



# North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

## A2. Table of Contents –

<b>GROUP A: PROJECT MANAGEMENT</b>	<b>1</b>
A1. Title and Approval Sheet	1
A2. Table of Contents	2
A3. Distribution List	3
A4. Project/Task Organization	3
A5. Purpose Statement/Problem Definition/Background	4
A6. Project Task/Description	5
A7. Measurement Quality Objectives	6
A8. Training Requirements and Certification	7
A9. Documentation and Records	7
<b>GROUP B: DATA GENERATION AND AQUISITION</b>	<b>8</b>
B1. Sampling Process Design	8
B2. Sampling Method Requirements	10
B3. Sample Handling and Custody Procedures	12
B4. Analytical Methods Requirements	12
B5. Quality Control Requirements	13
B6. Data Management	13
<b>GROUP C: ASSESSMENT AND OVERSIGHT</b>	<b>13</b>
C1. Assessment and Response Actions	13
C2. Reports to Management	14
<b>GROUP D: DATA VALIDATION AND USABILITY</b>	<b>14</b>
D1. Data Review, Validation, and Verification	14
D2. Validation and Verification Methods	14
D3. Reconciliation with Data Quality Objectives	14
<b>APPENDICES</b>	<b>15</b>
AppA. Revision History	15
AppB. Attachments	15

## North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

### A3. Distribution List

The following is a list of all the individuals and their organizations who will receive a copy of the plan.

<b>Name</b>	<b>Organization</b>	<b>Telephone</b>
Liz Vollmer-Buhl	Siuslaw Watershed Council	(541) 268-3044
Kami Ellingson	USDA/USFS-Siuslaw National Forest	(541) 750-7101
Bobbi Lindberg	Oregon Department of Environmental Quality	(541) 687-7353
Larry Marxer	ODEQ TMDL Monitoring Coordinator for the Lab	(503) 229-6859
Doug Drake	Oregon Department of Environmental Quality	(503) 229-5350
Paul Measeles	Oregon Department of Agriculture	(503) 986-4778
Leo Poole	Bureau of Land Management	(541) 683-6606

### A4. Project/Task Organization

The following lists the individuals or organizations that will be leaders in the project.

<b>Name</b>	<b>Project Title/Responsibility</b>	<b>Contact</b>
Bobbi Lindberg	Mid-Coast TMDL Coordinator	(541) 687-7353
Liz Vollmer-Buhl	Siuslaw Project Manager	(541) 268-3044

# North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

## A5. Purpose Statement, Problem Definition, Background

The North Fork Siuslaw (NFS) is listed as water quality limited under Section 303(d) of the Clean Water Act (CWA). This listing was based on limited synoptic stream survey data collected by the United States Forest Service (USFS) and presented in the NFS Watershed Analysis. In order to support the ongoing Oregon Department of Environmental Quality (ODEQ) led Mid Coast Total Maximum Daily Load (TMDL) effort, additional data on instream physical habitat was collected & analyzed in 2007 and 2008 using the Environmental Protection Agency's (EPA) Environmental Monitoring Assessment Program (EMAP) protocol. The methods and findings of this study are discussed in detail in the report titled: *North Fork Siuslaw Sediment & Physical Habitat Assessment* (2007 study) which can be obtained through the Siuslaw Watershed Council (SWC) or through Demeter Design. This report provides data on physical habitat conditions which was collected at 22 randomly selected and spatially balanced sites throughout the NFS. This data was compared to minimally disturbed, erodible geology (to be consistent with the erodible Tyege geology of the NFS) reference sites throughout the Coast Range Ecoregion III. **This process was consistent with the most recent guidance from the ODEQ and EPA. Additionally, DEQ and EPA scientists were consulted throughout the process, and provided input on the conclusions.** This study was initiated by the SWC and ODEQ in an effort to better understand these issues. ***The findings of this study, and those of the previously completed NFS assessment, are presented as recommendations only to the SWC and ODEQ.*** The ODEQ and EPA are legally charged with implementing the CWA, including final judgment of impairment and the development of appropriate water quality standards.

