at a more integrated basin-wide level requires sediment budgets or reasonable surrogates. The IMST used these same perspectives as the basis for the current review.

Sediment Budgets and Monitoring

Early in the Federal Guidelines, recognition is given to the need to balance gravel removal against gravel recruitment and accumulation in order to avoid extended impacts on channel morphology and anadromous fish habitat. While this is conceptually simple, annual gravel recruitment (the rate at which bed load is supplied from upstream to replace the extracted gravel) to a particular site is, in fact, highly variable and not well understood. As stated on page 46 of the Federal Guidelines, sediment transport in streams is highly variable over time because it is a function of stream flow and sediment availability (including delivery to the channel) which is difficult to characterize. Sediment replenishment events are cyclic and infrequent, therefore, average sediment yields are mathematical derivations not a reflection of actual sediment transport and availability. In fact, Kondolf (1993, 1994) dismisses the common belief that instream gravel extraction can be conducted safely so long as the rate of extraction does not exceed the rate of replenishment. Managing instream gravel extraction using this output equals input approach is flawed because it fails to account for the upstream and downstream effects that change the channel morphology as soon as gravel extraction begins.

The Federal Guidelines also recognizes that cumulative impacts of gravel extraction operations on anadromous fishes and their habitats should be addressed by federal permitting agencies and considered in the permitting process. The cumulative impacts on anadromous fish habitat caused by multiple extractions and sites along a given stream or river are compounded by other riverine and land use disturbances in the watershed. The Federal Guidelines indicate that sediment budgets that account for the effects of reservoirs and channel stabilization activities can be used for long-range management of sediment extraction. However, changes in upland management (e.g. agriculture, livestock grazing, forest management, and urbanization) and how it may affect long-term delivery of sediments to the channel and smaller tributaries may have significant effects on channel morphology or sediment delivery rates. IMST continues to state that individual gravel extraction operations must be judged from a perspective that includes their potential adverse cumulative impacts within the landscape. As indicated in IMST's 2002 review of aggregate mining, this is an integral part of any gravel extraction management plan.

As recognized on pages 46–48 of the Federal Guidelines, cumulative effects of changes in sediment supply need to be determined at the watershed level and can be done using sediment budgets. However, sediment budgets alone are not useful in determining if a channel or reach is aggrading, degrading, or is in equilibrium. This determination requires site-specific information along with watershed level data. The Federal Guidelines correctly recognizes that identification of stream aggradation requires a reconnaissance survey consisting of a combination of fieldwork and examination of existing data (using a combination of established methods and technologies listed on pages 47–48) for making sure interpretations are realistic and well tested.

The list of established methods and technologies that can be used as part of reconnaissance surveys (pages 47–48 in the Federal Guidelines), includes field sampling

and surveys, modeling, GIS technology, and analyses of archival materials and historical databases (e.g., aerial photographs, maps, previous surveys, etc.). These methods and technologies are used to characterize and identify species distributions and abundances; identify habitats critical to fisheries management objectives and federal responsibilities under a variety of legislative mandates; determine the limiting environmental factors of the anadromous fish populations; calculate sediment budgets and hydraulic flow rates; predict possible changes in water quality, channel morphology, among others.

While the development of sediment budgets can be problematic, as mentioned in the Federal Guidelines and above, IMST suggests that an additional source of data exists that could give supplemental information that may serve as a partial surrogate to sediment budgeting. This is the USEPA Environmental Monitoring and Assessment Program (EMAP). This program was initiated by USEPA to estimate the current status and trends of the nation's ecological resources and to examine associations between ecological condition and natural and anthropogenic influences. Two major features of EMAP are the use of probability-based sample site selection and the use of ecological indicators (Stoddard et al., 2005).

The statistical summary prepared by Stoddard et al. (2005) includes three types of habitat variables: continuous parameters such as thalweg profile and presence or absence of fine sediments, transect parameters such as width, depth and channel incision, and reach parameters such as instantaneous discharge. Such data could be used over sequential measurement periods to determine if a channel or reach is down cutting, stable, or aggrading. Incising channels or reaches would obviously not be candidates for gravel mining.

