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TO: North Coast Watershed Assessment Program Management Team

The University of California Center for Forestry has been asked to coordinate a scientific peer review of the Resources Agency's North Coast Watershed Assessment Program's (NCWAP) "Watershed Assessment Methods Manual." To carry this out, the Center arranged for a group of scientists to review the overall manual and provide a brief synopsis of their overall evaluation of the scientific merit of the work, with special reference to strengths and weaknesses of the approach proposed. All comments were provided directly to me. I will provide a very general synopsis of the overall comments received below. In addition, there is attached to this cover letter, a copy of the individual comments, including actual notes by various reviewers within the body of the manual itself.

Scientific peer review is a typical procedure followed in the evaluation of scientific journal articles to ensure that inferences and conclusions of a scientific work are logical and clear, and that appropriate analytical procedures are followed that support these. Peer reviewers are sometimes kept anonymous by the review coordinator or editor to minimize personal bias. Because of the broad, interdisciplinary nature of the NCWAP Methods Manual, I have chosen to let the Management Team see the comments of the various reviewers to give their context. Part of the culture of scientific peer review is that they often emphasize the weaknesses or shortcomings of the work, while not adequately complementing the positives. However, although the comments often appear hard hitting, they are always intended to be constructive. Topics not addressed by a reviewer are usually considered to be acceptable. The goal is to ensure that the work is defensible based on the body of science.

There were eight different reviewers of the draft manual. These are:

- Gerald E. Weber, Geological Consultant, Santa Cruz, Certified Engineering Geologist (CEG)
- Matt O'Connor, President, O'Connor Environmental, Inc., PhD, Registered Geologist (RG)
- George Ice, Nat. Council for Air and Stream Improvement, PhD, Professional Hydrologist (PH), Registered Professional Forester (RPF), Certified Forester (CF)
- G. Mathias Kondolf, Associate Professor of Env. Planning and Geography, UC Berkeley, PhD
- Frank Ligon, Stillwater Sciences, Berkeley
- Thomas E. Lisle, USDA Forest Service Pacific Southwest Research Station, Arcata, PhD
- Leslie M. Reid, USDA Forest Service Pacific Southwest Research Station, Arcata, PhD
- Robert R. Ziemer, USDA Forest Service Pacific Southwest Research Station, Arcata, PhD

Some of the general items brought forward by the reviewers are described below.

In general, the concept of NCWAP and a state-sponsored watershed assessment was applauded. Most of the reviewers made comments that complemented the interdisciplinary, interdepartmental approach to watershed assessment. The general approach was felt to be a great improvement over anything attempted in state in the past. The reviewers felt that NCWAP was an important and ambitious program for the state. Most reviewers felt that

the manual was well organized, clear, and well written. There are many wording and grammatical suggestions that are found in the attached annotated copies by the various reviewers.

At least two of the reviewers had some problems with the reference to this document as a manual. They pointed out that it is more of a general policy overview or blueprint of the NCWAP program. It really doesn't lay out a procedure that can be applied from watershed to watershed, but gives a broad strategic overview of the general approach. One reviewer suggested it might be better to start with a prototype assessment for the first area, and then to conduct a peer review of actual approach used, as a guide other assessments. Another suggested that the manual was lacking by not having a concrete example of application of the methods described.

Both Ice and O'Connor had good suggestions for improving the description of other watershed assessment methods used in the West. Their reviews provide some corrections for the descriptions of existing northwestern watershed assessment programs that should be incorporated into revisions.

In general, the reviewers felt that the draft manual doesn't spell out in enough detail how individual scoping will occur in specific watersheds. I know that I heard this discussed in several of the public meetings in some detail. The manual needs more description about how this will be addressed. Several reviewers emphasized that this initial scoping is perhaps the most important starting point of the watershed assessment. They also pointed out that preliminary initial scoping efforts should bring in the land history analysis, as this would form the basis for other modules.

There were several comments that the draft manual needs a clearer statement of how the critical questions will be answered through the formulation of hypotheses that will be tested through the development of data collection procedures. There is a very good suggestions about how the entire NCWAP process could utilize a formal adaptive management approach (see Kondolf suggestions especially).

Several reviewers pointed out that the manual really only addresses a limited number of the beneficial uses of a watershed. Although I understand that that the scope of NCWAP is largely governed by the legislation that established the program, there should be more of an attempt to evaluate where additional questions about watersheds might be addressed as well (see especially Lisle, Reid, Ziemer comments and their Table 2). Some reviewers felt that many of the controversies about watershed impacts, and the need for planning and assessment, will be inadequately addressed by limiting the scope of NCWAP. Revisions should carefully consider the point raised by reviewers about why certain important watershed questions are not included.