The results of the 2007 study indicated that sand and fine sediment levels in the NFS were significantly greater than reference conditions. Large wood volume was found to be lower than reference conditions as were shade scores while width to depth ratios were greater on average than reference sites indicating a widening of the stream channel. Several hypotheses were developed following the completion of the 2007 study.

- One hypothesis is that the fine sediments which were historically deposited in pools and onto the floodplain via large woody debris are now being transported more effectively and depositing more uniformly throughout the system (e.g. evenly in riffles, glides, etc. as opposed to settling in impoundment pools, at the tail out of scour pools, or on the floodplain) as a result of active wood removal.
- A second hypothesis is that wood volume in headwater channels (CLAMS hydro layer stream order 1 and 2) may be lower than in minimally disturbed conditions and that the increased stream power is resulting in the increased transport of fine sediments into the stream network.
- A third hypothesis is that landslide frequency has changed over the past two decades. In **some** cases, roads and timber harvests on unstable slopes may be instigators of these events. More stringent BMPS put into place over the past three decades are hypothesized to have influenced trends in landslide frequency.

## North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

- A fourth hypothesis is that land-use is not influencing instream sediment levels and that fine sediment levels within the NFS are naturally elevated in comparison to reference.
- A fifth hypothesis is that while LWD volumes are below reference, boulders in the headwaters may be serving the same role as LWD in regards to sediment retention.
- Finally, severe down-cutting of the stream channel has occurred along the lower mainstem (likely a result of wood removal and channelization for pasture) resulting in widespread bank slumping. This was photo-documented during the 2007 assessment. This is a potential point source of sediments but will not be evaluated in the analysis detailed in this plan.

Following the 2007 study and the resulting questions/hypotheses, the SWC and the ODEQ initiated a second study to further evaluate sediment within the NFS. This SAP is designed to investigate the hypotheses listed above.

Stream Name	Miles	Watershed/Sub-Watershed
Drew Creek	0 – 3.2	Siuslaw/North Fork
McLeod Creek	0 – 7.4	Siuslaw/North Fork
Morris Creek	0 – 3.9	Siuslaw/North Fork
North Fork Siuslaw River	0.4 – 27.3	Siuslaw/North Fork
Porter Creek	0 – 4.9	Siuslaw/North Fork
A5-1: NFS Streams Water-Quality Limited per 303(d) List for Sedimentation.		

### A6. Project Task/Description

The task of the second study (herein referred to as the 2009 study) is to collect and analyze data relating headwater (CLAMS hydro layer stream order 1 and 2) conditions to instream conditions in the greater NFS and to relate headwater conditions in reference watersheds to their respective downstream conditions. This is intended to clarify the relationship between the NFS and the reference pool and to identify the parameters which influence fine sediment transport and deposition within the NFS. During the 2009 study a combination of field measurements will be collected, GIS data layers will be analyzed, and the available literature will be reviewed. The field and analytical protocols to be used in the 2009 study are listed in sections B2 and B4 respectively. Largely as a result of land ownership within the basin, surveys will be conducted only on publicly owned land as the USFS is the majority headwater owner (~95%). For each of the following tasks the assumption that minimally disturbed watersheds (within the appropriate ecoregion and geological bin) serve as appropriate controls when evaluating current instream conditions. The following lists the specific task descriptions for the 2009 study.