Biological Monitoring

Section 6.2, *Biological Monitoring Methods*, of the Federal Guidelines would benefit from a comprehensive revision. This section is very brief and primarily focused on salmonid habitat; as opposed to monitoring biological organisms. The current version does not include any biological or habitat monitoring methods. A sound monitoring program should include monitoring both habitat and organisms. To be an equally usable counterpart to the physical monitoring descriptions included in Section 6.1, *Stream Channel Monitoring Methods*, the authors may want to expand the discussion to include the following elements:

1. other aquatic biota including non-salmonid fishes, benthic invertebrates, mollusks, non-native and invasive species;
2. riparian dependent species including vertebrates, invertebrates, and plants;
3. water quality;
4. temporal (immediate, near-future, and long-term effects and monitoring) and spatial (on site, up and down stream of operations, and riparian corridor) aspects;
5. cumulative effects both temporal and spatial;
6. surrogate measurements that could be used if monitoring the actual organism is not feasible.

Because the final methods recommended by the federal agencies will be determined by a combination of technical and policy/management choices and the stream/river system being considered, the IMST is not recommending any specific methods. The IMST, however, would be willing to review future revisions to this section.

Specific Comments

Several areas in the document indicate that either data or information on Oregon streams is available but the sources and details for this information are not adequately documented. The authors also draw unsubstantiated conclusions. Other areas cite old data. These include the following statements:

Section 1.2 page 7 – "*According to Oregon Department of State Lands (DSL) records, there are currently about 65 active sand and gravel operations in streams in Oregon, including the South Umpqua, Willamette, Columbia, Chetco, and Rogue Rivers. Almost all operations except those on the Columbia River utilize bar scalping to obtain material."* There is no indication of the number of operations, where they are located within the river system, or how much material is removed so that federal agencies can consider cumulative impacts. There is also no indication on what extraction method is used on the Columbia and what other methods are used on the other rivers when "almost all" operations are bar scalping.

Section 1.2 Page 7 – "*DSL reports that annual <u>permitted</u> aggregate extraction rate (based only on the operations that pay royalties to the state) from streams is approximately 5.5 million cubic yards per year. However, the amount permitted is generally 30 to 50 percent greater than the actual amount extracted (OWWRI 1995), resulting in actual extraction rates of 3.7 to 4.2 million cubic yards per year.* It is uncertain if the amounts reported by DSL were cited from OWWRI (1995) a document now 10 years old or if the numbers are more recent.

Section 3.2, Page 24, 1st paragraph – The statement ending the paragraph "*Few monitoring programs associated with commercial sediment removal projects in Oregon are capable of detecting the fundamental bed degradation over time scales...*" a citation from the information source that lead the authors to this conclusion and any comparisons that were made to programs that can achieve this level of detection would increase the credibility of the statement.

Section 3.3.1, Page 25 – The connection between sediment removal and riffle habitats potentially becoming a barrier to adult fish migration is not well known so a citation for this is needed.

Section 3.3.2, subsection e, page 28 – The statement "*This phenomenon has been directly observed at a gravel mining site on the South coquille River in southwestern Oregon*" a citation would increase the credibility of this statement and it would be helpful to include

the type and magnitude of changes that were observed. Additionally “coquille” is capitalized, but “South” is not capitalized.

Section 3.3.6, page 34, subsection a, 3rd paragraph – The statement “*Multiple observations by NOAA Fisheries biologists...*” a citation for the source of information either a document or a personal communication would increase the credibility of this statement.

Section 4.2, page 44-45 – “*Although the commercial extraction of stream sediment is a historical industry within which there is copious accumulated practical experience, there is surprisingly little in the scientific literature in regards to minimizing adverse ecological impacts while maintaining present extraction rates.*” seems to be contradictory to the statements made in the paragraph following the statement: *“Commercial sediment removal generally poses low risk in channel locations where: (1) degraded habitat can be improved by sediment removal, (2) interactions between aquatic species of interest and negative effects due to sediment removal are known (and are rare or non-existent), and where (3) risks of habitat loss caused by long-term geomorphic adjustments are low.”* If there are data to support the statements on what channel locations are low risk and where specific operations have addressed one to three of the listed situations, the inclusion of that information would be helpful to the reader.