There were a number of concerns raised about the data itself. Several reviews pointed out that ideally, the process followed should establish baseline data that has sufficient statistical power to answer the critical questions the data is being collected to address. Data development should lay the framework to serve as part of a longer term monitoring program. It may be necessary in revisions of the report to obtain statistical advice on the design of data collection so it can be used to evaluate changes. Reviewers felt that the manual needs to have a discussion of monitoring. It was pointed out that the program can't answer questions by just collecting data. There were also concerns expressed about using data from various sources and time periods. A formal appraisal of how the data will be collected, and limits to its use should be spelled out. The watershed assessment should drive the data development – not the data development driving the watershed assessment. This needs to be an ongoing process that doesn't stop with the final report.

The discussion of the Limiting Factors Analysis (LFA) raised the most comments by reviewers. Most felt this section needs to be revised and clarified. The recent EMDS training session for NCWAP staff should make this easier. Many of the reviewers were concerned about the availability and quality of data, the validity of proposed models, and the need to consider cumulative impacts. The analysis needs to consider limiting factors relative to natural conditions. There was concern expressed that without this evaluation of natural range of variability of watershed factors, that alternations of natural conditions may have unintended consequences for species not included in the NCWAP review, but nonetheless important. Much more description is needed on how the desired

conditions or reference conditions will be met. A stronger link is needed between in-stream conditions and current land use activities. The process also needs to consider what is physically achievable in a given stream reach or planning watershed.

Specific to the EMDS Expert System, there were a number of concerns raised about its use. What provisions are being made to ensure that the correct factors are being chosen? What is the feedback loop to validate and modify the model? Does the data to support the hypothesized relationships exist, or will it be collected? The example graphs illustrating the use of EMDS in the manual need to document the source of the relationships presented. There are concerns about inferences drawn from poorly documented relationships. There is also concern that inappropriate use of the model will result in a "Garbage In Garbage Out" situation. The hypothesized model needs to be tested in a location where there is fish population data to demonstrate the utility of this approach.

Reviewers raised concerns about how sediment transport will be evaluated in the watershed assessment process. The landslide mapping data doesn't appear to tie-in with the critical questions posed on erosion processes and stream health. The description in the manual does not make this link. There was a lack of specificity of the surface erosion model to be utilized. The large number of landslide maps to be generated was felt to potentially provide much useful information on sediment transfer process, however, this would involve additional spatial analysis and risk rating approaches not described, rather than the process being limited to just the maps. Also, NCWAP needs an evaluation of other sources of sediment transport (roads, land use change, etc.). The process could also could utilize modeling approaches such as SHALSTAB, and compare the model results with actual landslide data. The erosion module of the manual needs additional work to address some of the questions of sediment transport.

Concerns were raised about the stream gauge stations used in NCWAP. To address the critical questions posed, reviewers felt it really is necessary to evaluate the potential for establishing headwater gauges. Reviewers were also concerned that even though there would be a large investment in gauges and collection of historical time series of flow data, the report indicates that only mean, maximum, and minimum flow data will be used. The analysis should also consider evaluation of flood frequency, flow duration, seasonal hydrograph patterns, inter-annual variations in flow, and possibly other information as well.

The direction for synthesis of results for the entire watershed assessment between the diverse disciplines and state departments is not clearly spelled out. The reviewers commented that there was not a clear direction on how the synthesis will occur as part of NCWAP. There was concern that the management team lacked the necessary authority to override individual departmental priorities. This perceived lack of authority may create problems in the timely submission of products, or uniform commitment by the various agencies. If this problem has been dealt with by administrative procedures, these should be spelled out in the final draft.

There are many additional good, constructive comments throughout the evaluations by the various individual reviewers. The management team should spend the time to review and consider all of these comments thoroughly. The final revision should consider how addressing these points can enhance the scientific merit of NCWAP.

I would like to personally commend the management team for development of the NCWAP Manual. It is impressive that you have been able to break downs bureaucratic barriers that have kept the various departments separate over many years, to produce an integrated, well-thought out strategy.

Please let me know if you have any questions about any of the points raised in these reviews.

Sincerely,

Richard B. Standiford
Associate Dean of Forestry
Center for Forestry