## **North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment**

### **Task 1) Measure wood volume in headwater streams in the NFS and in reference watershed**

**headwaters:** As headwater streams constitute the majority of coastal stream networks and are often high gradient with unstable slopes, they supply a large proportion of the sediment and wood which enter larger stream channels. The 2009 study is investigating the hypothesis that perturbing headwater function and morphology through wood removal results in increased downstream fine sediments. In order to address the hypothesis that past headwater disturbance and wood removal resulted in increased downstream fine sediments large wood volume in headwater channels in the NFS will be compared to wood volumes in reference watershed headwaters. This task is intended to address hypotheses 1,2, and 4. – age of slides

### **Task 2) Measure riparian and hillslope vegetation along headwater streams in the NFS and in**

**reference watershed headwaters:** Riparian vegetation is an indicator of hillslope processes. Riparian vegetation will be evaluated in both the NFS and reference watershed headwaters to provide information on upslope processes and their impact on instream sediments. This task is intended to address hypothesis 3 and 4.

### **Task 3) Compare boulder counts and bedrock proportions in the NFS headwaters to those within**

**reference watershed headwaters:** Boulders can influence stream power and sediment transport in the same manner that LWD does. This task is intended to address hypothesis 5.

### **Task 4) Evaluate road condition throughout the NFS:**

Roads can potentially introduce sediments to a watershed. Field surveys will be conducted to evaluate the condition of the road beds throughout the watershed, as well as the effectiveness of water bars and drainage ditches. This task is intended to address hypothesis 3.

### **Task 5) Evaluate existing sediment related Best Management Practices (BMPs) in the NFS:**

A literature review will be conducted to document BMPs. Direct evaluation of effectiveness is outside the scope of this project.

### **Task 6) Evaluate Evidence of Landslides:**

Landslides will be evaluated in the field and by using aerial photography. Landslide analysis using aerial photography has been completed by the USFS up to the year 1996. This task is intended to evaluate hypotheses 3 and 4. All slides observed in the field will be noted, and vegetation will be used to estimate age. Extent will also be estimated.

### **Task 7) Beneficial Uses Identification:**

Available salmonid spawning and rearing data will be compiled and evaluated for both the NFS and reference watersheds. Although this may not directly address hypothesis 4, this information may inform hypothesis 4. (It is assumed that salmonids can utilize a broad range of habitat conditions. If fish utilization in the NFS is similar to that within reference watersheds then hypothesis 4 may be valid. If fish utilization in the NFS is lower than in reference watersheds then this hypothesis is less valid.)

# North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

## A7. Measurement Quality Objectives

The ODEQ has not developed formal QA/QC criteria for a project of this nature. Consequently the 2009 study is considered a pilot project and as such there are no formalized field collection requirements pertaining to QA/QC for the parameters collected and recorded for this scope of work. Recommendations may be made at the conclusion of the project to guide future efforts. Some internal QA/QC measurements that will occur include the review of data prior to completion of field data collection to check for reasonableness (slope, wood size, boulder size, etc.). Data will also be compared to photo documentation to check for reasonableness.

## A8. Training Requirements and Certification

Field crews familiar with the NFS watershed (and larger coastal Ecoregion III) and the EMAP protocol will be utilized and retrained for the specifics of the protocol modifications.

## A9. Documentation and Records

All data will be provided throughout the project to the SWC, and at the close of the project to the ODEQ lab, USFS, and BLM to meet consultation and special use permit requirements. Additionally, the guidelines below will be followed:

- Field teams will enter data directly into PDA in the field. Electronic data will be uploaded to office computers for distribution and uploading into TMDL databases. Data entry platforms will be developed on a Windows platform for hand-held PDA and, if required, field data sheets will be laser-printed on waterproof paper to ensure field permanence.
- Data sheets (both digital and paper) will include project name, data and time of sampling event, names of field staff, and field results. Each field crew will maintain the original field data sheets in a safe location as required by their Quality Assurance documents or submit the original field data sheets to the Data Manager. If the SWC is not able to retain these documents, they will be turned over to the ODEQ Regional Office in Eugene, which will maintain them for a minimum of five years from the date they were created.

# North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

## GROUP B: DATA GENERATION AND AQUISITION

### B1. Sampling Process Design

Specific samples and field measurements to be collected at each sample site are presented in Table B1-1.