Section 4.3.1, page 49, section e – What data or sources back up this assumption that “*seasonally dry stream channels are better candidates for sediment removal than channels with perennial flow*” when the authors then state “*... because immediate impacts can be more effectively addressed, although significant delayed effects may go unnoticed for many years.*”

Section 4.3.3, section d, page 51 – The authors state that “*where spawning may occur, it is recommended that disturbance of the hydraulic flow field and fluvial processes that result in spawning gravel sorting and accumulation at riffles be avoided*”, but no sources are listed on how to accomplish this other than “*by avoiding the disturbance of bars with elevations below the bankflow stage in natural channels, or below the effective discharge stage in manipulated channels”*. Citations for long-term effectiveness monitoring or experimental studies would increase the credibility of these statements.

Section 4.3.4, page 51 – “*It is recommended that site specific geomorphic features and habitat values be used to identify preferred post-extraction conditions, with the findings applied to minimize the deleterious effects of sediment removal*” and “*...it is recommended that the methods of sediment removal be designed to enhance topographic complexity within the channel, and to encourage natural restoration of self-sustaining geomorphic features and associated aquatic and riparian habitats.*” Providing documentation for situations/case studies that used the following recommendations and have been successfully implemented would be useful and increase the validity of the recommendations.

Section 4.4.4, Page 53 – This section discusses the "Redline" method used in other states but there are no citations to be able to evaluate it. The pros and cons of the method are not addressed until the 2nd half of the 2nd paragraph and these need to be more prominent (this is true for other methods discussed in the document). The last paragraph states "*Redline methods can provide adequate short-term protection of low flow channel habitat for fish migration*" but does not include a citation for the monitoring or experimental data. Additionally, a key point is at the end the end of the discussion and not well high-lighted "*...the long-term protection of the geomorphic processes that maintain riffle-pool complexes and deep pool habitats cannot be provided by the use of redline methods alone, unless accompanies by relatively high vertical offset.*" It also does not include a citation for the monitoring or experimental data.

Section 4.4.5, page 53 – This section indicates that the Oregon Department of Fish and Wildlife has recommended that permit conditions include a requirement for grading and shaping sites after extraction to prevent fish entrapment, and the bar be sloped to maintain a positive flow back toward the main channel to prevent strand but no citations are provided to indicate that this is effective.

Section 4.5, page 55 2nd paragraph – The authors state "*All of these recommended actions require thorough planning, development, implementation, and especially monitoring*" but do not indicate what type of monitoring (compliance, implementation, effectiveness or all) or for how long. The recommendations following this statement have no citations referring reader to monitoring guidelines published elsewhere.

Section 4.5.2, page 56, 3rd paragraph – "*This approach appears to be working well at a few sites in California,....it has not been rigorously evaluated for effectiveness over the long-term. Application of this method <u>should be considered experimental</u>, and... accompanied by a robust monitoring effort.*" There are no references to indicate who and where the work is being done in California, what information on short-term effects are available, and no indication on what constitutes a "robust monitoring effort". The cautions of using this method are more appropriate at the beginning of the discussion not buried in the 3rd paragraph.

Section 5.3, page 61, 2nd paragraph – The statement ending "*...the Willamette River provides and excellent example*" would be more credible if accompanied by a citation and the inclusion of figures or data to help substantiate the statement.

Section 63, page 63, 3rd paragraph – "*After meeting all state monitoring requirements... project... should need only minor follow-up monitoring to confirm habitat protection*" assumes that those requirements go beyond compliance monitoring (i.e., effectiveness monitoring) and that the recommendations followed were actually effective. The effectiveness of the recommendations have not been shown in the document.

Literature Cited

Kondolf, G.M. 1993. The reclamation concept in regulation of instream sediment mining. Landscape and Urban Planning. 28: 395–406.