The sampling process generates a random selection of sites using the General Random Tessellation Stratified (GRTS) sampling algorithm<sup>1</sup>. The result is a random, spatially balanced sample which can be adjusted as needed to account for GIS errors, site inaccessibility, or changes to the SAP. The sample frames are as follows:

- **NFS Headwaters:** All 1<sup>st</sup> and 2<sup>nd</sup> order streams in the NFS based on the CLAMS hydro layer.
- **Reference Headwaters:** All 1<sup>st</sup> and 2<sup>nd</sup> order streams based on the CLAMS hydro layer within sub basins identified by ODEQ as erodible reference watersheds.
- **NFS Roads:** Road crossings as identified by the intersection of the CLAMS hydro layer with USFS provided road layer.

Statistics generated using random sampling may not precisely match parameters in the population of interest, particularly when the sample size is moderate to low. Variance estimates will be generated, and confidence intervals will be used to describe the impact of sampling error on the statistics.

**TABLE B1-1: Assessment and Analysis Planned (Sites to be determined by random distribution analysis of stream systems)**

LASAR No.	UTM Lat.	UTM Long.	Site Name	Stream	Crew	Parameters
To be completed	See GIS Layer	See GIS Layer	NFS HW 1	NFS 5 <sup>th</sup> HUC	Contractor	Instream Wood, Landslides, Windthrow, Vegetation
"	"	"	NFS HW 2	"	"	"
"	"	"	NFS HW 3	"	"	"
"	"	"	NFS HW 4	"	"	"
"	"	"	NFS HW 5	"	"	"
"	"	"	NFS HW 6	"	"	"
"	"	"	NFS HW 7	"	"	"
"	"	"	NFS HW 8	"	"	"
"	"	"	NFS HW 9	"	"	"
"	"	"	NFS HW 10	"	"	"
"	"	"	NFS HW 11	"	"	"
"	"	"	NFS HW 12	"	"	"
"	"	"	NFS HW 13	"	"	"
"	"	"	NFS HW 14	"	"	"

<sup>1</sup> Stevens, D. L., Jr. and A. R. Olsen (2004). "Spatially-balanced sampling of natural resources." Journal of American Statistical Association 99(465): 262-278.

## North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

“	“	“	NFS HW 15	“	“	“
“	“	“	NFS HW 16	“	“	“
“	“	“	REF HW 1	Coast Ecoregion	“	“
“	“	“	REF HW 2	“	“	“
“	“	“	REF HW 3	“	“	“
“	“	“	REF HW 4	“	“	“
“	“	“	REF HW 5	“	“	“
“	“	“	REF HW 6	“	“	“
“	“	“	REF HW 7	“	“	“
“	“	“	REF HW 8	“	“	“
“	“	“	REF HW 8	“	“	“
“	“	“	REF HW 8	“	“	“
“	“	“	REF HW 9	“	“	“
“	“	“	REF HW 10	“	“	“
“	“	“	REF HW 11	“	“	“
“	“	“	REF HW 12	“	“	“
“	“	“	REF HW 12	“	“	“
“	“	“	REF HW 13	“	“	“
“	“	“	REF HW 14	“	“	“
“	“	“	REF HW 15	“	“	“
“	“	“	REF HW 16	“	“	“
“	“	“	NFS ROADS 1	NFS 5 <sup>th</sup> HUC	“	Road Condition
“	“	“	NFS ROADS 2	“	“	“
“	“	“	NFS ROADS 3	“	“	“
“	“	“	NFS ROADS 4	“	“	“
“	“	“	NFS ROADS 5	“	“	“
“	“	“	NFS ROADS 6	“	“	“
“	“	“	NFS ROADS 7	“	“	“
“	“	“	NFS ROADS 8	“	“	“
“	“	“	NFS ROADS 9	“	“	“
“	“	“	NFS ROADS 10	“	“	“
“	“	“	NFS ROADS 11	“	“	“
“	“	“	NFS ROADS 12	“	“	“
“	“	“	NFS ROADS 13	“	“	“
“	“	“	NFS ROADS 14	“	“	“
“	“	“	NFS ROADS 15	“	“	“
“	“	“	NFS ROADS 16	“	“	“
“	“	“	NFS ROADS 17	“	“	“
“	“	“	NFS ROADS 18	“	“	“
“	“	“	NFS ROADS 19	“	“	“
“	“	“	NFS ROADS 20	“	“	“