Kondolf, G.M. 1994. Environmental planning in regulation and management of instream sediment mining in California. Landscape and Urban Planning. 29: 185–199.

Stoddard, J.L., D.V. Peck, A.R. Olsen, D.P. Larsen, J. Van Sickle, C.P. Hawkins, R.M. Hughes, T.R. Whittier, G. Lomnicky, A.T. Herlihy, P.R. Kaufmann, S.A. Peterson, P.L. Ringold, S.G. Paulsen, and R. Blair. 2005. Environmental Monitoring and Assessment Program (EMAP) Western Streams and Rivers Statistical Summary. EPA 620/R-05/006. U.S. Environmental Protection Agency. Wash. D.C. 1762 p.

Appendix A. Editorial Comments

Not all acronyms are defined within the text. A list of acronyms within the document would be helpful.

There are several undefined terms (e.g. aggradation, degradation, planform, thalweg) and a glossary would be helpful for non-geomorphologists and hydrologists that will be using this document.

With citations, there is an inconsistent use of “et al.” and “and others”. For example, Gregory and others (1991) and Gregory et al. 1991 are used in the same paragraph on page 31.

There is an inconsistent use of US Army Corps of Engineers, USACE, and the Corps.

When multiple citations are listed for a statement, the authors sometimes mix primary publications with secondary publications. It would be useful to point out which citations are actually reviews of other professionals’ work and are not based on primary research.

Section 1, Page 5, 1st paragraph – An adequate reference for “Ordinary High Water” or include it’s legal definition within this document since it is the basis for “instream” used in the document is needed. Also, in Line 5 replace “between” with “among”.

Section 1.1 The federal acts listed within this section do not include adequate citations.

Section 2.1.1., Page 12, 1st paragraph – The statement “*Hence, for a stream in equilibrium...*” could use a qualification if this conclusion is for all stream types, all sizes, and in all regions of Oregon.

Section 2.3, Page 16, last sentence – Not all native riparian plant communities are forests, many maybe shrub and/or grass dominated.

Section 2.3.1 Page 17, 2nd paragraph – What is meant by “Frequent *communication* with the floodplain”?

Section 2.3.1, Page 17, 3rd paragraph – “*The ‘damage’ done by large, less frequent floods...*” Damage is a judgmental term. Floods cause disturbances and may not result in “damage” to the ecosystem but could assist restoration efforts.

Section 2.3.1, Page 17, 4th paragraph – What is meant by “*rejuvenate mature riparian stands to early successional stages...*” ? This again is a value laden, not an ecological statement. Plant communities can be altered and disturbance can move them into an earlier successional stage. A mature stand is not rejuvenated; it is replaced by an earlier sere.

Section 2.3.2, Page 17 the space between the 1st and 2nd paragraphs is missing.

Section 2.3.2, Page 17, 2nd paragraph – "*Mature, late succession vegetation*" would be more appropriately referred to as "late successional forests". Plant communities can be late successional and not have trees that could eventually provide the large wood referred to in the next sentence of the text.

Section 2.3.2, Page 18, last paragraph – Riparian vegetation "buffers" not "protects" stream temperatures. The word "canopy" should be plural. Additionally, not all riparian plant communities are of sufficient stature to shade the stream channel, particularly larger channels such as river mainstems.

Section 3.1.2, Page 21, 2nd paragraph – "bank retreat" is used within this paragraph but using "erosion" instead would make the paragraph consistent with the section title and other statements made within this section.

Section 3.3.1, subsection c, Page 27 – The authors may want to note that not all stream systems have hyporheic flow and in streams with hyporheic flow the amount of exchange can vary greatly between streams and between reaches.

Section 3.3.1, subsection d, Page 27 – The use of "debris" with large and small wood has a negative value associated with it. Ecologists are now using "large wood" without the debris. The acronym LWD is also out of place within the discussion.