### B2. Sampling Method Requirements

A random sample of 16 sites will be drawn using 1<sup>st</sup> and 2<sup>nd</sup> order streams in the NFS using the CLAMS hydro layer as the sample frame. The standard EMAP RBS protocol (the protocol used in the 2007 study) will be used to determine the survey length. In most cases it is expected that the wetted width will be less than 3.5 meters in which case the protocol calls for a survey length of 150 meters around each X point. There are two caveats:

- 1) If a site is encountered that is greater than **3.5 meters**, then the wetted width will be multiplied by 40 to determine the survey length.
- 2) Wetlands (excluding channel margin wetlands) will be dropped but noted.

## **North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment**

All surveys will be 20 meters wide (10 meters from each channel margin). Each site will also be photo documented. Disturbance will be noted according to standard EMAP protocols.

### **Task 1) Measure wood volume in headwater streams in the NFS and in reference watershed**

**headwaters:** This task is intended to address hypotheses 1, 2, and 4. All wood in the active stream channel will be binned and classed based on EMAP guidelines. Additionally classification of hardwood or softwood will be noted as will stage of decay. Stage of decay will be noted as either:

- 1) Green leaves present, species obvious
- 2) No green leaves, species obvious
- 3) Bark decay present, species obvious
- 4) Bark decay too great to determine species

Where qualitative slope breaks are encountered within the survey reach, the dominant substrate type will be noted and photo-documented where possible (vegetation may not allow).

### **Task 2) Measure riparian and hillslope vegetation along headwater streams in the NFS and in**

**reference watershed headwaters:** This task is intended to address hypothesis 3 and 4. Vegetation type and age class will be evaluated within 10 meters of each bank to estimate future recruitment potential by applying the vegetation survey component of the EMAP protocol. Windthrow (no rootball) and treefall (rootball attached) within 10m of the channel will be quantified (quantity, size of tree, species if possible, and stage of decay) as well. Stage of decay will be noted as either:

- 5) Green leaves present, species obvious
- 6) No green leaves, species obvious
- 7) Bark decay present, species obvious
- 8) Bark decay too great to determine species

Existing forestry stand information will be compared to the extent possible at each site within the riparian survey zone.

### **Task 3) Compare boulder counts and bedrock proportions in the NFS headwaters to those within**

**reference watershed headwaters:** This task is intended to address hypothesis 5. Boulders in the stream channel greater than 1 meter will be tallied. Pool/boulder complexes will be tallied. The percentage of bedrock in the stream will be estimated.

### **Task 4) Evaluate road condition throughout the NFS:**

This task is intended to address hypothesis 3. A driving survey of the NFS will be conducted during to evaluate road conditions. A random sample (drawn using the GRTS algorithm) of 20 road crossings will be evaluated in the NFS. Road condition ~ 200 m above the crossings (i.e. in the direction water would flow from) will be evaluated for erosion (as indicated by scour and

## **North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment**

deposition along the survey). Size and length of rills/ruts/gullies will be measured. Active erosion will be evaluated at each site (i.e. is active scour and deposition observed?). Each site will be photo documented. Additionally, a driving/walking survey of the NFS will be conducted to evaluate the effectiveness of existing waterbars throughout the watershed. The locations of the waterbars surveyed will be recorded and evaluated for effectiveness. The following questions will be evaluated, based on past work completed by the Siuslaw NF (Barbara Ellis-Sugai, per. comm.):

- Is the waterbar filling in?
- Are they eroding at the outlet?
- Are they broken down or nonfunctional?
- Is there deposition at the outlet?
- If eroding at the outlet, where is the sediment being deposited? Hillslope? Waterway? How far downslope?

Additionally, indication of off road/ATV activity on roads closed to vehicular traffic will be noted and reported to the appropriate management agency.

**Task 6) Evaluate Evidence of Recent Landslides:** This task is intended to evaluate hypotheses 3 and 4. Landslides and debris flows will be counted and their extent quantified when encountered in the field. Field data collected during the headwater assessment will be used to estimate the sensitivity of the aerial identification. To evaluate landslides that may not be visible from aerial photography any landslides noted during field surveys will be used to calibrate the aerial photography analysis.

**Task 7) Beneficial Uses Identification:** This task is intended to inform hypothesis 4. Amphibians, fish, mammals, and birds will be noted (if possible by species, if not by class) when present (both actual presence such as sculpin in pools and signs such as beaver chew).

### **B3. Sample Handling and Custody Procedures**

No samples will be taken.

### **B4. Analytical Methods Requirements**

Analysis of field data will be conducted following the protocol listed below:

**Task 1 and 2) Measure wood volume and vegetation condition in headwater streams in the NFS and**

## **North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment**

**in reference watershed headwaters:** Data from the NFS and Reference reaches will be compared using standard hypothesis testing procedures, and direct comparison of cumulative distribution functions.

**Task 4) Evaluate road condition throughout the NFS:** Synoptic statistics will be generated to estimate the quality of road condition in the NFS and the extent of poor quality roads adjacent to road crossings. Consultation with local and regional experts (e.g. USFS and ODEQ staff) will be complemented by literature review to identify road conditions which would be judged as poor.

**Task 5) Document existing sediment related Best Management Practices (BMPs) in the NFS:** This is a non-comprehensive documentation of USFS road management practices, Forest Practice Act requirements, Oregon Department of Agriculture riparian regulations, and County road maintenance practices. The primary goal will be to document existing BMPs and compare them to those already in place in existing sediment TMDLs in Oregon. Land actions will also be noted and mapped (active harvests, recreational use, improvements, etc.) This is not a comprehensive survey of land-use actions. No attempt will be made to associate actions with BMP compliance.

**Task 6) Evaluate Evidence of Recent Landslides:** This task is intended to evaluate hypotheses 3 and 4. Aerial Photography for the time period following 1996 will be evaluated for evidence of landslides and/or debris flows. Landslides will be delineated in GIS and the frequency and extent by year will be evaluated. A breakdown by land-use and ownership will be conducted as well. If possible (using publicly available GIS data), hypotheses relating landslides to land-use will developed. It is acknowledged that this analysis represents a coarse filter evaluation of landslides, and may not capture every small event. The Oregon Watershed Assessment Manual (among many other publications<sup>2</sup>) describes landslide features which can be identified on aerial photography. Field data collected during the headwater assessment will be used to estimate the sensitivity of the aerial identification. To evaluate landslides that may not be visible from aerial photography any landslides noted during field surveys will be used to calibrate the aerial photography analysis.

**Task 7) Beneficial Uses Identification:** This task is intended to inform hypothesis 4. This section will describe the beneficial uses (as defined by Oregon State Law) present within the watershed and whether they spatially overlap with areas impacted by sedimentation. If fish and/or macroinvertebrate data is available for reference watersheds this data will be compared to NFS data.

### **B5. Quality Control Requirements**

There are no existing, official ODEQ field collection requirements pertaining to QA/QC for the

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<sup>2</sup>Foggin, GT & Rice RM Predicting Slope Instability from Aerial Photos. Society of American Foresters. 1979.