Section 3.3.3, Page 29, 1st paragraph – It would be appropriate to indicate that the aquatic species listed in Line 3 are in Oregon and to include scientific names along with the common names since this is the first time these species are mentioned. In Line 2, the proper reference to the agency is "USDA Natural Resources Conservation Service"

Section 3.3.3, Page 32, 1st paragraph – The personal communication reference for J. Christy would be more credible if it includes an agency or other affiliation for this person. A professional title would also add credibility to the communication.

Section 3.3.5, subsection d, page 34 – "Superfund sites" is not defined. The last sentence of this paragraph is very awkward and could be rewritten for clarity.

Section 3.3.6, page 34, 1st paragraph, Last Line – does the "many species" include terrestrial riparian species or just aquatic species? And is "species of concern" a legal reference or does it include species not state or federally listed or considered for listing?

Section 3.3.6, subsection d, Page 36, 3rd Line – Should "conditions" be replaced with "habitats"?

Section 3.3.6, subsection e, Page 37, 2nd paragraph – How does the disturbance of riparian vegetation and habitats for amphibians and reptiles affected by disturbances relate to the actual mining operations (e.g., equipment access to streams)?

Section 4.3.1, subsection b, Page 48, 5th bulleted item – Omit the word "horizon" at the end of sentence; the term "buried soil" is sufficient. One could also use the more specific technical term "Paleosol" instead of "buried soil", but this adds unnecessary technicality.

Section 4.3.3, subsection a, Page 50 – It would be more appropriate to specify native riparian communities in this subsection. High densities of non-native and/or non-riparian species may indicate degradation of the channel or banks may have already occurred. Riparian forests adjacent to the immediate channels of concern are not the only sources of large wood; wood is also transported by debris flows that are not part of the "normal channel migration processes".

Section 4.4.7, page 54, 5th line – The correct spelling of "there" is "their".

Section 4.5, page 54, 2nd paragraph – When referring to "unaltered reaches" are the authors referring to reaches that have not be changed by instream sediment removal or does "unaltered" include other anthropogenic alterations such as rip rap, channelzation, excess bank erosion, etc.

Section 4.5.4, bullet # 1, page 58; page 59 1st line (and other places)– Historical is the correct word, not historic. Historic means having considerable importance such as a document, a place, an event, or law.

Section 4.5.4, page 59 last sentence of paragraph – "Removing large stands of mature woody vegetation...." It would be more appropriate to use "removing large areas of established riparian communities" since the communities may be dominated by grasses, sedges, or herbs not trees and shrubs. Grasses and sedges can have considerable root density and strength and removal can have similar implications to banks as removing woody plants.

Section 4.5.4, page 59, bullet # 5 – "live poles" is jargon and has not been defined. The statement could end with just "vegetative plantings" which leaves it open for site appropriate vegetation to be used.

Section 5.1, page 60, last line – Since USFW has jurisdiction over freshwater fish and is mentioned earlier after NOAA Fisheries/NMFS this would be more correctly stated as: "...any adverse impacts to native anadromous and resident fishes and their habitats"

Section 6, page 63, 1st line – Write out Oregon sediment removal rather than us acronym (OSR) since it is not used a lot throughout the document.

Section 6, page 63, 3rd paragraph – Paragraph refers to "… the four steps outlined in section 4.2 …" but the reader cannot clearly identify the four steps when reading section 4.2 on pages 44–45. Either the reference to the section is incorrect or section 4.2 is in need of revision to more clearly state the four points.

Section 6.1, page 65, item "g" – insert space between "# 7" and the word "and"

Section 6.3, page 68, 3rd paragraph – Scientific species names are needed for the knotweeds; there is actually a complex of knotweeds not just one species. " Knotweed" is not capitalized. Suggest deleting the word "cuttings" as it implies horticultural methods. Broken stems and rhizomes are dispersed and both can resprout; eroding banks during high flows will also dislodge and disperse pieces down stream. This paragraph involves invasive plants but is there any concern with transport of non-native aquatic species either with mined sediments or contaminated equipment used at multiple sites?

Section 7, page 69 – "Bjornn, T.C. **and seven coauthors.** 1974" is incomplete.