## **North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment**

parameters collected and recorded for this scope of work. As described above, recommendations may be made at the end of the project to guide future efforts.

### **B6. Data Management**

Data collected will be analyzed and stored by the Contractor, and will be provided throughout the project to the SWC, and at the close of the project to the ODEQ and to the USFS to meet consultation and special use requirements.

## **GROUP C: ASSESSMENT AND OVERSIGHT**

### **C1. Assessment and Response Actions**

Surveillance and data management will be performed in a timely manner to ensure that the data being collected will meet the needs of the project. All results of the individual assessments will be compiled and managed by the Contractor and provided to the SWC throughout the project, and to USFS and ODEQ at the close of the project. Response actions will be developed as data becomes available. Any stop work orders or change in project scope will come from the Siuslaw Project Coordinator. Corrective actions will be documented as addendums to this SAP.

### **C2. Reports to Management**

The final report developed as a product of this study will describe the results of the field assessments and analysis described above. The Contractor (Demeter Design) retains final editing rights. The final document will conform to the format which follows:

**Executive Summary:** This will include a one page or less summary detailing the results and conclusions of the study.

**Background:** This will describe (briefly) the basis for the original listing, the results of the 2007 sediment study, and the historical impacts which may have led to it.

**Methods:** This section will describe methods used for the field measurements, GIS analysis, as well as statistical design and analysis.

**Results:** This section will describe the results of the analysis and field surveys.

**Conclusions:** This section will interpret the results of this study in the context of existing data and legal requirements.

# North Fork Siuslaw Headwater, Road Condition, and Landslide Assessment

## GROUP D: DATA VALIDATION AND USABILITY

### D1. Data Review, Validation, and Verification

The Project Officer, QA Officer, and Data Manager will determine if the data collected meets the QA Plan objectives and will review all data resulting from this project as data becomes available. Decisions to accept, qualify, or reject data will be made by the Contractor and Project Manager.

### D2. Validation and Verification Methods

All data will be examined upon analysis for reasonableness and accuracy. Measurements outside expected thresholds will be examined to determine if erroneous field data may be contributing to the result. Data quality problems will be discussed as they occur and in the final report to data users.

### D3. Reconciliation with Data Quality Objectives

If data quality indicators do not meet the project's specifications, data may be discarded and re-sampling may occur. The cause of the failure will be evaluated. If the cause is found to be equipment failure, calibration and/or maintenance techniques will be reassessed and improved. If the problem is found to be sampling team error, team members will be retrained. Any limitations on data use will be detailed in both interim and final reports, and other documentation as needed. If failure to meet project specifications is found to be unrelated to equipment, methods, or sample error, specifications may be revised for the next sampling season. Revisions will be submitted to the QA section of the DEQ Laboratory for review and/or approval.

## Appendix A - Revision History

The plan author must increment the revision number with each approved revision. A new document is assigned a revision number of 1.0. The revision number of a plan that receives routine or minor editing is updated by incrementing the minor number by one (i.e., 1.0 becomes 1.1) The revision number of a document that has undergone major revisions is updated by incrementing the major number by one and setting the minor number to zero (i.e., 1.1 becomes 2.0). Revisions to documents should be clearly identified in a "Revision History" section of the document. The Revision History documents the specific changes made to the controlled document, who made the changes, and the date (month and year) the changes were made.

**North Fork Siuslaw Headwater, Road Condition, and Landslide  
Assessment**

**Table App-1 Revision History**

<b>Revision</b>	<b>Date</b>	<b>Changes</b>	<b>Editor</b>
1.0	5/25/09	Version 1.0 finalized	Lindsay Mico

**Appendix B – Attachments**

- GIS layers identifying the location of NFS headwater sites to be samples
- GIS layers identifying the location of Coastal Reference headwater sites to be samples
- GIS layers identifying the location of NFS Road Crossings sites to be samples